COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC APPLICATION OF NORTHERN KENTUCKY WATER DISTRICT FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO CONSTRUCT A 0.50 MG WATER STORAGE TANK	))))	**CASE NO. 2024-00025**

APPLICATION

Northern Kentucky Water District ("NKWD"), by and through counsel, petitions the Commission for an order authorizing for a Certificate of Public Convenience and Necessity for construction of a 0.50 MG Water Storage Tank **before the bids expire on May 1, 2024** pursuant to KRS 278.020 and approval of financing pursuant to KRS 278.300. In support of this Application, NKWD states as follows:

GENERAL INFORMATION

1. NKWD states pursuant to **807 KAR 5:001(14)** that its office address is 2835 Crescent Springs Rd., Erlanger, Kentucky 41018-0640. Its principal officers are listed in its current Annual Report, which is filed with the Commission as are its prior years Reports.

2. Pursuant to **807 KAR 5:001(14)**, NKWD states it is a non-profit water district organized under Chapter 74 and has no separate articles of incorporation; its web page is www.nkywater.org. Its contact officers and employees are:

Stacey Kampsen Vice President of Finance and Support Services 2835 Crescent Spring Road P.O. Box 18640 Erlanger, KY 41018 Phone: (859) 578 9898 Fax: (859) 578-3668 Email: skampsen@nkywater.org	Tom Edge General Counsel and Manager of Legal, Compliance, and Regulatory Affairs 2835 Crescent Spring Road P.O. Box 18640 Erlanger, Kentucky 41018 Phone: (859) 578 5457 Fax: (859) 578-3668 Email: tedge@nkywater.org

3. A description of NKWD's water system and its property stated at original cost by accounts is

contained in its Annual Report, which is incorporated by reference.

4. NKWD serves retail customers in Kenton, Boone and Campbell Counties and sells water at wholesale to non-affiliated water distribution systems in Kenton, Boone, Pendleton and Campbell Counties.

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

5. NKWD proposes constructing new facilities as described in Exhibit A.

6. The proposed construction project identified in Exhibit A is scheduled to begin construction upon PSC approval and beginning in May 2024 and completed in October 2025. Board approval of the final bids for the project is included in Exhibit C. The bids were opened February 1, 2024 and are subject to acceptance for 90 days. **The bids will expire May 1, 2024.**

7. This project was recommended as part of the Asset Management Program, updated in 2011, an excerpt of which is attached as Exhibit A-3.

8. The construction is in the public interest and is required to allow NKWD to continue to provide adequate service to its customers. The project, its cost, need and other details are contained in Exhibits A -1 through A-7.

9. NKWD has received approvals from the DOW for the Plans and Specifications and funding for these improvements. See Exhibit B.

10. A copy of the Bid Tabulation for this project, along with the Engineer's Recommendation of Award and minutes of NKWD's Board of Commissioner's meeting approving the award are contained in Exhibit C-1 through C-3.

11. The project finance information including: (i) customers added and revenue effect; (ii) debt issuance and source of debt; (iii) USoA Accounts; (iv) additional costs for operating and maintenance; and (v) depreciation costs and debt service after construction is contained in Exhibit D.

12. Information on NKWD's Mortgages, Bonds, Notes and Other Indebtedness is included in Exhibit E.

13. NKWD's Financial Statements are included as Exhibit F and an Affidavit for this Application is included as Exhibit G.

14. No rate adjustment is being proposed as part of this Application.

15. The following information is provided pursuant to **807 KAR 5:001(15)(2)**:

a. Specifications and descriptions are in Exhibit A. The construction is in the public interest and is required to allow NKWD to continue to provide adequate service to its customers. Facts relied on to justify the public need are included in the project descriptions in Exhibit A-1 through A-7.

b. No new franchises are required. Copies of permits from the proper public authority for the proposed construction are in Exhibit B.

c. A full description of the proposed location and route of the proposed construction including a description of the manner of the construction and related information is in Exhibit A-1 through A-7. The project will not compete against any other public utility in the area.

d. A Project Map is included as Exhibit A-2.

e. The project will be funded using $5,000,000 from a future Bond Anticipation Note which includes construction cost, engineering, and contingencies. A summary of the project costs is provided below:

Engineering	$317,064.00
Contractor's Bid	$4,247,758.00
Misc. & Contingencies	$435,178.00
TOTAL PROJECT COST:	$5,000,000.00

Because the Bond Anticipation Note is temporary financing for fewer than two years, NKWD believes no approval of financing is necessary. However, if approval pursuant to KRS 278.300 is needed, such approval is requested. Project financial information is outlined Exhibit D.

16. Pursuant to **807 KAR 5:001(12)(1)**, Financial operations for the twelve-month period not less than 90 days prior is attached hereto in Exhibit F.

17. The following information is provided pursuant to **807 KAR 5:001(12)(2)**:

a. No stock is authorized.

b. No stock is issued.

c. There are no stock preferences.

d. Mortgages are listed in Exhibit E.

e. Bonds are listed in Exhibit E.

f. Notes are listed in Exhibit E.

g. Other indebtedness is listed in Exhibit E.

h. No dividends have been paid.

i. Current balance sheet and income statement are attached as Exhibit F.

18. Pursuant to **KRS 322.340**, Engineering plans, specifications, drawings, plats and reports for the proposed construction or extension prepared by a registered engineer are signed, sealed and dated by an engineer registered in Kentucky are included as Exhibit A.

19. The following information is provided as required by **807 KAR 5:001(18)(1)**:

a. The information required by **807 KAR 5:001(14)** is contained within this Petition generally and within paragraphs 1-4 specifically as if fully rewritten herein;

b. A general description of the property is contained in the NKWD Annual Report filed

with the Public Service Commission and is incorporated herein. The Annual Report and attached financial information in Exhibit F are the latest available from NKWD.

No stock or bonds are to be issued as part of this case. The project will be funded using $5,000,000 from a future Bond Anticipation Note. Project financial information is included as Exhibit D.

c. The funds will be used to construct the project described in Exhibit A.

d. A detailed description of property to be acquired, constructed, improved or extended is included in Exhibit A and Exhibit B.

e. There is no refunding or refinancing proposed herein.

f. The state debt officer has not been notified pursuant to 807 KAR 5:001(18)(1)(g) because no permanent debt is being issued.

20. The following exhibits are provided pursuant to **807 KAR 5:001(18)(2)**:

a. Financial Exhibits, pursuant to **807 KAR 5:001(12)**, are included as Exhibit F.

b. There are no trust deeds. All notes, mortgages and other forms of indebtedness are included as Exhibit E.

c. Maps and plans of property constructed or acquired are listed in Exhibit A.

21. Pursuant to **KRS 278.300**, this Application is made under oath through an Affidavit located in Exhibit G.

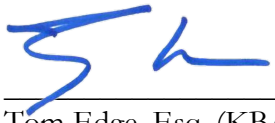
For these reasons, NKWD requests issuance of an order granting authority to construct and finance the facilities and for any other authorizations that may be necessary.

RESPECTFULLY SUBMITTED:

Tom Edge, Esq. (KBA #95534)
General Counsel
Cassandra Zoda, Esq. (KBA #96871)
Contracts, Claims and Procurement Coordinator
Northern Kentucky Water District
2835 Crescent Springs Rd.
Erlanger, KY 41018
Phone - 859-578-5457
Fax - 859-426-2770
Email: tedge@nkywater.org
czoda@nkywater.org
Counsel for Northern Kentucky Water District

CERTIFICATE OF SERVICE

In accordance with 807 KAR 5:001, Section 8, I certify that this document was submitted electronically to the Public Service Commission on February 23, 2024 and that there are currently no parties that the Public Service Commission has excused from participation by electronic means in this proceeding.



Tom Edge, Esq. (KBA #95534)

EXHIBIT LIST

TABLE OF CONTENTS

EXHIBIT A

ENGINEERING REPORTS AND INFORMATION

Northern Kentucky Water District

EXHIBIT A-1

PROJECT DESCRIPTION

New Taylor Mill Tank
City of Taylor Mill
Kenton County, Kentucky
184-4018

PROJECT DESCRIPTION

This project will construct a new elevated water storage tank at 5421 Pride Parkway (KY 16) between Wayman Branch Road and Scott High School in the City of Taylor Mill, Kenton County, Kentucky. Water storage in the Taylor Mill area was originally provided by a 330,000-gallon ground-level standpipe situated a mile south of the proposed tank site adjacent to Taylor Mill Elementary. Due to its geometry, height, and location within the system, this standpipe provided very little elevated storage and was inadequate to avoid relatively lower pressures (≈40 psi) within the higher elevations of its service area.

NKWD's Asset Management Program made recommendations to retire the standpipe and construct a new elevated storage tank 30' higher to provide additional pressure and to match the gradient of an adjacent zone. In preparation for these improvements, the District has been slowly increasing system pressures by adjusting the pressure regulators which feed this zone. Because this change in gradient made the standpipe obsolete, it was taken out of service in 2019 and sold as surplus.

The new 0.9-acre tank site at 5421 Pride Parkway is more centrally located within the Taylor Mill system, has better access, and is large enough to accommodate construction of the new tank as compared to the original standpipe's 0.086-acre landlocked parcel. Construction of the new 500,000 gallon elevated water storage tank will include a submersible mixer, telemetry / supervisory control and data acquisition (SCADA) equipment, instrumentation, analyzers, site piping, electrical work, and security measures.

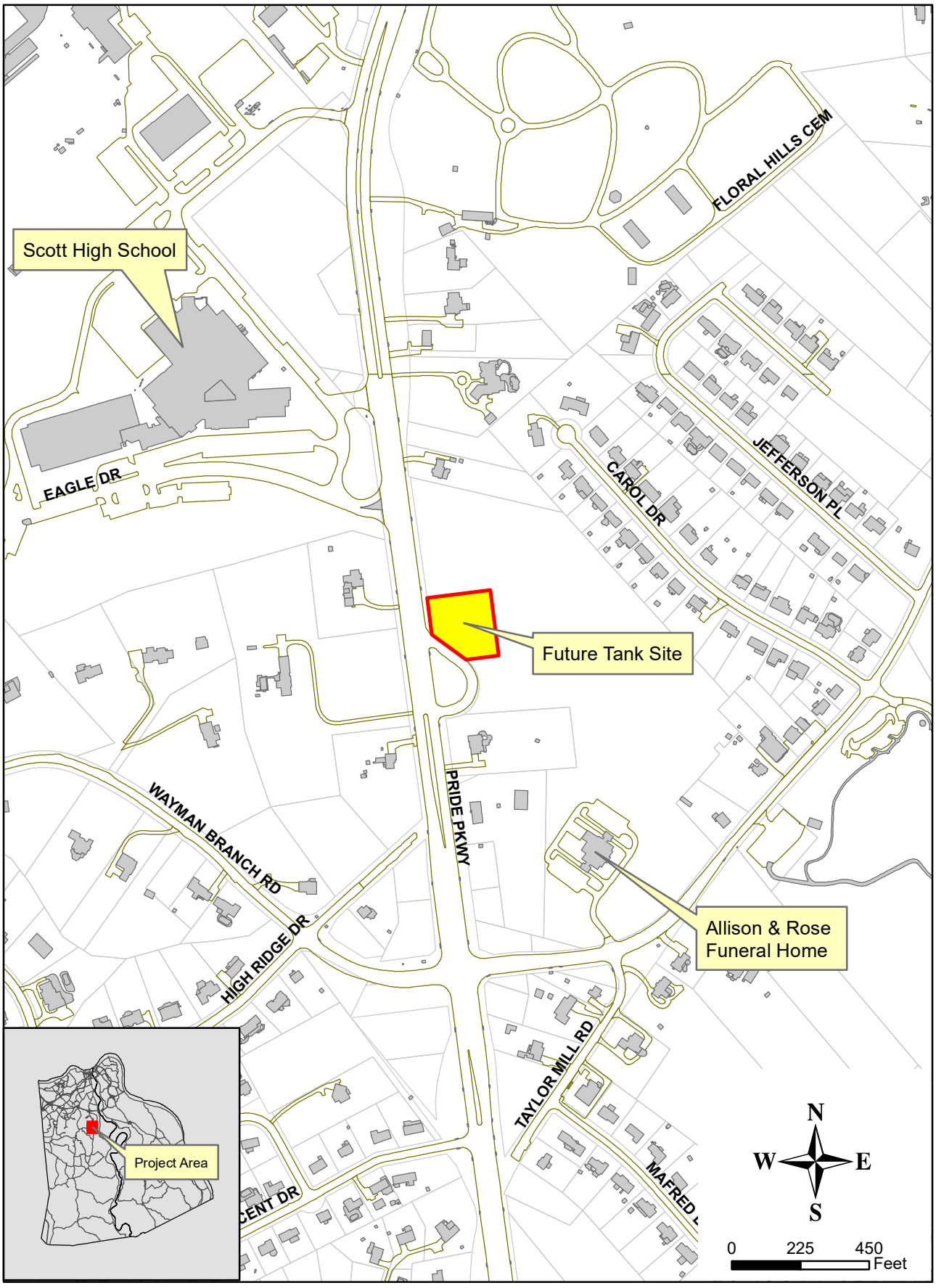
NKWD's Board of Commissioners selected to construct a pedesphere water storage tank (Bid Option 2) from the lowest and best bid of Phoenix Fabricators and Erectors, LLC. While the pedesphere style tank costs $146,346 more to construct as compared to the multi-column style tank, its 60-year coating cost is $372,000 cheaper. See Exhibit C-2, Engineer's Recommendation of Award. A pedesphere tank also provides additional safety and security benefits as equipment and ladder access is not exposed to weather and instead is kept within the confines of the tank.

Bids for this project were opened on February 1, 2024 and are subject to acceptance for 90 days.

Northern Kentucky Water District

EXHIBIT A-2

PROJECT MAP



Taylor Mill Elevated Water StorageTank

Northern Kentucky Water District

EXHIBIT A-3

2008 ASSET MANAGEMENT PROGRAM EXCERPTS

See highlighted sections of 4-31 and 4-38

4. Identified Needs and Improvements

4.1. Large Capital Projects in 5-Yr CIP

The results of the asset renewal and replacement planning were combined with evaluations of alternatives to meet the District's needs in areas of increased capacity and regulatory compliance. Areas of focus for this AMP Update included:

- Raw Water Supply
- Water Treatment Plants
- Pumping Stations and Storage Tanks
- Other (including laboratory equipment)

4.1.1. Raw Water Supply Evaluation

4.1.1.1. Ohio River Pump Station No. 2

In the 2004 Asset Management Plan, NKWD identified the Ohio River Pump Station No. 2 (ORPS2) as one of the Districts' assets that was most critically in need of improvements. The 100 plus year old pump station delivers raw water to the Memorial Parkway Water Treatment Plant (MPTP). Currently, ORPS2 contains three 10 MGD pumps with one of the three being inoperable. The remaining two pumps are able to provide the necessary 10 MGD firm capacity of raw water necessary at the MPTP. To accommodate their expanding service population over the foreseeable future, NKWD has decided to upgrade the capacity at the MPTP to 15-20 MGD at some point during the duration of this planning period. The timing of this improvement depends on available treatment plant capacity pending detailed hydraulic analyses. In order to meet that increased raw water demand and address the identified physical condition of the pump station, NKWD has several alternatives to satisfy these necessary improvements. This analysis will evaluate the raw water pumping alternatives and provide preliminary capital cost estimates associated with each alternative to assist NKWD in the critical task of improving their raw water intake asset in ORPS2.

The first alternative available to the District (Alternative A) would be a complete rehabilitation and upgrade of the existing ORPS2. The renovated pump station would house two 12 MGD pumps to meet off-peak pumping capacity needs and a third 12 MGD pump would be added giving ORPS2 a future firm pumping capacity of 24 MGD. The pump station's concrete and brick have significantly deteriorated over the years and rehabilitation would be challenging and unpredictable. Numerous amounts of structural and destructive testing would have to be performed to accurately assess the condition of

the existing superstructure. It is also not conceivable to assume the continued operation of this facility during the rehabilitation process. It is very possible that ORPS2 could be out of service for almost two years during construction. Because of the building's being listed as a historical site by the AWWA, any rehabilitation and upgrade efforts must retain the historical integrity of the structure. This alternative would result in larger design fees and disclaimers associated with the unpredictability and dangers present with the task of renovating a 100 plus year old facility. Further, by providing this summary of probable costs, Malcolm Pirnie and GRW are in no way conclusively stating that a rehabilitation of this facility can actually be accomplished.

Table 4-1.
Probable Costs for Alternative A - Rehabilitate and Upgrade Existing ORPS2

Item	Cost
Structural renovation (floors, walls, roof, etc.)	$10,800,000
Protective Cofferdams in River	$1,600,000
Equipment (HVAC, electrical, etc.)	$1,800,000
Misc. Improvements (bar screens, stairs, etc.)	$2,900,000
Three 12 MGD Pumps	$2,450,000
Back-up Generator	$1,700,000
24" DIP from PS to Top of Hill	$1,700,000
24" DIP from Top of Hill to MPTP	$2,300,000
Design and Fees (40%)	$10,100,000
Subtotal	**$35,350,000**
Contingency (40%)	$14,150,000
Total	**$49,500,000**

The second alternative available to the District (Alternative B) would be to retire the existing ORPS2 and replace it with a new 24 MGD intake structure and pumping facility. The new pump station would also house three 12 MGD pumps giving the ORPS2 a firm pumping capacity of 24 MGD. A large percentage of the cost for this alternative would be in the rock excavation for the superstructure, the building of coffer dams, and the pumping equipment itself. This alternative would provide NKWD a new, reliable source of raw water in comparison to what is currently available. Since there is no retrofitting to an existing facility, this alternative provides minimal effect on current operations during construction. This alternative also provides more flexibility in design and offers a greater accuracy in estimating construction costs.

Table 4-2.
Probable Costs for Alternative B - Replace ORPS2 with a New Intake & Pumping Facility

Item	Cost
Raw Water Intake Structure and Equipment	$22,400,000
Electrical Services Updates	$500,000
Back-up Generator	$1,700,000
24" DIP from PS to Top of Hill	$1,700,000
24" DIP from Top of Hill to MPTP	$2,300,000
Design and Fees (25%)	$7,150,000
Subtotal	**$35,750,000**
Contingency (25%)	$8,900,000
Total	**$44,650,000**

The third alternative available to the District (Alternative C) would be to retire the existing ORPS2 and supply MPTP from the existing Ohio River Pump Station No. 1 (ORPS1). Currently, ORPS1 is nominally sized for six 12 MGD pumps and supplies the District's Fort Thomas Water Treatment Plant (FTTP). The FTTP has a rated capacity of 44 MGD and the firm capacity of ORPS1 is 60 MGD. Due to site constraints, a future expansion of the FTTP has not been considered. If ORPS1 is also to supply MPTP with the future treatment capacity of 15-20 MGD, then an upgrade and possible expansion of ORPS1 would be necessary to circumvent any redundancy and reliability issues. The first option considered was to upgrade the size of the existing pumps at ORPS1 therefore raising the firm capacity at the pump station to supply raw water to both treatment plants. As it currently stands, the weight of each existing pump meets or narrowly exceeds the floor loading design capacity of the pump foundation at ORPS1. Therefore, due to floor loading issues, it is not feasible to just upgrade the size of the pumps currently in ORPS1 without considering methods to increase the floor loading capacity and pipe gallery modifications. This option was not further considered due to the assumption that it is not feasible to remove ORPS1 from service to accomplish the structural and piping modifications. The second option would be to build an addition onto the current ORPS1 structure that could house three 10 MGD pumps giving ORPS1 an additional 20 MGD of firm capacity. This would provide NKWD with the capacity and reliability to now provide MPTP with raw water from ORPS1. In addition to the upgrades at ORPS1, a transmission main would need to be constructed to supply MPTP with raw water from ORPS1. This option is the basis for the costs presented below in Table 4-3. This alternative will no longer provide the District with the redundancy of having two separate raw water intake pumping sources and would require significant hydraulic modeling to ensure proper pumping operations.

Table 4-3.
Probable Costs for Alternative C - Retire ORPS2 and Supply MPWTP from Existing ORPS1

Item	Cost
Pumping Station Structure Upgrades	$17,250,000
Three 10 MGD Pumps	$1,950,000
Changes to ORPS1 Gallery Piping	$1,150,000
24" DIP from ORPS1 to ORPS2	$2,700,000
24" DIP from ORPS2 to Top of Hill	$1,700,000
24" DIP from Top of Hill to MPTP	$2,300,000
Additional Back-up Generator	$1,700,000
Electrical Services Updates	$500,000
Design and Fees (25%)	$7,300,000
Subtotal	**$36,550,000**
Contingency (30%)	$11,000,000
Total	**$47,550,000**

All estimates do not include any costs associated with easement or land acquisition. The costs for Alternatives B and C are similar, but Alternative B is being recommended because it provides more redundancy and less disruption to operations at ORPS1. However, additional detailed evaluation would needed to verify costs for these options.

4.1.1.2. Licking River Pump Station

The following level of service improvements were identified during a site visit to the Licking River Pump Station and are included in the 5-year CIP as 09-05.

- **Improvements to the Building Superstructure -** A large number of structural deficiencies that were identified in the 2004 AMP have been addressed. A number of small cracks were still visible in the concrete and brick on both the interior and exterior of the building. The current condition of the roof is unsatisfactory and operations staff indicated there is no efficient method to remove and service the station's pumps. Current openings in the roof to pull pumps are not sized properly creating difficulties when removed via crane on the Licking River. It is recommended that a new roof be installed with properly sized hatches to facilitate removal of the pumps along with a new 2-ton hoist. Hatches should double as sky lights to improve lighting inside the pump room. Ventilation inside the building is provided by one roof mounted fan and one wall fan with fresh air louvers located on the river side wall. Temperatures inside the building were slightly higher than normal with both ventilation fans running. The operations staff indicated some deterioration in some of the ladders used to maneuver alongside the exterior of the building. The District expressed interest in implementing a programmatic approach to building maintenance allowing a budgeted amount of money to be set aside each year to aide

in the rehabilitation efforts of the building. The estimated annual cost for building rehabilitation is $40,000/year. The estimated cost for roof replacement is $205,000.

- **Replacement of Sluice Gates -** Currently there are three sluice gates located at various points of the intake structure that have not been operated in several years, according to the operations staff, and need to be replaced. The majority of this work would need to be completed in wet conditions by divers. A capital cost was generated to replace the current gates as well as their corresponding electric operators. The estimated cost to replace the sluice gates is $185,000.
- **Raw Water Main Relocation -** The aerial portion of the 16" raw water main that runs across the Licking River was previously identified as a security risk in a vulnerability assessment due to the lack of redundancy. However, discussion on feasibility of building this line suggests this is not a realistic budget and it may not be possible to build a buried main at this site (affordably). This project is being removed from the budget.
- **Variable Frequency Drive Pump Upgrade and Relocation -** NKWD and its operations staff indicated strong interest in moving the existing drives and MCC out of the pump station into a newly constructed, climate controlled electrical building located on the river bank side of the walk bridge (approximately 400 feet from the pumps). This change would also correspond with installation of variable frequency drives on the remaining two pumps. These improvements would improve reliability, provide operational flexibility and result in a facility that is more easily maintained. Also, by moving the existing drives and MCC outside of the pump room, this will improve any current deficiencies in ventilation. The estimated cost for upgrading and relocating the VFD are $940,000. To perform this work the follow tasks are required:

    1. New VFD's to control current 150 Hp, 250 Hp and 350 Hp pump motors.
    2. New building to house the MCC and VFD drives.
    3. New MCC with service rated feed along with TVSS.
    4. New service feeds to the pumps out from the new building.
    5. Commissioning, tuning and debugging of the new drives.
    6. Spare parts needed for the VFD's.
    7. The demolition work needed for removal of the drives, conduit and wire, clean up, removal of the old electrical feed to the motors and MCC.
    8. Installation of the new motor (need to be at least a class F to handle the VFD requirements).
    9. New service feed to the new MCC panel.

4.1.2. Water Treatment Plant Evaluation

4.1.2.1. Memorial Parkway WTP

Regulatory

Regulatory needs at the Memorial Parkway WTP include the addition of granular activated carbon (GAC) for advanced treatment to meet the Stage 2 Disinfectant/Disinfection By-product (D/DBP) Rule and potentially a UV disinfection facility to meet the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), or to provide an additional disinfection barrier.

Several site alternatives were analyzed and the selected alternative was to locate the GAC facility in the footprint of Sedimentation Basins No. 5 and No. 6. The following assumptions for capacity and redundancy were made in developing the basis of design for the GAC facilities:

- The GAC facility will include 6 GAC contactors, GAC feed pump station, GAC backwash system, contactor-to-waste function, combination backwash waste/contactor-to-waste equalization basin, and carbon loading/unloading facilities.
- Normal operation will provide at least a 20-minute EBCT with all contactors in-service at a maximum production rate of 20 MGD.
- Duty and standby pumps are provided for each of the pumping systems required for these facilities.
- Provisions to enable incorporation of UV disinfection at the future treatment capacity of 20 MGD.

All six GAC contactors will have the same type of equipment and operational mode as shown in Table 4-4.

Table 4-4.
Design Criteria for GAC Contractors MPTP

Parameter	Value
No. of Contactors	6
Contactor Length (feet)	34
Contactor Width (feet)	15
Surface Area per Contactor (sf)	510
GAC Media Depth (inches to top of underdrain)	144
Design Flow per Contactor at Current Design Capacity (MGD)	3.3
Surface Loading Rate at Current Design Capacity (gpm/sf)	4.5

As the preliminary design progressed, a final opinion of probable costs was developed. The cost opinion is considered a Class 3 estimate in accordance AACE and has a predicted accuracy of -20% to +30%. The detailed cost opinion is shown in Table 4-5, and includes the UV disinfection facility.

Table 4-5.
Opinion of Probable Project Costs-MPTP

Item	Capital Cost ($ Million)
GAC Facilities (Contactor building, site work, GAC PS, EQ Basin)	$18.5
UV Facility	$2.3
Contingency	$4.1
Engineering (Legal, administration)	$3.1
Total	**$28.0**

Capacity

Capacity needs at the MPTP will include an upgrade of the plant capacity from a 10 MGD to 15 MGD or 20 MGD facility sometime between 2020 and 2030. Additional coagulation, sedimentation, filter, clearwell and pumpage capacity is anticipated.

Level of Service

During a recent site visit to the MPTP facility, a number of items were identified in need of repair. The findings of this visit are described in the following paragraphs.

- **Replacement of Raw Water Reservoir suction/discharge piping -** The District indicated, during our site visit, that the original suction/discharge piping located at both existing raw water lagoons is undersized therefore creating a hydraulic bottleneck that possibly limits the capacity of the treatment plant. This piping

supplies the raw water pump station by conventional gravity methods. It is recommended that the existing suction/discharge piping be upsized and replaced to accommodate additional capacity at MPTP. Estimated cost is $285,000.

- **Dredging of Residuals in North and South Raw Water Reservoirs (2012-2013) -** The South Reservoir is currently being used as the raw water presedimentation basin and feeds the plants raw water pump station while the North Reservoir is currently being used only as a sludge and backwash holding basin. Based on comments by the operating staff, it is believed that the North Reservoir is over 80% filled with solids and when the water level reaches a certain height water spills over the dam separating the two reservoirs. Due to possible improvements to the Sludge Handling Facility and implementation of Advanced Treatment facilities at MPTP, the District expressed interest in postponing any possible improvements to the condition of both Raw Water Reservoirs past the year 2012.
- **Addition of Backup Generator -** The District expressed interest in providing MPTP with an additional back-up generator to provide the plant with a source of additional power reliability for the Actiflo® process and plant's general operations. Currently, the existing generator at MPTP only serves the lighting panels for the Filter Building, Chemical Building, Backwash Pump Station, and the Raw Water Pump Station. The generator is part of the Advanced Treatment Project AMP 09-03. The estimated cost for the addition of a backup generator is $900,000.
- **Demolition or Conversion of Current Chemical Building -** The current condition of the Chemical Building's superstructure is unsatisfactory. Visible structural defects are numerous and a large portion of the buildings upper levels have been taken out of service. Over the past several years, the District has had numerous studies completed on the possible demolition of the existing building or possible conversion of the existing building to a single story maintenance shop. Either alternative would be an acceptable recommendation since the District seeks to take some type of action towards the condition of the existing building. A specific project has not been included for this work.
- **Replacement of valve actuators on Filters 4, 5, and 6 -** Currently, the District uses pneumatic actuators for all valves involved in the filter process at MPTP. NKWD has stated they would like to replace the current pneumatic valve actuators on Filters 4, 5, and 6 with electrically controlled actuators. This is part of Advanced Treatment Project AMP 09-03.
- **Sludge Process Equipment Rehabilitation (annual programmatic budget and AMP 17-02 & 29-01) -** The residuals handling system at MPTP is currently not in operation due to numerous problems associated with the process equipment in the Sludge Handling Building. Instead of a single project to rehabilitate the residuals handling system and place it back in service, the District expressed strong interest in supplementing projects with an annual programmatic budget approach to rehab/upgrade the existing inoperable facilities. An upgrade to the following process

equipment is recommended - Sludge Press Rehab, Conveyer System Rehab, Sludge Pump Replacement, Electrical Upgrade, and Dumpster Area Rehab. Once the recommended improvements are addressed and the facility is put back in service, the current practice of using the North Raw Water Reservoir for residuals storage may be eliminated. The estimated annual cost associated with rehabilitation of the sludge process equipment is $120,000/year.

4.1.2.2. Fort Thomas WTP

Regulatory

Regulatory needs at the FTTP include the addition of granular activated carbon (GAC) for advanced treatment to meet the Stage 2 Disinfectant/Disinfection By-product (D/DBP) Rule and potentially a UV disinfection facility to meet the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) or to provide an additional disinfection barrier.

Several site alternatives were analyzed and the selected alternative was to locate the GAC facility adjacent to the existing laboratory building. The following assumptions for capacity and redundancy were made in developing the basis of design for the GAC facilities:

- The GAC facility will include 8 GAC contactors, a GAC feed pump station, GAC backwash system, contactor-to-waste function, combination backwash waste/contactor-to-waste/filter-to-waste equalization basin, and carbon loading/unloading facilities.
- Normal operation will provide at least a 20-minute EBCT with all contactors in-service at a maximum production rate of 44 MGD.
- Duty and standby pumps are provided for each of the pumping systems required for these facilities.
- Provisions to enable incorporation of UV disinfection at the current treatment capacity of 44 MGD.
- A GAC supplier will provide virgin carbon to the site and truck the spent GAC off-site.

All eight GAC contactors will have the same type of equipment and operational mode as shown in Table 4-6.

Table 4-6.
Design Criteria for GAC Contactors-FTTP

Parameter	Value
No. of Contactors	8
Contactor Length (feet)	44
Contactor Width (feet)	20
Surface Area per Contactor (sf)	880
GAC Media Depth (inches to top of underdrain)	144
Design Flow per Contactor at Design Capacity (MGD)	5.5
Surface Loading Rate at Design Capacity (gpm/sf)	4.3

As the preliminary design progressed, a final opinion of probable cost was developed. The cost opinion is considered a Class 3 estimate in accordance AACE and has a predicted accuracy of -20% to +30%. The detailed cost opinion in 2007 dollars is shown in Table 4-7, and includes the UV disinfection facility.

Table 4-7.
Opinion of Probable Project Costs-FTTP

Item	Capital Cost ($ Million)
GAC Facilities (Contactor building, site work, GAC PS, EQ Basin)	$33.5
UV Facility	$2.8
Contingency	$7.3
Engineering (Legal, administration)	$5.4
Total	**$49.0**

Capacity

There were no assets identified at the FTTP that required improvements to provide capacity for meeting future growth through the year 2030.

Level of Service

During a recent site visit to the FTTP facility, a number of items were identified in need of repair. The findings of this visit are described in the following paragraphs.

- **Repair of Concrete Flocculation/Sedimentation Basins #2 & #3 -** Visual inspection of sedimentation basins #2 & #3 showed numerous areas of deterioration in the concrete and similar deteriorations were apparent in the corresponding flocculation basins. It is recommended that the District take the necessary measures to repair the concrete as part of capital improvement planning at FTTP before the condition worsens. The estimated cost for these repairs is $900,000.

- **Improvements to Flocculation Process Equipment -** NKWD expressed interest in revising the current flocculation arrangement for three of the four existing basins. It is recommended that NKWD revise current flocculator drive arrangements in basins #1, #2 & #3 similar to the direct drive assembly in basin #4. The current two stage horizontal flocculator arrangement should be converted to a three stage vertical flocculator arrangement to alleviate current alignment issues, age, and system wear. The estimated cost associated with revising the drive arrangement on flocculation basins #1, #2 & #3 is $71,500. The estimated cost associated with revising the flocculation paddle arrangement is $42,500.
- **Addition of Protective Covers to all Four Sedimentation Basins -** NKWD expressed interest in the addition of protective covers over all four existing sedimentation basins at FTTP. This capital improvement will aide in blocking sunlight which is a proven and effective method for algae control. By covering the basins, it may no longer be necessary to feed copper sulfate to all four sedimentation basins. Upon further investigation, the cost to span the dimension with support members to cover the basin was higher than anticipated. This project will not be carried forward.
- **Replacement of Filter Backwash Tank -** During our site visit, NKWD indicated that the current condition of the underground Filter Backwash Tank is unsatisfactory and may still leak even after recent attempts to recondition the aging tank. The District expressed strong interest in replacing the existing underground tank with a slightly larger tank. A lower cost alternative, with less functionality, would be to make remedial repairs to the existing tank. The District may elect to cancel this project if the new backwash pumps installed with the Advanced Treatment Project are found to be reliable. The estimated cost for upgrading and replacing the Filter Backwash Tank is $460,000.
- **Perform Comprehensive Hydraulic Analysis of FTTP -** NKWD expressed strong interest in completing a comprehensive hydraulic analysis of the operations at FTTP. There may be hydraulic bottlenecks that are preventing the Plant from operating at its optimal capacity. One area of concern that was specifically mentioned by the District was the Filter Influent Flume.
- **Replacement of Sludge Building Interior Process Equipment -** NKWD indicated that, even though there are no current operational issues with any of the existing sludge handling process equipment, the aging equipment is quickly approaching the end of its useful life and should be considered for scheduled replacement. Two new sludge belt filter presses, conveyor system, decant valves, and repairs to the dumpster room were all specifically mentioned by the District and are recommended to be addressed as part of the capital improvements at FTTP. NKWD recommended delaying the above mentioned capital improvements until the year 2012-2013 in order to concentrate solely on Advanced Treatment improvements in the near future. The estimated cost associated with replacing the sludge belt filter press is $1,600,000 and

the estimated cost associated with replacement of the sludge press process equipment is $270,000.

4.1.2.3. Taylor Mill WTP

Regulatory

Regulatory needs at the TMTP include the addition of granular activated carbon (GAC) for advanced treatment to meet the Stage 2 Disinfectant/Disinfection By-product (D/DBP) Rule.

Both basin-style and vessel-style contactors were investigated for the GAC facility to be located west of the current treatment processes at the TMTP. Vessel-style contactors were selected and the following assumptions for capacity and redundancy were made in developing the basis of design for the GAC facilities:

- The GAC facility will include 28 GAC pressurized vessels, GAC feed pump station, GAC backwash system, contactor-to-waste function, combination backwash waste/contactor-to-waste equalization basin, and carbon loading/unloading facilities.
- Normal operation will provide at least a 20-minute EBCT with all contactors in-service at a maximum production rate of 10 MGD.
- Duty and standby pumps are provided for each of the pumping systems required for these facilities.

Twenty-eight pressurized contactors will be provided. It is anticipated that the contactors will have the following characteristics as shown in Table 4-8.

Table 4-8.
Design Criteria for GAC Contactors-TMTP

Parameter	Value
No. of Contactors	28
Contactor diameter (feet)	10
Approximate Contactor height (feet)	22
Design Flow per Contactor at Design Capacity (MGD)	0.42

As the preliminary design progressed, a final opinion of probable costs in 2007 dollars was developed. The cost opinion is considered a Class 3 estimate in accordance AACE and has a predicted accuracy of -20% to +30%. The detailed cost opinion, which includes the UV disinfection facility, is shown in Table 4-9.

Table 4-9.
Opinion of Probable Project Costs-TMTP

Item	Capital Cost ($ Million)
GAC Facilities (Contactor building, site work, GAC PS, EQ Basin)	$15.3
Contingency	$3.1
Engineering (Legal, administration)	$2.3
Total	**$20.7**

Capacity

There were no assets identified at the TMTP that required improvements to provide capacity for meeting future growth through the year 2030.

Level of Service

During a recent site visit to the TMTP facility, a number of items were identified in need of repair. The findings of this visit are described in the following paragraphs.

- **Replacement of Concrete Sedimentation, Flocculation, and Rapid Mix Basins -** Recent tests by a concrete testing company have validated the operations staff's concerns that both the north and south sedimentation basins are rapidly deteriorating. Visual inspection showed similar, but less severe, deterioration in the concrete of the adjoining flocculation and rapid mix basins. It is recommended that the District replace the concrete sedimentation, flocculation, and rapid mix basins as part of capital improvement planning at TMTP. The existing rapid mixer was last replaced in 1989 and should also be replaced with a new mixer as part of the basin replacement. The District has expressed interest in replacing the existing tube settlers in both basins but has elected to wait until replacement of the existing basins is completed. This project is combined with the Advanced Treatment Project. The estimated cost for replacing the concrete basins is $3,405,000. The estimated cost for replacing the rapid mixer is $4,500. The estimated cost for replacing the tube settler is $235,000.
- **Replacement of Sludge Building Interior Process Equipment -** NKWD indicated that, even though there are no current operation issues with any of the existing sludge handling process equipment, the aging equipment is quickly approaching the end of its useful life and should be considered for scheduled replacement. A new belt filter press, conveyor system, decant valves, and repairs to the dumpster room were all

specifically mentioned by the District and are recommended to be addressed as part of the capital improvements at TMTP. NKWD recommended delaying the above mentioned capital improvements until the year 2014 in order to concentrate solely on Advanced Treatment improvements in the near future. The estimated cost for the sludge belt filter press replacement is $800,000. The estimated cost for replacing the sludge press process equipment is $175,000.

4.1.3. Pumping Station Evaluation

Regulatory

There were no regulatory improvements identified for any of the pump stations through the year 2030.

Capacity

A pump station capacity analysis was conducted as part of the Hydraulic Model Update, see Section 1 of this report.

Level of Service

Bromley Pump Station

During a recent site visit to the Bromley Pump Station, a number of items were identified in need of repair. These items are included in the R&R portion of the CIP. The findings of this visit are described in the following paragraphs.

- **Improvements to Interior of Pump Room Building -** Unlike at the Carothers Pump Station, the renovations to the Bromley Pump Station had not been completed at the time of out site visit. It could be assumed that similar renovations would have a similar impact on the capital improvement recommendations at this pump station. According to the operations staff, the Bromley Pump Station is at the top of the District's renovations list. The current condition of the interior of the building was fair and the staff indicated no problems with daily operations of the pump station. All pumps have been recently refurbished by NKWD staff. All three concrete pump support blocks were in poor condition, with significant concrete deterioration visible at the Pump #1 support block. All non-buried piping showed extensive corrosion and, according to the operations staff, is to be painted as part of the renovations program. Piping supports underneath control valves were either non-existent or crude pieces of wood and should be addressed. One of the three pump motors in use appeared to be much older than the other two pump motors. It is recommended to phase out the old pump motor in order to standardize the existing pump motors therefore minimizing spare parts. There was not an adequate method to maneuver

around the pump room without jumping over non-buried piping. In case of an emergency, this would present safety concerns. The District expressed interest in implementing a programmatic approach to building maintenance, above and beyond the existing O&M capital budget, allowing a budgeted amount of money to be set aside each year to aide in the rehabilitation efforts of the building. The estimated annual cost for building rehabilitation is $10,000. The estimated cost associated with pump motor standardization is $50,000

- **HVAC Improvements to Pump Room -** Ventilation within the pump room is provided by a single fan located in the ceiling of the pump room. Temperatures inside the pump room were well above normal, with the fan running, during summer month operation. It should also be noted that the discharge damper was disconnected during the site visit and should be addressed. It is recommended that at least one additional ceiling fan be installed to help improve cross-flow ventilation. The fans should be operable either by a local thermostat or by manual switch. The estimated cost for HVAC improvements is $2,700.

Carothers Pump Station

During a recent site visit to the Bromley Pump Station, a number of items were identified in need of repair. These items are included in the R&R portion of the CIP. The findings of this visit are described in the following paragraphs.

- **Improvements to Interior of Pump Room Building -** Currently, NKWD is in the process of a systematic program of renovating and rehabilitating all of their distribution pump stations. The District did not divulge a schedule or criticality assessment but stated rather that the program is driven on an "as needed basis" and as O&M capital funds are made available. At the time of our site visit, the Carothers Pump Station renovations had recently been completed, therefore this pump station had little or no capital improvement needs. The current condition of the interior of the building was satisfactory and every piece of non-buried piping was painted recently and in fairly good condition. The restroom in the building was not in service and, according to the operations staff, has been that way for numerous years. The District expressed little interest in improving the operation of the stations lavatory.
- **Addition of a Back-up Generator -** NKWD expressed interest in providing this pump station with a back-up generator. Due to space limitations on the property this improvement might not be feasible. An existing generator at the FTTP will become redundant since a new generator is included as part of the recent Advanced Treatment project at that site. Therefore the old generator may possibly be moved to the Carothers Pump Station. There is discussion of also moving that same generator to service the TMPS or the Central Facilities Building. For the purposes of this planning document, it will be assumed that because of the space limitations at this site that a new nominally sized, portable generator will be purchased to satisfy this capital improvement. The estimated cost for the back-up generator is $220,000

Dudley 1040 & 1080 Pump Stations

During a recent site visit to the Bromley Pump Station, a number of items were identified in need of repair. These items are included in the R&R portion of the CIP. The findings of this visit are described in the following paragraphs.

- **Improvements to Interior Process Equipment of Pump Room Building 1080 -** The interior of the buildings was in overall good condition. All pumps have been recently rebuilt by NKWD staff within the last 4 years and all control valves have been reconditioned within the last 5 years. The operations staff indicated that all four pumps are in good operating condition. Some non-buried piping showed minor corrosion and, according to the operations staff, is scheduled to be painted. At this time, there are no identified capital improvement recommendations and any minor improvements to this pump station can be addressed within the O & M budget.
- **Improvements to Interior Process Equipment of Pump Room Building 1040 -** The current condition of the interior of the buildings was satisfactory. The operations staff indicated that all four pumps are in good operating condition and have been recently refurbished by NKWD staff within the last 7 years. The District expressed concern about the age (originally installed in 1965) and lack of efficient hydraulic performance of three of the four station's vertical can pumps. It is recommended that all three of the existing vertical can pumps be systematically replaced as part of the on-going capital improvements to this station. All non-buried piping showed minor corrosion along with small patches of moss growth and, according to the operations staff, is scheduled to be painted. NKWD also expressed interest in implementing new soft start instrumentation at this pump station for all four pumps similar to that currently in use at the 1080 station. This improvement would help cut down on peak power demand during pump run time and start-up. The estimated cost associated with pump replacement is $800,000. The estimated cost for soft start RVAC retrofit is $60,000. The estimated cost for soft start auto transformer overhaul is $240,000.
- **HVAC Improvements to Pump Room 1080 & 1040 -** During our site visit, it was observed that NKWD consistently placed the insect screens/bird screens on the inside of the existing pump station louvers. This creates an ideal spot for insects and birds to build nests between the louver blades and the screens and may create a serious health hazard associated with droppings. It is recommended that the District possibly replace these louvers with the screen on the outside. The estimated cost for louver replacement is $1,500.
- **Replacement and Upgrade of Isolation Valves for both 1040 & 1080 Tanks -** NKWD expressed strong interest in replacing isolation valves located on the inlet side of the two 5 MGD storage tanks. The operation of these isolation valves should be tied into and controlled by the District's existing SCADA system. Currently, in case

of a transmission main break, the District has no preventative measures in place to reduce the volume of water lost. The estimated cost for replacing the isolation valves and upgrading SCADA is $55,000.

4.1.4. Storage Tank Evaluation

Within the 5-Year planning window the only new tank recommended is the replacement of the Rossford Tank due to age and condition. Additional storage capacity is projected to be needed to meet future demand increases beyond the 5-year horizon as discussed in Section 1, Hydraulic Model Update. Recommendations for storage tank maintenance can be found in Section 4.2.4, Storage Tank Evaluation.

4.1.5. Other

4.1.5.1. Laboratory Equipment

The replacement of laboratory equipment was included in the evaluation of the capital improvements plan as shown in Table 4-10. The equipment was assigned a service life of either 10 or 15 years. Equipment was assumed to be replaced with the same model or equivalent. This evaluation assumed that the exact same number and type of equipment would continue to be needed throughout the planning horizon.

Table 4-10
Laboratory Equipment Replacement Schedule

Replacement Year	Purchase Year	Equipment	Make/Model	Location	Instrument Service Life	2008 Cost	Annual Replacement Cost	Final Cost (including inflation)
2008	2000	TOC Analyzer No. 1	Tekmar Fusion **	Organics Lab	10 years	$37,000		
2009	1988	Incubator No. 1	Fisher Scientific CO2 incubator/ 605	Micro Lab	15 years	$26,000		
2009	1988	Autoclave No. 1	Market Forge Sterilmatic/STME	Micro Lab	15 years	$12,000		
2009	2000	AA Varian No. 1	Spectra AA 280 **	Analytical Chemistry Lab	10 years	$75,000		
2009	1997	AA Perkin Elmer No. 1	Furnace 41102L, Flame AA analyst 400 **	Analytical Chemistry Lab	10 years	$22,000	$172,000	$172,000
2011	1996	Autoclave No. 1	Market Forge Sterilmatic/STME	Micro Lab	15 years	$12,000	$12,000	$13,230
2012	1997	Muffle Furnace No. 1	Lindberg	Wet Chem Lab	15 years	$7,000	$7,000	$8,103
2014	1999	D.I. Unit	Barnstead Infinity/D9011	Micro Lab	15 years	$4,000		
2014	2005	GC (for HAAs) No. 2	Thermo Trace GC Ultra	Organics Lab	10 years	$37,000		
2014	2005	Ion Chromatograph No. 2	Dionex	Analytical Chemistry Lab	10 years	$60,000	$101,000	$128,904
2016	2007	GC Mass Spec No. 2	Agilent GC 7890A, MS 5975C	Organics Lab	10 years	$50,000	$50,000	$70,355
2017	2008	Discrete Analyzer No. 2	OI Analytical DA3500 **	Wet Chem Lab	10 years	$58,000	$58,000	$85,692
2018	2008	TOC Analyzer No. 2	Tekmar Fusion **	Organics Lab No. 2	10 years	$37,000		
2018	2003	Muffle Furnace	Lindberg Blue	Wet Chem Lab	15 years	$7,000	$44,000	$68,258
2019	2009	AA Varian No. 2	Spectra AA 280 **	Analytical Chemistry Lab	10 years	$75,000		
2019	2009	AA Perkin Elmer No. 2	Furnace 41102L, Flame AA analyst 400 **	Analytical Chemistry Lab	10 years	$22,000		
2019	2004	D.I. Unit	Barnstead Diamond/D12651	Micro Lab	15 years	$5,000	$102,000	$166,147
2024	2009	Incubator No. 2	Fisher Scientific CO2 incubator/ 605	Micro Lab	15 years	$26,000		
2024	2009	Autoclave No. 2	Market Forge Sterilmatic/STME	Micro Lab	15 years	$12,000		
2024	2014	GC (for HAAs) No.2	Thermo Trace GC Ultra	Organics Lab	10 years	$37,000		
2024	2014	Ion Chromatograph No. 2	Dionex	Analytical Chemistry Lab	10 years	$60,000	$135,000	$280,655
2026	2011	Autoclave No. 2	Market Forge Sterilmatic/STME	Micro Lab	15 years	$12,000		
2026	2016	GC Mass Spec No.e 2	Agilent GC 7890A, MS 5975C	Organics Lab	10 years	$50,000	$62,000	$142,105
2027	2012	Muffle Furnace No.e 2	Lindberg	Wet Chem Lab	15 years	$7,000		
2027	2017	Discrete Analyzer No. 2	OI Analytical DA3500 **	Wet Chem Lab	10 years	$58,000	$65,000	$156,430
2028	2018	TOC Analyzer No. 3	Tekmar Fusion **	Organics Lab	10 years	$37,000	$37,000	$93,497
2029	2019	AA Varian No. 3	Spectra AA 280 **	Analytical Chemistry Lab	10 years	$75,000		
2029	2019	AA Perkin Elmer No. 3	Furnace 41102L, Flame AA analyst 400 **	Analytical Chemistry Lab	10 years	$22,000	$97,000	$257,370

4.1.6. Project Recommendations

A brief description of all the recommended projects in the 5-Year CIP can be found in Table 4-11 followed by a table of the project costs and projected dates when projects will be needed are presented in Table 4-12. A map of all the recommended improvements is provided as Figure 4-1.

Additionally, in order to provide options within the CIPs, multiple approaches were developed to evaluate the timing of projects, and how this timing affects the capital required to fund the AMP throughout the 20-year planning horizon. These approaches are defined below:

Minimum Approach. The minimum approach includes projects required to meet regulations and replace failing critical assets. The minimum approach also includes what is considered to be a minimum amount of funding for maintenance and repairs just to keep the facilities in operation.

Moderate Approach. The moderate approach includes projects required to meet or exceed regulations, replace aging assets at levels below highest level, and improve reliability. The moderate approach also includes funding for what is considered to be an average level of maintenance and repairs for all facilities.

Aggressive Approach. The aggressive approach includes projects required to exceed regulations, replace all categories of aging assets at highest level and significantly improve reliability at the earliest timeframe practical. The aggressive approach also includes adequate funding for maintenance and repairs required for all facilities as well as funding for unanticipated maintenance.

Appendix F contains the results of this analysis for all recommended improvements from 2009-2030.

Table 4-11.
5-Year CIP Project Description

Designation	Description
Yearly	Distribution System R&R This program involves the systematic replacement of water mains in areas which the District has experienced problems such as discolored water, poor flows, or failures.
Yearly	Coordinated Main Replacement This program involves working with various cities and agencies in the service area to replace water mains in streets that are being resurfaced. Working together saves the District restoration costs and coordinates our work with the street work.
Yearly	Mains to Unserved Areas These funds are utilized to extend water mains into unserved areas. The total project funding may include these funds along with grant funds, county funds, and surcharges to the customers.
Yearly	Annual General Facility R&R – Plants, Tanks, and Pump Stations This program involves rehabilitation and replacement of aging infrastructure and miscellaneous improvements at the treatment plants, tanks, pump stations, and regulator and meter pits. This may include improvements to address recommendations such as adding flow meters on the discharge of all pumps and gravity feed lines from FTTP and MPTP, surge suppression at pump stations, and connecting pressure regulating valves and large meter pits into SCADA.
09-01	FTTP – Advanced Treatment Project NKWD must comply with Stage 2 of the Disinfection By-Product Rule (DBPR) in April 2012. The DBPR will require all water systems to comply with a local running annual average of 80 ug\L and 60 ug|L for THM and HAA5 respectively at worst-case sampling points in the distribution system. NKWD will not be able to comply with this new regulation with the existing treatment processes at the FTTP. This project will install granular activated carbon (GAC) and ultraviolet (UV) disinfection at the FTTP. The standby generator will also be replaced.
09-02	TMTP – Advanced Treatment Project The preliminary treatment process housing the rapid mix, flocculation basins, and sedimentation basins at the TMTP are approximately 50 years old and need to be replaced because they are failing. The existing basins will be demolished and a granular activated carbon (GAC) feed pump station and emergency power generators installed in their place. The preliminary design report for advanced treatment options includes GAC at TMTP in order to meet the 2012 regulations. The ultraviolet (UV) disinfection units will be moved to the new GAC building.

Table 4-11.
5-Year CIP Project Description

Designation	Description
09-03	MPTP – Advanced Treatment Project This project will add granular activated carbon (GAC) and ultraviolet (UV) disinfection at MPTP in order to meet new regulations. The improvements will be located in the abandoned sedimentation basins. The project also includes replacing the standby power generator and upgrading filter control valves on 3 of the 6 filters as the other 3 were upgraded in 2007 with the underdrain and media installation.
09-04	FTTP Filter Renovations Industry standards recommend that filter media be changed out approximately every 20 years. The filter media in the 12 filters at FTTP is all older than 20 years and has started to exhibit performance problems. For example, 6 of the 12 filters significantly underperform, resulting in increased turbidity breakthrough and more frequent and longer backwashing. In this project the filter media will be replaced along with the surface wash system which will be replaced by an air scour system. The filters at the two other treatment plants all have air scour which reduces backwashing by about 50%, resulting in savings of finished water.
09-05	LRPS Structural Improvements, Roof Replacement, Sluice Gates, Actuators, and VFD This project will repair small cracks in the concrete and brick on the interior and exterior of the building and the ladders on the outside of the building that are deteriorating. This project will replace the roof that is in unsatisfactory condition and will upsize the hatches to facilitate removal of pumps. This project will replace the existing inoperable sluice gates that are located at multiple levels of the intake with new electrically actuated gates. The addition of a variable speed drive for increased pumping flexibility will be evaluated as well.
09-06	TMTP Valves and Actuators This project will replace aging valves and actuators in the pump station at the Taylor Mill Treatment plant.
09-07	Dudley 1040 – Pump Replacement This project will replace up to four pumps in the Dudley 1040 pump station and may add variable speed drives to two of the pumps. This station is the primary supply of water for northern Kenton County service area. The pumps were installed in 1965 and are at the end of its useful service life.

Table 4-11.
5-Year CIP Project Description

Designation	Description
09-08	Washington Trace from Twelve Mile to Hwy 1996 The proposed project involves construction of a new 12-inch water main along Oneonta and Washington Trace Roads from Stonehouse to Carthage Road in Campbell County, Kentucky. The length of this project is approx. 14,300 LF. Several new right-of-ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to extend water service to additional customers, support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
09-09	US 27 from East Alexandria Pike to Main Street The proposed project involves constructing a new 24-inch water main along AA Highway from East Alexandria Pike to Four Mile Pike, Alexandria, Campbell County, Kentucky. The length of this project is approx. 9,700 LF. No new right-of-ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
09-14	Dolwick 1080/1040 Interconnect This project involves consructing a new 12-inch water main along Dolwich from the existing 12-inch on Dolwick to Turfway Road. This project is designed to provide a back-up feed to the Airport and the surrounding commercial and industrial area. The project will connect two different pressure zones together through a special valve.
09-15	42-inch Transmission from FTTP to Moock Road The proposed project involves constructing a new 42-inch water main along U.S. 27 and Moock Road from the FTTP to the Moock Road 36-inch in the City of Wilder and Southgate, Campbell County, Kentucky. The length of this project is approx. 8,500 LF. New right-of-ways of easements will needed. The estimated cost for the project is $2,900,000. This project will replace the existing 24-inch main which is approximately 100 years old. This project is designed to strengthen and improve the transmission system to meet population growth and commercial development needs. The District's Master Plan identified this as a needed hydraulic improvement.

Table 4-11.
5-Year CIP Project Description

Designation	Description
09-16	Siry to Flatwoods (Subdistrict F) These remaining funds from Subdistrict F will be utilized to extend water mains along Siry & Flatwoods Roads. This project will provide an additional feed to Pendleton County Water and is part of the District Hydraulic Master Plan. The total project funding will include these funds along with grant funds, county funds and surcharges. The approx. length of the project is 3.6 miles.
10-01	Dudley Discharge Redundancy – Phases 1, 2, and 3 This project involves constructing a new 36-inch/24-inch/16-inch water main through the City of Crestview Hills, Kenton County, Kentucky. This project is designed to strengthen the District's water transmission system and provide some redundancy for the District's existing 36-inch water main. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this as a needed improvement.
10-02	Stonehouse Rd (Twelve Mile Road) from KY 10 to KY 1566 The proposed project involves constructing a new 8-inch water main along Twelve Mile Road from Ky. 10 to Ky. 1566 in Campbell County, Kentucky. The length of this project is approx. 8,200 LF. No new right-of-ways of easements should be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to extend water service to additional customers, support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as needed hydraulic improvement.
10-06	Senour Avenue West of Clover Ridge This project involves construction a 16-inch transmission water main along Senour Road from the existing 16-inch on Senour to Taylor Mill Road. This project is designed to provide additional water to the Independence area. The District's newest Master Plan identified this as a needed improvement.
11-01	Replace PLCs at TMTP This project will replace the existing PLCs at the Taylor Mill Treatment Plant installed in 1992 that have reached the end of their useful service life. The PLCs are used to control the filter operations including normal filtering flow rates and monitoring points, filter backwash, and filter-to-waste operation.
11-02	FTTP Filter Building Improvements This project will repair the walls, windows, and coatings that are failing due to condensation in the filter bays at the FTTP.
11-07	IT Improvements – Year 1 This project includes implementation of improvents to the WAN, conversion to GeoDatabase, inventory control, and IT Tracking system.

Table 4-11.
5-Year CIP Project Description

Designation	Description
12-01	Rossford Tank The project involves the replacement of the current 300,000 gallon Rossford tank with a larger 1 million gallon tank. The District has already secured land adjoining the existing tower for the replacement tower. The existing Rossford Tank will be retired and the Lumley Tank could also be retired.
12-02	MPTP Reservoir Pump Station Suction Piping Replacement A review of the Memorial Parkway Treatment Plant by CH2MHill and later by Quest/JJG showed that the suction piping for the reservoir pumping station has deteriorated and needs to be replaced. This pipe will be upsized to facilitate future capacity expansion of the plant.
12-03	Carothers Road Pump Station Generator This project will provide backup power to the Carothers Road Pump Station which serves as the sole supply of water to the southern part of the Newport service area under normal operations. This area may be served through emergency interconnections from the Ft. Thomas system. This project will reduce our risk of being without power at this station.
12-04	FTTP Residuals Handling Improvements The residuals processing system at the Fort Thomas Treatment Plant was built in the early 1990s and the equipment is reaching the end of its service life. The preliminary concept for this project includes replacing the two existing belt filter presses, belt conveyors, and polymer feed system; adding a third dumpster bay to provide additional storage of pressed cake prior to hauling; improving HVAC to reduce condensation; adding two flow equalization tanks ahead of the presses to maintain a more constant feed consistency; upsizing the recyled water line to the reservoirs; adding a new pipe to return settled water from the sedimentation basins to the reservoirs for routine cleaning; and adding a lamella plate settler housed in a building to treat water prior to returning to the reservoirs or allowing discharge to a creek under a KPDES permit.
12-06	Burns Rd. Between Persimmon Grove & Flatwoods This project involves constructing a new 8-inch water main along Burns Road from Persimmon Grove to Flatwoods Road. This project is designed to strengthen the District's water transmission system. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this as a needed improvement.
12-07	KY 1280 Between US 27 & Burns Rd. This project involves construction a new 8-inch water main along Ky. 1280 from Burns Road to U.S. 27. This project is designed to strengthen the District's water transmission system. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this as a needed improvement.

Table 4-11.
5-Year CIP Project Description

Designation	Description
12-08	Madison Ave. Parallel 24-inch Main Between Dudley & Hands Pike This project involves constructing a new large transmission water main along Madison Pike from the existing 42-inch at Dudley Pike to Hands Pike. This project is designed to provide additional water to the Richardson Road Pump Station and Hands Pike Pump Station. The District's newest Master Plan identified this as needed improvement.
12-9	Orphanage Rd. Parallel 24-inch Main Between Redwood & Valley Plaza This project involves constructing a 24-inch transmission water main along Orphanage Road from the existing 24-inch at Horsebranch Road between Redwood School and Valley Plaza. This project is designed to provide additional water to the 1040 pressure zone. The District's newest Master Plan identified this as needed improvement.
12-10	Hands Pike Between KY16 & Edwin The proposed project involves constructing a new 12-inch water main along Hands Pike from Ky. 16 to Edwin Drive, Covington, Kenton County, Kentucky. The length of this project is approx. 2,500 LF. No new right-of–ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
12-11	KY 16 Between Hands Pike & Klette Rd The proposed project involves constructing a new 12-inch water main along Ky. 16 from Hands Pike to Klette Road, Covington/Independence, Kenton County, Kentucky. The length of his project is approx. 3,000 LF. No new right-of-ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
12-15	Highland Avenue 12-inch from Kyles Lane to new reg pit near Hanser pit The proposed project involves constructing a new 12-inch water main along Highland Ave. from Kyles Lane to regulator pit at Hanser Drive in Fort Wright, Kenton County, Kentucky. New right-of-ways of easements may be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.

Table 4-11.
5-Year CIP Project Description

Designation	Description
12-16	KY 16 from I-275 to TM Swim Club upgrade 16-inch with KDOT project This project involves constructing a new 16-inch water main along the new alignment of KY 16. This project is designed to strengthen the District's water transmission system. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this as a needed improvement.
12-17	KY 16 from TM Swim Club to TM Standpipe upgrade 16-inch with KDOT project This project involves constructing a new 16-inch water main along the new alignment of KY 16. This project is designed to strengthen the District's water transmission system. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this as a needed improvement.
12-18	IT Improvements - Year 2 This project includes implementation of improvents to the WAN, conversion to GeoDatabase, inventory control, IT Tracking system, and intergration with software systems.
13-01	FTTP Backwash Tank Replacement The existing backwash supply tank was constructed in 1936 and is a rectangular basin that is mostly buried. This structure is in need of significant concrete repair and needs to be replaced with a new tank.
13-02	Dudley - Install Isolation Valves This project will install valves to isolate the two 5 million gallon Dudley tanks in the event of a rapid loss of water such as a large water main failure. The valves would be SCADA controlled so that they would close automatically and signal the pumps at the Taylor Mill Pump Station to turn off as well.
13-03	Taylor Mill PS Pump Replacement (proposed 1, 5, 6 and 2 or 3) This project will replace four of the six pumps at the Taylor Mill Pump Station. The new pumps will replace pumps at the end of their useful service life. The proposed pumps to replace are numbers 1, 5, 6 and either 2 or 3.
13-04	LRPS New Generator & Walkbridge Upgrade This project will make improvements to the walkbridge and install standby power to the Licking River pump station which supplies water to the Taylor Mill Treatment Plant.
13-05	Improvements to FTTP Flocculation/Sedimentation Basins 2 & 3 Sedimentation basins 2 and 3 were constructed in 1936 and presently have two-stage flocculation. It is recommended to modify the basins for three-stage flocculation with vertical flocculation paddles instead of horizontal. This configuration is preferred for improving the effectiveness of removing the particulates through sedimentation. It is also recommended to replace the rakes and repair the concrete walls that are deteriorating.

Table 4-11.
5-Year CIP Project Description

Designation	Description
13-07	Low Gap Rd. Between Tollgate Rd & 8-inch Dead End The proposed project involves construction a new 8-inch water main along Low Gap Road from Ky. 9 to existing water main dead-end in the City of Alexandria, Campbell County, Kentucky. The length of this project is approx. 1,300 LF. No new right-of-ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to extend water service to additional customers, support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
13-08	Interconnect 1080 & 1017 The proposed project involves constructing a new 12-inch water main along KY 536 (Pond Creek Road) from KY 1936 (Pond Creek Road) to Decoursey Pike in Campbell & Kenton Counties, Kentucky. The length of this project is approx. 2,000 LF. New right-of-ways of easements should be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to support existing water systems, improve water quality, and improve fire protection in the area. This water main will need to cross the Licking River. The District's Master Plan identified this as a needed hydraulic improvement.
13-12	US 27 24-inch from Sunset to Martha Lane Collins This project involves constructing a 24-inch transmission water main along U.S. 27 from Sunset Ave. to Martha Lane Collins. This project is designed to provide additional water to the 1017 pressure zone. The District's newest Master Plan identified this as a needed improvement.
13-13	Independence Rd. Between KY17 & 12-inch Pipe This project involves constructing a new 12-inch water main along Independence Road from Ky. 17 to the existing 12-inch main. This project is designed to strengthen the District's water transmission system. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this a needed improvement.
13-14	IT Improvements - Year 3 This project includes implementation of improvents to the WAN, IT Tracking system, and intergration with software systems.
14-01	Laboratory Generator This project will install standby power to the laboratory at the Ft. Thomas Treatment Plant that performs the analyses of water for the entire system that is necessary for compliance with KDOW testing requirements.

Table 4-11.
5-Year CIP Project Description

Designation	Description
14-02	TMTP Sludge Pumps, Conveyors & Press This project will replace the existing sludge processing equipment at the Taylor Mill Treatment Plant that has reached the end of its useful service life. A new belt filter press, conveyor, decant valves and repairs to the dumpster room are recommended.
14-03	ORPS2 Replacement Design and Construction This project will replace the existing Ohio River Pump Station No. 2 that supplies water to the Memorial Parkway Treatment Plant because the existing station was built in the late 1800s and has reached the end of its useful service life. The facility has numerous structural issues that need addressed to remain in operation and would take significant work to bring into current building code compliance if altered. The first year budget includes design engineering services for all improvements and installation of two phases of raw water main. The second and third year budgets include engineering services during construction and the contractor's construction cost for the station.
14-05	36-inch Licking River Crossing This project involves constructing a new 36-inch redundancy water main across the Licking River between Kenton & Campbell Counties. This project is designed to strengthen the District's water transmission system and provide additional redundancy for the District's existing 36-inch concrete water main. The District's Master Plan Addendum for Reliability and Redundancy Analyses identified this as a needed improvement.
14-09	Vineyard (Gunkel Rd.) Between Eight Mile & Fender Rd. The proposed project involves constructing a new 8-inch water main along Gunkel Road from Eight Mile Road to Fender Road in southern Campbell County, Kentucky. The length of this project is approx. 9,000 LF. No new right-of–ways of easements will be needed. This project is designed to strengthen and improve the transmission system and local distribution system to meet population growth and commercial development needs. This project is designed to extend water service to additional customers, support existing water systems, improve water quality, and improve fire protection in the area. The District's Master Plan identified this as a needed hydraulic improvement.
14-10	IT Improvements - Year 4 This project includes implementation of improvents to the WAN, IT Tracking system, and intergration with software systems.

Table 4-11.
5-Year CIP Project Description

Designation	Description
15-04	Bromley Pump Replacement and Misc. Improvements This project will replace the existing pumps at the Bromley Pump Station that have reached the end of their useful service life. The smaller pump was installed in 1968 and the two larger pumps in 1986. The chlorine storage and feed facility will be replaced along with various electrical and security improvements, replacement of valves and actuators.
15-05	Upgrade SCADA/Instrumentation/Security Equipment at Plants and PS This project will upgrade the SCADA operating system, replace the PLCs at the plants and pump stations that were installed between approximately 1998 and 2003 as they will have reached the end of their useful life, and replace security systems that were installed primarily from the Vulnerability Assessment recommendations in the same time period.
15-07	IT Improvements - Year 5 This project includes implementation of improvents to the WAN, IT Tracking system, and intergration with software systems.
16-05	Hands Pike Pumps and Misc Improvements The pumps, motors, and motor control centers installed in 1983 will be at the end of their useful lives and due to be replaced. It is recommended the lighting, electrical, and exhaust fans be inspected and replaced if needed. As an option to improving Hands Pike, the station could be retired when the new Richardson Road Pump Station is in place (proposed 2018).
16-06	Horsebranch Road 24-inch from 36-inch to Thomas More Parkway This project involves construction of a approximately 1,800 feet of 24-inch main along Horsebranch Road to Thomas More Parkway.
17-01	Raw water line to FTTP South Reservoir This project involves replacing the 30-inch raw water main installed in 1936 feeding the south reservoir at FTTP with a new 36-inch line. This improvement will bring more water to the south reservoir.
17-02	MPTP Residuals Handling Improvements This project will allow the residuals handling building to be placed back into operation. Improvements include adding a gravity thickener to process settled process solids and solids removed from the reservoir by a dredge, installation of 3 positive displacement pumps, modifications to truck loading area roof height, conversion of the existing sludge holding tank to a holding tank for belt filter press filtrate and gravity thickener supernatant and return pumps, and electrical upgrades.

Table 4-11.
5-Year CIP Project Description

Designation	Description
17-04	SR17 From Hands Pike to Apple Drive This project involves the construction of approximately 28,000 feet of 24-inch water main along SR 17 between Hands Pike and Apple Drive. It will serve as a primary north/south water main to increase flow to both the existing Independence Tank and a new tank east of Independence.
17-08	Replace Bellevue Tank The Bellevue Tank was built around 1930 and is approaching the end of its useful service lives. Since the tank was painted in 1999, it is recommended a detailed inspection of the tanks be performed when the coatings reach 15 to 20 years old. Based on the condition of the tanks, the District will need to decide if the condition is adequate for repainting and keeping the tank in service for at least another 15 to 20 years or whether a new tank is needed.
18-01	New KY17 PS To Replace Richardson Rd. PS The pumps at Richardson Road station are currently running at much lower head than their design and will need to be replaced to meet future demand conditions. Due to limited capacity in the discharge pipe it is recommended this station be replaced with a new station at a different location along SR 17. The existing Richardson Road Pumping Station would be retired and the Hands Pike Pumping Station could also be retired.
18-02	1.0 MG Elevated Storage Tank East of Independence Based on demand projections and a storage gap analysis additional storage in the southern Kenton County area will be needed sometime between 2015 and 2020. This project consists of building a new 1.0 MG tank east of Independence.
18-03	Replace Dayton Tank The Dayton Tank was built around 1930 and is approaching the end of its useful service lives. Since the tank was painted in 2001, it is recommended a detailed inspection of the tanks be performed when the coatings reach 15 to 20 years old. Based on the condition of the tanks, the District will need to decide if the condition is adequate for repainting and keeping the tank in service for at least another 15 to 20 years or whether a new tank is needed.
18-04	US 27 Pump Station VFDs It is recommended that variable frequency drives be added to at least 2 of the pumps to reduce pressure surges in the system.
18-09	SR17 to Stephens Rd cross country 16-inch to New Tank in Independence This approximately 4,500 feet of 12-inch pipe between SR 17 and Stephens Road is needed to connect the new 1.0 MG Tank east of Independence.
18-10	24-inch on US 27 Between FTTP and Martha Layne Collins replace 16-inch It is recommended that the existing 16-inch main between the FTTP and Martha Layne Collins be replaced with a 24-inch main for approximately 16,000 feet.

Table 4-11.
5-Year CIP Project Description

Designation	Description
19-01	1.0 MG Elevated Storage Tank – Southern Campbell County Based on demand projections and a storage gap analysis, additional storage will be needed in the southern Campbell County area between 2015 and 2020. This project will construct a new 1.0 MG tank in southern Campbell County near KY 9 and Lick Hill. The Main Street Tank may need retired for water quality reasons when this new tank is in place.
19-03	New Pump Station near the existing Ripple Creek PS The existing Ripple Creek Pump Station will be unable to supply enough water to all of southern Campbell County at some time between 2020 and 2030. A new pump station is recommended at the same location or in very close proximity to the existing station.
19-07	24-inch along US 27 from Martha Layne Collins to Ripple Creek PS It is recommended a new parallel 24-inch main be constructed from Martha Layne Collins to the Ripple Creek Pumping Station. The distance is about 12,000 feet.
19-08	16-inch along AA Highway from Hwy 547 & California Cross Rd. This project involves the construction of approximately 32,000 feet of 16-inch water main along the AA Highway (KY 9) between Hwy 547 and California Cross Road that will extend transmission capacity into southern Campbell County. At this time the Main Street Tank could be retired.
19-09	36-inch Redundancy from 42-inch at Moock Rd to 36-inch Licking River Crossing This project consists of constructing 6,300 feet of 36-inch main along Moock Road and across the Licking River into Covington.
19-10	Replace Lumley Tank The tank was built in 1934 and will be at the end of its service life. The tank was last coated in 1999 and will need repainted between 2014 and 2019. This tank can be retired following the construction of the larger Rossford Tank.
20-01	Electrical Upgrades at FTTP It is anticipated that upgrades to the power supply and distribution within the plant will be needed to replace systems at the end of their useful life.
20-02	Retire TM Standpipe Build Elevated 1040 Tank The tank was last coated in 2006 and would be due to be repainted around 2021. In order to increase pressure in Taylor Mill, it is recommended the existing standpipe be retired and a new elevated tank be constructed in its place. The system would be served directly from the 1040 pressure zone be removing the Sandman PRV. The new tank would be about 175 feet tall and should be in the same general vicinity as the existing standpipe. The recommended volume is not confirmed but is estimated to be about 500,000 gallons.

Table 4-11.
5-Year CIP Project Description

Designation	Description
20-03	Pump Station Improvements at Dudley 1040 It is recommended the pumps be retrofitted with variable speed drives and the motor control centers and electrical, mechanical, and lighting systems be upgraded.
20-08	Replacement Ida Spence Tank (or retire and serve from 1040) This tank was last coated in 2005 and will need repainted around 2020. The tank is approaching the end of its useful life having been built in 1953. The tank will need replaced, or it could be retired along with Latonia Pumping Station and the area served through a regulator off the 1040 pressure zone. Some system improvements would be needed to facilitate this conversion.
21-01	Chemical Feed Systems Upgrades at TMTP It is anticipated that chemical feed systems installed in 1998 will need rehabilitated or replaced. Systems include corrosion inhibitor, coagulants, caustic soda, fluoride, polymer, sodium hypochlorite, and sodium bisulfite. Components include piping, valves, actuators, tanks, and pumps.
21-02	Filter Valves and Actuators at FTTP It is recommended the filter valves and actuators at FTTP be replaced as they will be at the end of their useful life.
21-03	Pump Station Improvements at Carothers The pumps, motors, and motor control centers and electrical systems should be replaced.
22-01	20-inch Gravity Discharge from MPTP The two 20-inch gravity discharge lines from MPTP into Newport are over 100 years old. It is recommended these mains be replaced given their importance as the sole supply to Newport and future greater dependency when on these mains when Covington is served by MPTP. The total length is estimated to be 32,000 feet of two parallel 20-inch mains.
22-02	Pump Station Improvements at Bristow Road This project consists of replacing the 3 pumps with new 4,200 gpm pumps rated at 50 feet of head. The new pumps will be better matched to demand conditions and feeding the tanks in the 1080 system. The pumps should be installed with VFDs.
23-010	Chemical Feed Systems Upgrades at FTTP It is anticipated that chemical feed systems installed in 2001 will need rehabilitated or replaced. Systems include copper sulfate, corrosion inhibitor, coagulants, caustic soda, fluoride, polymer, sodium hypochlorite, and potassium permanganate at ORPS1. Components include piping, valves, actuators, tanks, and pumps.

Table 4-11.
5-Year CIP Project Description

Designation	Description
23-02	Pump Station Improvements at Dudley 1080 It is recommended the pumps, motors, and motor control centers be replaced along with upgrades to the mechanical, electrical, and lighting systems.
24-01	Pump Station Improvements at Latonia It is recommended the pumps, motors, and motor control centers be replaced along with upgrades to the mechanical, electrical, and lighting systems.
25-01	Pump Station Improvements at Waterworks Road It is recommended the pumps, motors, and motor control centers be replaced along with upgrades to the mechanical, electrical, and lighting systems. An emergency generator will also be installed.
25-02	MPTP Expand to 20 MGD In order to meet additional demand requirements in the system, the MPTP will be used to supply water to northern Kenton County and Campbell County. Improvements will include addition of a larger raw water pump in the Reservoir Pumping Station and replacement of the existing 24-inch discharge line with a 36-inch main, addition of another ACTIFLO® train,
26-01	Pump Station Improvements and Electrical Improvements at TMTP This project will replace two of the six pumps at the Taylor Mill Pump Station. The new pumps will replace pumps at the end of their useful service life. The proposed pumps to replace are numbers 4 and either 2 or 3. Power distribution at the plant may need replaced and should be evaluated to prioritize needs.
27-05	20-inch to Connect 11th Street in Newport to 12th Street in Covington This project consists of extending one of the gravity lines from MPTP down 11th Street in Newport to supply a new pump station near the Licking River and then connecting back into the main at 12th and Wheeler in Covington. The addition of 5,700 feet of 20-inch is needed.
27-06	12-inch Parallel Main Btwn Vulcan and Lytle The addition of a 12-inch parallel main approximately 6,300 feet in length is needed between Vulcan and Lytle Roads. This main will provide additional capacity needed to serve the Industrial and Devon Tanks.
28-01	New pump station from Newport to Covington This station will utilize Memorial Parkway Treatment Plant as a second supply to serve northern parts of Kenton County along with FTTP. Currently MPTP cannot be used to supply any water to Kenton County.
28-03	24-inch Parallel Main Persimmon Grove from AA Hwy to Jerry Wright Additional transmission is needed to provide adequate turnover and maintain the South County Tank and Claryville Tank water levels under future demand. This project consists of building 16,000 feet of 24-inch parallel main along Persimmon Grove and Jerry Wright Road.

Table 4-11.
5-Year CIP Project Description

Designation	Description
28-04	16-inch Main Jerry Wright, Lickert, Old SR 4 to Claryville Tank Additional transmission is needed to provide adequate water levels in the South County Tank and Claryville Tank water levels under future demand. This project consists of constructing 9,000 feet of 16-inch along Lickert Road and Old State Route 4.
29-01	MPTP add second gravity thickener This project involves the addition of a second gravity thickener and pumps to process increased production capacity and reservoir solids at MPTP.
29-02	ORPS2 Addition of One 10 MGD Pump In order to meet increased system demands, it will be necessary to add one 10 MGD pump to the raw water pumping station.
29-04	20-inch Percival Rd from 24-inch in Banklick/Walton Nicholson to New Tank This 20-inch water main will provide flow to the new southern Kenton County Tank needed to maintain pressures in the around Walton under 2030 projected demand conditions.
29-05	1 MG Tank in Southern Kenton County near Walton Based on demand projections and a storage gap analysis, additional storage will be needed in southern Kenton County sometime by 2030. This project consists if building a new 1.0 MG tank near Walton. A check valve will be installed in Independence Road to keep Bristow Road Pumping Station from pumping directly to the Independence Tank. This valve will help supply more water to the new tank.
30-01	Chemical Feed Systems Upgrades at MPTP It is anticipated that chemical feed systems installed in 2006 will need rehabilitated or replaced. Systems include copper sulfate, corrosion inhibitor, ferric sulfate, polyaluminum chloride, caustic soda, fluoride, polymer, sodium hypochlorite, and powdered activated carbon. Components include piping, valves, actuators, tanks, and pumps. Systems will be sized to meet 20 MGD treatment capacity.
30-02	Pump Station Improvements at US 27 It is recommended the pumps, motors, and motor control centers be replaced along with upgrades to the mechanical, electrical, and lighting systems.
30-07	Replace Kenton Lands Tank The tank was built in 1954 and will be at the end of its service life. The tank was last coated in 2010 and will need repainted between 2025 and 2030.

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
09-01	FTTP	FTTP Advanced Treatment - Design & Construction	$30,000,000
09-02	TMTP	TMTP Advanced Treatment and Generator - Design & Construction	$28,350,000
09-03	MPTP	MPTP Advanced Treatment - Design & Construction	$15,300,000
09-04	FTTP	FTTP Filter Renovations	$1,665,000
09-05	LRPS	Structural Impr., Roof Replacement, Sluice Gates, Actuators, VFD	$984,750
09-06	TMTP	Valves & Actuators	$168,300
09-07	Dudley 1040	Replace Four Pumps, 2 constant speed and 2 VFDs	$440,550
09-08	Distribution	Washington Trace from Twelve Mile to Hwy 1996	$964,970
09-09	Distribution	US27 from E. Alex Pike to Main Street/Phase 4 and 5 unfunded	$1,947,000
09-10	Distribution	Yearly 2009 Distribution System R & R	$3,100,000
09-11	Distribution	2009 Mains to Unserved Areas	$250,000
09-12	Distribution	2009 Coordinated Main Replacement	$2,000,000
09-13	Distribution	Kenton County Water Main Replacement Match	$600,000
09-14	Distribution	Dolwick 1080 / 1040 Interconnect	$850,000
09-15	Distribution	42" Transmission Main from FTTP to Moock Rd, Construction	$2,500,000
09-16	Distribution	Siry to Flatwoods (Subdistrict F)	$1,100,000
10-01	Distribution	Dudley Discharge Redundancy Imp. - Phase 1	$760,000
10-01	Distribution	Dudley Discharge Redundancy Imp. - Phase 2	$960,000
10-01	Distribution	Dudley Discharge Redundancy Imp. - Phase 3	$945,000
10-02	Distribution	Stonehouse Rd (Twelve Mile Rd) from KY 10 to KY 1566	$1,120,000
10-03	Distribution	Yearly 2010 Distribution System R & R	$3,500,000
10-04	Distribution	2010 Mains to Unserved Areas	$250,000
10-05	Distribution	2010 Coordinated Main Replacement	$2,500,000
10-06	Distribution	Senour Ave. West of Cloverridge	$750,000
10-07	Distribution	Subdistrict H Upgrade	$497,018
10-07	Distribution	Subdistrict H Surcharge	$946,670
10-08	Distribution	US27/AA Hwy/KY 547- unfunded Phase 3, 4, 5	$2,971,200
11-01	TMTP	Replace PLCs for Filters at TMTP	$350,000
11-02	FTTP	Repair Walls and Windows in FTTP Filters	$530,000
11-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$829,000
11-04	Distribution	Yearly 2011 Distribution System R & R	$4,000,000
11-05	Distribution	2011 Mains to Unserved Areas	$250,000

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
11-06	Distribution	2011 Coordinated Main Replacement	$2,500,000
11-07	Distribution	Subdistrict I Surchage	$257,576
11-08	Technology	IT Improvements - Year 1	$175,000
12-01	Rossford	1.0 MG Rossford Elevated Storage Tank	$3,125,000
12-02	MPTP	MPTP PS Suction Piping	$1,000,000
12-03	Carothers	Carothers Rd. PS Generator	$386,678
12-04	FTTP	Residuals Handling Upgrade Project - Design & Construction	$6,500,000
12-05	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$928,000
12-06	Distribution	Burns Rd. Between Persimmon Grove & Flatwoods	$1,554,000
12-07	Distribution	KY 1280 Between US 27 & Burns Rd.	$357,000
12-08	Distribution	Madison Ave. Parallel 24" Main Between Dudley & Hands Pike	$2,132,000
12-09	Distribution	Orphanage Rd. Parallel 24" Main Between Redwood & Valley Plaza	$1,390,000
12-10	Distribution	Hands Pike Between KY16 & Edwin	$608,000
12-11	Distribution	KY 16 Between Hands Pike & Klette Rd	$613,000
12-12	Distribution	Yearly 2012 Distribution System R & R	$4,000,000
12-13	Distribution	2012 Mains to Unserved Areas	$250,000
12-14	Distribution	2012 Coordinated Main Replacement	$2,500,000
12-15	Distribution	Highland Avenue 12" from Kyles Lane to new reg pit near Hanser pit	$480,000
12-16	Distribution	KY 16 from I-275 to TM Swim Club upgrade 16" with KDOT project	$450,000
12-17	Distribution	KY 16 from TM Swim Club to TM Standpipe upgrade 16" with KDOT project	$350,000
12-18	Technology	IT Improvements - Year 2	$405,000
13-01	FTTP	FTTP Backwash Tank Replacement	$782,000
13-02	Dudley	Dudley - Install Isolation Valves	$345,119
13-03	TM TP PS	Taylor Mill PS Pump Replacement (proposed 1, 5, 6 and 2 or 3)	$3,731,013
13-04	LRPS	LRPS New Generator & Walkbridge Upgrade	$4,100,000
13-05	FTTP	Improvements to FTTP Flocculation/Sedimentation Basins 2 & 3	$2,784,000
13-06	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$888,000
13-07	Distribution	Low Gap Rd. Between Tollgate Rd & 8" Dead End	$375,000
13-08	Distribution	Interconnect 1080 & 1017	$1,200,000
13-09	Distribution	Yearly 2013 Distribution System R & R	$4,000,000
13-10	Distribution	2013 Mains to Unserved Areas	$250,000
13-11	Distribution	2013 Coordinated Main Replacement	$2,500,000
13-12	Distribution	US 27 24" from Sunset to Martha Lane Collins	$1,280,000
13-13	Distribution	Independence Rd. Between KY17 & 12" Pipe	$115,000
13-14	Technology	IT Improvements - Year 3	$343,000

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
14-01	FTTP	Laboratory Generator	$237,000
14-02	TMTP	TMTP Sludge Pumps, Conveyors & Press	$1,537,000
14-03	ORPS2	ORPS2 Replacement Design and Construction	$42,250,000
14-04	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$983,000
14-05	Distribution	36" Licking River Crossing	$4,503,000
14-06	Distribution	2014 Distribution R&R	$4,000,000
14-07	Distribution	2014 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
14-08	Distribution	2014 Mains into Unserved Areas	$250,000
14-09	Distribution	Vineyard (Gunkel Rd.) Between Eight Mile & Fender Rd.	$608,000
14-10	Technology	IT Improvements - Year 4	$86,000
15-01	Distribution	2015 Mains into Unserved Areas	$250,000
15-02	Distribution	2015 Water Main Replacement Program	$5,000,000
15-03	Distribution	2015 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
15-04	Bromley	Bromley Pump Replacement and Misc. Improvements	$1,716,000
15-05	Plants/PS	Upgrade SCADA/Instrumentation/Security Equipment at Plants and PS	$10,172,000
15-06	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,007,000
15-07	Technology	IT Improvements - Year 5	$300,000
16-01	Distribution	2016 Mains into Unserved Areas	$250,000
16-02	Distribution	2016 Water Main Replacement Program	$5,250,000
16-03	Distribution	2106 Coordinated Roaday Imp./Water Main Replacement	$2,500,000
16-04	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,018,000
16-05	Hands Pike	Hands Pike Pumps and Misc Improvements	$700,000
16-06	Distribution	Horsebranch Road 24" from 36" to Thomas More Parkway	$800,000
17-01	FTTP	Raw water line to FTTP south reservoir	$700,000
17-02	MPTP	MPTP Residuals Handling Improvements	$4,600,000
17-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,038,000
17-04	Distribution	SR17 From Hands Pike to Apple Drive	$12,740,000
17-05	Distribution	2017 Mains into Unserved Areas	$250,000
17-06	Distribution	2017 Water Main Replacement Program	$5,500,000
17-07	Distribution	2017 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
17-08	Bellevue	Replacement Bellevue Tank	$1,300,000
18-01	New PS	New KY17 PS To Replace Richardson Rd. PS	$1,900,000
18-02	New Tank	1.0 MG Elevated Storage Tank East of Independence	$4,375,000
18-03	Dayton Tank	Replace Dayton Tank	$3,700,000
18-04	US 27 PS	US 27 Pump Station VFDs	$449,000

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
18-05	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,061,000
18-06	Distribution	2018 Mains into Unserved Areas	$250,000
18-07	Distribution	2018 Water Main Replacement Program	$5,750,000
18-08	Distribution	2018 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
18-09	Distribution	SR17 to Stephens Rd cross country 16" to New Tank in Independence	$1,068,570
19-01	New Tank	1.0 MG Elevated Storage Tank - Southern Campbell County	$4,500,000
19-02	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,084,000
19-03	New PS	New Pump Station near the existing Ripple Creek PS	$2,079,000
19-04	Distribution	2019 Mains into Unserved Areas	$250,000
19-05	Distribution	2019 Water Main Replacement Program	$6,000,000
19-06	Distribution	2019 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
19-07	Distribution	24" along US 27 from Martha Layne Collins to Ripple Creek PS	$5,810,000
19-08	Distribution	16" along AA Highway from Hwy 547 & California Cross Rd.	$10,330,000
19-09	Distribution	36" Redundancy from 42" at Moock Rd to 36" Licking River Crossing	$4,100,000
19-10	Lumley Tank	Replace Lumley Tank	$1,400,000
20-01	FTTP	Electrical Upgrades at FTTP	$1,000,000
20-02	TM Tank	Retire TM Standpipe Build Elevated 1040 Tank	$2,100,000
20-03	Dudley 1040 PS	Pump Station Improvements at Dudley 1040 (VFDs)	$1,275,000
20-04	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,110,000
20-05	Distribution	2020 Mains into Unserved Areas	$250,000
20-06	Distribution	2020 Water Main Replacement Program	$6,500,000
20-07	Distribution	2020 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
20-08	Ida Spence	Replacement Ida Spence Tank (or retire and serve from 1040)	$2,121,000
21-01	TMTP	Chemical Feed Systems Upgrades at TMTP	$1,380,000
21-02	FTTP	Filter Valves and Actuators at FTTP	$650,000
21-03	Carothers	Pump Station Improvements at Carothers	$500,000
21-04	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,138,000
21-05	Distribution	2021 Mains into Unserved Areas	$250,000
21-06	Distribution	2021 Water Main Replacement Program	$6,500,000
21-07	Distribution	2021 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
22-01	MPTP	20" Gravity Discharge from MPTP	$16,000,000
22-02	Bristow	Pump Station Improvements at Bristow Road	$600,000
22-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,163,000
22-04	Distribution	2022 Mains into Unserved Areas	$250,000

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
22-05	Distribution	2022 Water Main Replacement Program	$6,500,000
22-06	Distribution	2022 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
23-01	FTTP	Chemical Feed Systems Upgrades at FTTP	$2,295,000
23-02	Dudley 1080 PS	Pump Station Improvements at Dudley 1080	$3,600,000
23-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,190,000
23-04	Distribution	2023 Mains into Unserved Areas	$250,000
23-05	Distribution	2023 Water Main Replacement Program	$6,500,000
23-06	Distribution	2023 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
24-01	Latonia PS	Pump Station Improvements at Latonia	$600,000
24-02	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,218,000
24-03	Distribution	2024 Mains into Unserved Areas	$250,000
24-04	Distribution	2024 Water Main Replacement Program	$6,500,000
24-05	Distribution	2024 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
25-01	Waterworks PS	Pump Station Improvements at Waterworks Road (include generator)	$1,500,000
25-02	MPTP	MPTP Expand to 20 MGD - Actiflo	$7,400,000
25-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,246,000
25-04	Distribution	2025 Mains into Unserved Areas	$250,000
25-05	Distribution	2025 Water Main Replacement Program	$6,500,000
25-06	Distribution	2025 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
26-01	TMTP PS	Pump Station Improvements at TMTP	$3,100,000
26-02	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,277,000
26-03	Distribution	2026 Mains into Unserved Areas	$250,000
26-04	Distribution	2026 Water Main Replacement Program	$6,750,000
26-05	Distribution	2026 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
27-01	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,310,000
27-02	Distribution	2027 Mains into Unserved Areas	$250,000
27-03	Distribution	2027 Water Main Replacement Program	$7,000,000
27-04	Distribution	2027 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
27-05	Distribution	20" to Connect 11th Street in Newport to 12 Street in Covington	$6,000,000
27-06	Distribution	12" Parallel Main Btwn Vulcan and Lytle	$2,500,000
28-01	New PS	New pump station from Newport to Covington	$7,000,000
28-02	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,342,000
28-03	Distribution	24" Parallel Main Persimmon Grove from Riley to Jerry Wright	$11,200,000
28-04	Distribution	16" Main Jerry Wright, Lickert, Old SR 4 to Claryville Tank	$3,600,000

Table 4-12
Master List of 5-Year CIP Projects 2009 – 2030

Designation	Location	Project Description	Cost
28-05	Distribution	2028 Mains into Unserved Areas	$250,000
28-06	Distribution	2028 Water Main Replacement Program	$7,500,000
28-07	Distribution	2028 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
29-01	MPTP	MPTP add second gravity thickener	$1,000,000
29-02	ORPS2	ORPS2 add 1 10 MGD pump	$1,900,000
29-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,376,000
29-04	Distribution	20" Percival Rd from 24" in Banklick/Walton Nicholson to New Tank	$16,000,000
29-05	New Tank	1 MG Tank in Southern Kenton County near Walton	$7,000,000
29-06	Distribution	2029 Mains into Unserved Areas	$250,000
29-07	Distribution	2029 Water Main Replacement Program	$8,000,000
29-08	Distribution	2029 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
30-01	MPTP	Chemical Feed Systems Upgrades at MPTP	$1,751,000
30-02	US 27 PS	Pump Station Improvements at US 27	$1,500,000
30-03	WQ&P	Annual General Facility R&R - Plants, Tanks, Pump Stations	$1,411,000
30-04	Distribution	2030 Mains into Unserved Areas	$250,000
30-05	Distribution	2030 Water Main Replacement Program	$8,500,000
30-06	Distribution	2030 Coordinated Roadway Imp./Water Main Replacement	$2,500,000
30-07	Kenton Lands	Replace Kenton Lands Tank	$4,600,000

EXHIBIT A-4

PRELIMINARY ENGINEERING REPORT

PRELIMINARY ENGINEERING REPORT

Taylor Mill Tank

Northern Kentucky Water District

November 2022

GRW Project No. 5059

engineering | architecture | geospatial

GRW | 9710 Bunsen Parkway | Louisville, KY 40299 | 502.489.8484

NORTHERN KENTUCKY WATER DISTRICT
TAYLOR MILL TANK

PRELIMINARY ENGINEERING REPORT

Draft - September 2022
Final - November 2022

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

NORTHERN KENTUCKY WATER DISTRICT
TAYLOR MILL TANK

PRELIMINARY ENGINEERING REPORT
Draft - September 2022
Final - November 2022

1.0 BACKGROUND

The Northern Kentucky Water District (NKWD) has identified a need to construct a new 500,000 gallon water storage tank located just east of KY 16 in Taylor Mill, Kentucky. NKWD has indicated for the new tank to have an overflow elevation of 1,040 ft to be consistent with the hydraulic zone in the area. The District procured a 0.9 acre site off of KY 16 for the new tank. The following report summarizes preliminary design considerations, options and decisions for various aspects of the new tank design such as style, coatings, mixing, instrumentation, etc. The information in this report will be used as a basis for preparation of the final design drawings and specifications for bidding of the project.

2.0 DESIGN CONSIDERATIONS

The following items were examined by GRW during the preliminary engineering phase of this project and will be further considered and developed by NKWD and GRW during final design for the new Taylor Mill Tank.

A. Tank Site and Tank Location

The NKWD has acquired a 0.9-acre property directly across KY 16 from 5402 Pride Parkway in Taylor Mill for construction of the new Taylor Mill Tank. The site is bordered by a school bus/truck turnaround to the south, a large KYTC drainage basin to the north and KY 16 to the west. Entry to the tank site is planned to be from the south off the existing school bus/truck turnaround. The tank site is currently approximately half wooded and the topography slopes from the west to the east.

1. Existing Utilities

Based on recent survey information, there are no existing utilities within the NKWD property. There is an existing gas line along the east KY 16 right-of-way, an existing NKWD 16" waterline along the west KY 16 right-of-way and an existing storm pipe south of the property that crosses the existing bus/truck turnaround. There is also an emergency alert system in the east KY 16 right-of-way. GRW does not anticipate issues or conflicts with existing utilities for construction of the new tank.

2. Zoning Requirements

The tank site is located in a Residential Conventional Subdivision (R-CVS) zone. The City of Taylor Mill Zoning Ordinance Article IX, Section 9.5 Utilities Locations

indicates that utility uses such as electrical transformer stations, sewage and water treatment plants, standpipes for public water supply, etc. may be located in any zone subject to the approval of the board of adjustment. This section of the zoning ordinance includes the following requirements for such utility facilities:

a. A building or structure, except an enclosing fence, shall be set back at least fifty (50) feet from any property line.
b. Facilities shall be enclosed by a protective fence as regulated in Article XIII.
c. Open spaces shall be landscaped and maintained and a screening area according to Section 9.17 may be required in and along any yard.

The above mentioned 50-foot property line setback requirement limits the location for the new tank on the tank property. The enclosed Figure A "Tank Site Plan" shows a preliminary site plan for the tank site with the property lines and 50-foot setback lines shown. Also shown is a preliminary proposed location for the new tank outside the setback lines. Once geotechnical borings are performed on the site during final design and the subgrade geotechnical information is known, it can be determined whether the tank can be located in this preliminary location, or if it needs to be moved inside the setback. If the tank needs to be located inside the setback, a site setback variance will need to be requested from the City of Taylor Mill.

B. Tank Style

Elevated water storage tanks can be constructed in various tank styles and geometries. The Multi-Column, Composite and Pedesphere style tanks would all be possible styles for the new Taylor Mill Tank based on site constraints and the project budget. Most tank erectors offer multiple bowl configurations as well. In general, the higher head range offerings are generally more cost effective because of lower quantities of plate steel. Further, the Multi-Column tank has two leg configurations: plumb legs and battered legs. The volume of the tank also has a definite impact on tank geometry and economy. In addition, each of these different tank styles/configurations has differing foundation implications.

Following is a brief description of each of the three tank styles being considered for the new Tayler Mill Tank, including some advantages and disadvantages of each style per information provided by Caldwell Tanks.

1. Multi-Column
   a. An elevated welded carbon-steel water storage tank, supported by a series of carbon-steel supporting columns and cross braces.
   b. Advantages
      1) Most economical style in terms of initial capital cost in small and medium capacities (less than 1,000,000 gallons).
      2) Traditional elevated water storage tank design.
      3) Balcony and handrail around the tank with access ladders on the tower column and tank which provide useful exterior access.

c. Disadvantages
   1) More expensive to repaint due to greater steel surface area than a composite style tank of the same capacity.

2. Pedesphere
   a. An elevated, welded, carbon-steel, spherical water storage tank; supported by a single cylindrical carbon-steel support pedestal with a flared conical base.
   b. Advantages
      1) Interior ladders and piping protected from weather and vandalism in the support pedestal.
      2) Aesthetically pleasing tank style due to simple, contoured shape, small "sky print" and small ground silhouette.
      3) Sleek design reduces steel surface area and future maintenance costs.
      4) Beneficial in specific types of soil and seismic conditions.
   c. Disadvantages
      1) Typically higher capital cost than Multi-Column style tank of the same capacity.

3. Composite
   a. An elevated welded carbon-steel water storage tank, supported by a steel-reinforced concrete support pedestal (extending vertically from the steel-reinforced foundation as a circular concrete support structure). The reinforced concrete pedestal features architectural, horizontal, and vertical rustication patterns formed into the exterior of the pedestal.
   b. Advantages
      1) Minimizes steel surface area for repainting operations.
      2) Low maintenance.
      3) Most modern style / attractive.
      4) Utilized in areas where future repainting is either limited or more frequent (such as tight sites or aggressive environments)
      5) Most common and typically most economical style in capacities greater than 1,000,000 gallons.
      6) No coating system required for the concrete pedestal which means less long-term maintenance and reduced surface area for repainting.
      7) Interior ladders and piping protected from weather and vandalism in the concrete pedestal.
   c. Disadvantages
      1) Typically higher capital cost than Multi-Column style in small and medium capacities (less than 1,000,000 gallons).

Below in Table 1 is a summary of preliminary budget pricing GRW received from two tank manufacturers for the Multi-Column, Pedesphere and Composite style tanks. Landmark Structures does not offer Multi-Column tanks, so they could not provide a price for that tank

style. In general, the below prices include tank fabrication and erection, as well as shallow foundations, standard tank accessories (hatches, handrail, ladders, etc.), interior and exterior coatings (shop primed and field painted), combined inlet/outlet piping and overflow piping.

Table 1
Preliminary Tank Budget Pricing

Tank Manufacturer	500,000 Gallon Multi-Column Tank	500,000 Gallon Pedesphere Tank	500,000 Gallon Composite Tank
Caldwell Tanks	$2,300,000	$2,800,000	$2,900,000
Landmark Structures	---	$2,500,000	$2,550,000

See enclosed Figure C "Multi-Column Tank Elev.", Figure D "Pedesphere Tank Elev." and Figure E "Composite Tank Elev." for preliminary depictions of the proposed elevated tank styles and accessories, with elevations labeled. Note the tank accessories such as openings, piping, valves, ladders, handrail, etc. shown in these Figures are only preliminary at this time. Detailed design of these items (location, size, etc.) will be developed during final design.

Following review of the Draft PER, NKWD elected to include design documents for two tank styles – the Multi-Column and Pedesphere – in the project contract documents. This will allow the District to receive bid pricing for both tank styles to aid in their final decision on the style of tank to construct. GRW will prepare design drawings and specifications for construction of the Multi-Column and Pedesphere style tanks to be included in the contract documents for the project.

C. Paint System and Containment

NKWD intially indicated a preference of Tnemec products for the interior and exterior coatings on their water storage tanks as they have used Tnemec products on other tanks in the past with positive results. NKWD has, however, recently experienced some Tnemec coating product shortages and delay issues, so have also used Induron coatings on recent projects. NKWD and GRW discussed to include comparable Tnemec and Induron interior and exterior coating products in the final project specifications.

GRW contacted the local Tnemec representative, Nexgen Coating Resources, Inc., to discuss coating system options and obtain updated coating system specifications. Two coating system options for interior wet surfaces and two coating system options for exterior surfaces were discussed and provided to GRW. Below in Tables 2, 3, 4 and 5 are summaries of these options.

GRW will also contact Induron during final design to obtain their comparable products to the selected interior and exterior Tnemec coating systems shown below.

1. Interior Wet Coatings:

Table 2
Interior Wet Coatings - Option 1
High Solids Epoxy System with Zinc Rich Primer
AWWA D102 ICS No. 3

Coat	Tnemec Product	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 94 H2O	2.5 - 3.5
"Stripe Coat"	Polyamidoamine Epoxy, Pota-Pox Plus Series N140 or N140F	---
Finish	Modified Polyamine Epoxy, Epoxoline Series 22	20.0 to 30.0
Total Minimum Dry Film Thickness	---	22.5 mils

Table 3
Interior Wet Coatings - Option 2
Solventated Epoxy with Zinc Rich Primer
AWWA D102 ICS No. 6

Coat	Tnemec Product	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 94 H2O	2.5 - 3.5
"Stripe Coat"	Polyamidoamine Epoxy, Pota-Pox Plus Series N140 or N140F	---
Finish	Phenalkamine Epoxy, Epoxoline Series 21	10.0 to 14.0
Total Minimum Dry Film Thickness	---	12.5 mils

The only difference in the above two interior coating systems are the Finish coat products. Both interior systems include a zinc rich primer which will greatly extend the service life of the coating system. Option 1 is similar to the coating system used on the Aqua Drive Tank overcoat and Option 2 is similar to the coating system used on the new Lumley Tank. The Series 22 product in Option 1 is a 100% solids epoxy that provides greater barrier protection due to the higher application thickness but can

be marginally more expensive than the Series 21 product in Option 2. The Tnemec representative did not have a recommendation of one Finish coat over the other.

2. Exterior Coatings:

Table 4
Exterior Coatings - Option 1
Fluoropolymer with Zinc Rich Primer
AWWA D102 OCS No. 4

Coat	Tnemec Product	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 94 H2O	2.5 - 3.5
Intermediate	Aliphatic Acrylic Polyurethane, Endura Shield Series 1095	2.0 - 3.0
Finish	Fluoropolymer, HydroFlon Series 700	2.0 - 3.0
Lettering and Logo	Fluoropolymer, HydroFlon Series 700	2.0 - 3.0
Total Minimum Dry Film Thickness	---	6.5 mils

Table 5
Exterior Coatings - Option 2
Polyurethane with Zinc Rich Primer
AWWA D102 OCS No. 6

Coat	Tnemec Product	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 94 H2O	2.5 - 3.5
Intermediate	Polyamidoamine Epoxy Hi-Build Epoxoline Series N69	3.0 - 5.0
Finish	Aliphatic Acrylic Polyurethane, Endura Shield Series 1094-Color	2.0 - 4.0
Lettering and Logo	Fluoropolymer, HydroFlon Series 700	2.0 - 3.0
Total Minimum Dry Film Thickness	---	7.5 mils

The Tnemec representative recommended the Option 1 fluoropolymer exterior coating system as the Series 700 Hydroflon Finish coat product has extended color and gloss retention when compared to the Option 2 acrylic polyurethane Finish coat product. They indicated that the fluoropolymer system provides the lowest life cycle cost over time, as it is a 20 - 30 year system compared to a 15 -20 year system for the polyurethane system. Also, the rep indicated that there currently is a polyurethane global shortage, so the fluoropolymer product is a more sustainable solution.

The Option 1 fluoropolymer exterior coating system is more expensive initially than the Option 2 polyurethane system. Caldwell Tanks indicated that the fluoropolymer system on the exterior of a 500,000 gallon tank would be an upcharge of $30,000 to $50,000. This cost is not reflected in the budget pricing above provided by Caldwell and Landmark but has been included in the total opinions of probable costs provided below in Section 5. At a minimum, a fluoropolymer product is recommended to be specified for use on the NKWD logos to be painted on the new tank.

Following review of the Draft PER, NKWD indicated to specify the fluoropolymer exterior coating system due to supply issues with polyurethane and long-term benefits of the fluoropolymer products.

3. Containment:

After the Draft PER was submitted, GRW spoke with Caldwell Tanks about containment recommendations for coating operations of the new tank. Since the tank site is not immediately surrounded by homes and businesses, Caldwell indicated that full containment of the entire work area may not be necessary, so they recommended not requiring it to save on project costs. Instead, because there are still some homes and a school near the tank site, Caldwell recommended including language in the contract documents requiring the Contractor to be responsible for protecting all property from fugitive blast media and paint particles. This will require the Contractor to determine the means and methods used to contain the coating debris.

D. Valve Vault and Valve Assembly

As discussed in more detail below in Section H, the filling and tank levels for the new Taylor Mill Tank will initially be controlled by a new SCADA controlled valve at a remote site. Therefore, an Altitude valve at the tank site is not needed initially. However, there may be a need to add an Altitude valve in the future, so the tank site will include a valve vault that will be sized and piped to accommodate a bypass pipe for an Altitude valve on the tank inlet piping and a check valve on the tank outlet piping.

The vault will be a below grade, precast concrete vault that will initially house one inlet and one outlet pipe, straight pipe through the vault (no check valve or Altitude valve), isolation valves, and dismantling joints. There will also be a standard hose bib in the vault on the active water line for connection to a garden hose for site maintenance/washdown. Additionally, corporation stops will be installed on the piping for a sample line for the chlorine, pH and turbidity analyzers and for the pressure transducer discussed below in

Section I. See Figure F - "Tank Site Valve Vault" for a preliminary plan view of this valve vault.

If the new tank is either the Pedesphere or Composite style, the future check valve and Altitude valve and associated pipe assemblies could be located indoors in the base of the tank support pedestals. Figure G - "Pedesphere Tank Valve Assembly" and Figure H "Composite Tank Valve Assembly" show section views of preliminary possible valve and piping layouts in the tank pedestals. Detailed design of these valves and piping for the Pedesphere style will be developed during final design.

E. Tank Site Work

As design progresses on the project, improvements to the tank site will be developed. Following are anticipated Site Work items that will be included in the final design documents.

1. Site Piping
   a. A 16" water line extension will be designed from the existing 16" water line on the west side of KY 16 to the tank site to facilitate filling and draining the new tank.
   b. The water line extension will be encased in steel pipe that is bored and jacked beneath KY 16 and potentially open cut under the bus/truck turnaround. GRW will determine the best location for the KY 16 crossing during final design to minimize disturbance to neighboring properties and minimize the length of new water line needed.
   c. Water line to be ductile iron with single polywrap.
   d. A fire hydrant assembly will be installed on the new 16" DI site piping between the valve vault and tank that can be used to drain the tank. Drain water will be routed to flow to the existing KYTC drainage basin to the north of the tank site with the overflow pipe discussed below.
   e. The tank overflow pipe will be routed to drain to the existing KYTC drainage basin to the north of the tank site via a rip rap lined drainage channel.

2. Entrance Drive and Parking
   a. An entrance drive from the existing bus/truck turnaround to the base of the tank and instruments building will be designed.
   b. KYTC requires the new entrance drive to be 100 feet from the KY 16 curb at the bus/truck turnaround, measured along the north side of the entrance drive.
   c. At this time, entrance drive and any parking area are planned to be concrete.

3. Construction Areas
   a. Locations for material and equipment staging areas and access to the site during construction will be determined.

4. Fencing
   a. Initial direction was for the site fence to be chain link fence with barbed wire at the top. GRW will confirm fencing requirements with the City of Taylor Mill Zoning Ordinance.
   b. Site fence to include a single "man" gate and vehicular slide gate. These gates will be equipped with security features and controlled as discussed in Paragraph I Electrical and Instrumentation – Tank Site below.

5. Landscaping
   a. Landscaping and/or screening design will be performed in accordance with the City of Taylor Mill Zoning Ordinance.

F. Cellular Equipment

During design of the new Taylor Mill Tank, consideration will be given to the accommodation of cellular and radio equipment such as cables and antennas. Design documents for the new tank will include mounting appurtenances dedicated for the cellular providers and NKWD and consideration of the ability to add more cellular and radio equipment to the new tank. The design and location of these features will take into account safe access to the tank, potential damage to the tank and future maintenance of the tank.

G. Active Mixing System

Through discussions with NKWD, it was decided to include an active mixing system in the interior of the new tank to improve water quality. GRW contacted two mixer equipment representatives/vendors and obtained the following information on two mixing options. Brochures and budget pricing for both options are provided in the Appendices of this report. Following are summaries of the system components and operation, budget pricing and energy usage.

1. GridBee Electric Submersible Mixer
   a. 24" long, 10" diameter submersible mixer with motor and impeller that either hangs from the top of the tank or sits on the tank bowl floor.
   b. Water enters one end of the mixer, passes over the motor to the impeller, is released through slits on the end of the mixer, then water sheets get pushed to the top of the tank to induce mixing.
   c. 24-hour active mixing
   d. 0.5 hp motor
   e. Control Box with SCADA monitoring at base of tank
   f. Budget price $11,380
   g. Estimated energy cost of $1 to $1.5 per day

2. Pulsed Hydraulics Inc. Large Bubble Mixing
   a. System consists of two 8" diameter bubble forming plates in the tank bowl, 1" diameter air piping from base of tank to bowl, and air compressor and mixing valve control enclosure at base of tank.
   b. Air is delivered from the electro-pneumatic valve at the base of the tank through the air piping where it is squished between the two forming plates to create a 36" diameter bubble that rises to the top of the tank to induce mixing.
   c. Mixing cycle once per day
   d. Each bubble requires ¾ hp
   e. Control enclosure includes an Allen Bradley CompactLogix PLC to integrate with SCADA system
   f. Budget price $57,653
   g. Estimated energy cost of $1 to $2 per day

Both of these appear to be good options to provide active mixing. They both provide mixing at low energy costs and have minimal equipment requiring maintenance. If NKWD would like to talk to the manufacturers/representatives and/or Owners that have these products in service, GRW can request additional information and facilitate those discussions during final design.

The Pulsed Hydraulics Inc. (PHI) system is clearly more expensive than the GridBee system. Much of the cost for the PHI system is due to the Allen Bradley CompactLogix PLC. PHI can provide the bubbler equipment (forming plates, air compressor, piping and mixing valve) without the Allen Bradley PLC, for a lower cost. This option has limited functionality for communicating externally, however. If NKWD is interested in this system, during final design, GRW can review if there are any options for communicating the mixer with the SCADA system that may be cheaper than an Allen Bradley PLC being provided with the mixer.

Following review of the above two mixing system options in the Draft PER, NKWD indicated a preference to install a drop-in type submersible mixer, such as the GridBee mixer, since they have similar mixers installed in other tanks in the their system and there did not appear to be any cost savings/incentive to use the PHI bubble mixing system.

H. SCADA Controlled Valve

The new Taylor Mill Tank will initially be supplied by an existing pump station within NKWD's water system that also supplies two existing water tanks. To control the filling and water level of the new tank, a new control valve will be included in the project to be located at a remote site from the new tank. The valve operations will be controlled via SCADA based on the tank water elevations. Through correspondence and recommendations from Cla-Val, NKWD indicated for this valve to be a Model 58-01 Combination Back Pressure and Solenoid Shut-Off Valve with check feature by Cla-Val.

Following is a summary of preliminary operation and control discussions between NKWD and Cla-Val for this valve. As design progresses for the project, these items will be finalized and specified in the contract documents. Data sheets for the Cla-Val Model 58-01 valve and

optional Model X105L Limit Switch discussed below are included in the Appendices of this report.

1. Valve will include a solenoid that will be energized and de-energized by the SCADA system remotely to open and close the valve. It will be configured to be normally open and energized to close so that in a power failure, the valve will remain open. The valve will also be equipped with a battery backup to power the valve to close, if needed, during a grid power failure to the valve.
2. A manual operator can be supplied with the control valve to open the valve in an emergency when power is not available at the valve.
3. The valve check feature will prevent reverse flow from the new Taylor Mill Tank back towards the pump station and other tanks.
4. The backpressure pilot control system on the control valve can be set somewhere between the pressure at the valve when the supply pumps are running and the static pressure at the valve when the level in the other tanks is close to their low level to allow the Taylor Mill tank to fill when the supply pumps are off but not fill when the other tanks in the system are low.
5. A single limit switch can be supplied with the control valve that can be connected to the SCADA system to provide a contact closure for feedback on valve open/close status.

This valve will be located in a new precast concrete vault adjacent to NKWD's existing 16" water line near Eaton Drive in Fort Wright, Kentucky on a new 12" DI bypass line. The vault will include 12" isolation gates valves on either side of the new 12" control valve. The vault will be sized to allow at least four feet of straight pipe downstream of the control valve to allow NKWD to install a clamp-on flow meter on the pipe. Required straight runs of upstream and downstream pipe for the meter will also be taken into account when determining vault size and valves and piping layout. Site modifications will include new electrical and instrumentation items discussed below in Paragraph J Electrical and Instrumentation – SCADA Valve Site. Additionally, an isolation gate valve and box will be installed on the existing 16" water line. This valve will remain closed during normal conditions.

See enclosed Figure B "SCADA Valve Site Plan" for a preliminary Site Plan of this valve site. This Site Plan shows a preliminary location for the new valve vault adjacent to the existing water line.

Also shown in Figure B is the location of an existing water main easement. This easement has been drawn/placed by GRW Surveyors based on information in Exhibit A, Part B of the existing easement agreement provided to GRW by NKWD. The agreement is recorded in Deed Book 15, Page 176. According to the existing easement documents, a temporary construction easement was also provided with the water main easement as well as a right-of-way. The agreement grants a right-of-way and easement to construct, operate, maintain, repair, replace and remove a water main, service lines, meter boxes and other appurtenant improvements and equipment on and under the real estate. At the proposed location of the new vault, the existing easement is 10 feet wide. At this time of this PER, GRW anticipates that the new vault can be installed within the existing easement but will confirm during final design.

I. Electrical and Instrumentation - Tank Site

As the electrical design for the new Taylor Mill Tank progresses, the below electrical and instrumentation items will be included in the contract documents at the water tank site based on discussions and decisions by NKWD.

1. An existing three-phase, overhead distribution line is located across the street (KY 16) from the proposed tank site. A new overhead electrical service drop will be required to cross KY 16 and terminate at new utility-owned transformer pole. A new underground 100-ampere service (engineer to coordinate with equipment to be proposed - likely a 120/240-volt, single-phase, 100-ampere electrical service) will be installed from the utility-owned transformer pole to the new tank electrical service equipment (located within new prefabricated instrument building).

2. A new grounding system will be provided in accordance with the NEC for the new electrical service.

3. A new surge protection device (Type 2) will be provided at the service entrance equipment for surge and over-voltage protection of downstream equipment.

4. A new RTU (SCADA) telemetry panel w/PLC (NEMA 12 enclosed) shall be located within the new prefabricated instrument building. The RTU PLC shall monitor the following equipment:
   a. Intrusion Alarm - Tank Access Ladder
   b. Intrusion Alarm - Water Tank Access Hatch
   c. Intrusion Alarm - Tank Overflow on Flap Valve
   d. Intrusion Alarm - Valve Vault Access Hatch
   e. Intrusion Alarm - Man-Door at Instrument Building
   f. Flood Alarm - Valve Vault Sump/Floor
   g. Entry Gate Position - Gate Open Status
   h. Water Tank Continuous Level (via pressure transducer) - Primary Level
   i. Water Tank Continuous Level (via radar) - Backup Level
   j. Hach TU5 Turbidimeter
   k. Hach CL17sc
   l. Hach pH analyzer
   m. Tank Mixer

5. The new RTU PLC and radio equipment will be coordinated with equipment provided as part of the SCADA Phase 2 project. GRW will coordinate requirements with Mr. Nathan Hodges.

6. SCADA Programming:
   a. NKWD indicated initial direction for the SCADA programming to be provided by the Contractor, not NKWD. GRW will coordinate

required SCADA programming with NKWD as the design progresses.

7. FAA obstruction lighting complying with FAA's document Obstruction Marking and Lighting will be installed on top of the new Taylor Mill Tank (if required).

8. A chlorine analyzer (Hach CL17sc), turbidimeter (Hach TU5 Series) and pH analyzer (Hach) will be provided with the new tank. The continuous analytical signals will be connected to the SCADA PLC panel as noted above.

9. Both a pressure transducer and a radar depth indicator will be installed on the new tank for measuring tank levels. Both continuous signals will be connected to the SCADA PLC panel.

10. It is recommended that the radar transmitter, located at the top of the water tank, be provided with an EDCO SS64, or equal, signal suppressor, for over-voltage transient protection.

11. For the Multi-Column style tank, a prefabricated instruments building will be located adjacent to the valve vault. This building will be a temperature-controlled space and will house the following equipment:
    a. RTU PLC/SCADA
    b. Chlorine Analyzer
    c. Turbidimeter
    d. pH Analyzer
    e. Electrical Panel w/surge protection device
    f. Tank Mixer Motor Controller (and other mixer appurtenances such as air compressor)
    g. Verkada Access Control System
    h. FAA obstruction light control panel
    i. LED lighting - interior and exterior
    j. General purpose receptacles

12. For the Pedesphere and Composite style tanks, the equipment noted above can be located within the base of the support pedestals.

13. As previously discussed, isolation valves will be provided on the tank inlet and outlet piping in a precast concrete vault. A new sump level monitor, Magnetrol T20, or equal, shall be provided just above the bottom of the vault floor, for detection of flooding events. The sump level monitor will be located 4" above the floor slab and shall provide a digital output to the RTU PLC to transmit a flooded condition when actuated.

14. Site Security
    a. Verkada cameras will be located at the site in the following locations:
        1) One camera to monitor the bottom of the tank ladder hatch

2) One camera to monitor the vehicle/man gate
3) One camera to monitor the prefabricated instrument building (wall mounted adjacent to man-door.
4) Cameras will be interfaced to the new ethernet switch provided as part of the RTU PLC cabinet.

b. Two pole-mounted (20' aluminum pole) with LED luminaires shall be provided for general site security, each controlled via photocell.

c. A vehicular slide gate shall be provided for site access. The gate shall be accessed via local keypad and system shall be incorporated into the Verkada Access Control System. In addition, a digital output shall be provided from the gate controller to the RTU PLC for monitoring of gate position (open or closed).

d. GRW will coordinate the requirements of the Verkada System with NKWD. It is assumed a Verkada AC41 - 4-Door Controller (Cloud-managed controller) will be provided at the site for access control. This system will be coordinated for the man-door located at the instrument building, as well as the main gate.

15. A new grounding counterpoise, encircling the water tank support legs, shall be installed. Each water tank leg shall be bonded to grounding counterpoise via exothermic welds.

J. Electrical and Instrumentation – SCADA Valve Site

As the electrical design for the new Taylor Mill Tank progresses, the below electrical and instrumentation items will be included in the contract documents at the SCADA valve vault site based on discussions and decisions by NKWD.

1. There is an existing three-phase, overhead distribution line located approximately 250' from the proposed altitude valve vault site. A new overhead electrical service will be extended from the existing overhead distribution line to the site - GRW to coordinate requirements with Duke Energy. A new underground 60-ampere service (engineer to coordinate with equipment to be proposed - likely a 120/240-volt, single-phase, 60-ampere electrical service) will be installed from the utility-owned transformer pole to the new tank electrical service equipment (rack-mounted adjacent to the altitude valve vault).

2. A new grounding system will be provided in accordance with the NEC for the new electrical service.

3. A new surge protection device (Type 2) will be provided at the service entrance equipment for surge and over-voltage protection of downstream equipment.

4. A new RTU (SCADA) telemetry panel w/PLC (NEMA 4X enclosed) shall be located at the common electrical equipment rack, adjacent to the service entrance equipment. The RTU PLC shall monitor the following equipment:

a. Intrusion Alarm - Valve Vault Access Hatch
b. Intrusion Alarm - RTU PLC Control Panel
c. Flood Alarm - Valve Vault Sump/Floor
d. Altitude Valve Position

5. The new RTU PLC and radio equipment will be coordinated with equipment provided as part of the SCADA Phase 2 project. GRW will coordinate requirements with Mr. Nathan Hodges.

6. SCADA Programming:
   a. The control valve will be controlled via the SCADA System (RTU PLC) - GRW will coordinate the desired operation with NKWD as the design progresses.
   b. NKWD indicated initial direction for the SCADA programming to be provided by the Contractor, not NKWD. GRW will coordinate required SCADA programming with NKWD as the design progresses.

7. Site Security
   a. Currently, there are no plans for cameras at this site.
   b. A single pole-mounted (20' aluminum pole) with LED luminaire shall be provided for general site security, controlled via photocell.

8. A new sump level monitor, Magnetrol T20, or equal, shall be provided just above the bottom of the valve vault floor, for detection of flooding events. The sump level monitor will be located 4" above the floor slab and shall provide a digital output to the RTU PLC to transmit a flooded condition when actuated.

3.0 PERMITS

Based on the scope of work, the following permits are anticipated to be required during the design phase:

A. Kentucky Division of Water "Construction Application for Drinking Water Distribution" Form DW-1.

B. Kentucky Transportation Cabinet “Application for Encroachment Permit” Form TC99-1A.

C. Kentucky Department of Housing, Building and Construction "Plan Application Form", if required.

D. Sanitation District No. 1 Clearing Permit, Grading Permit or Land Disturbance Permit, if required.

E. Federal Aviation Administration (FAA) permit.

F. Local permits or inspections, if any, will be the responsibility of the contractor.

4.0 SCHEDULE

Below is the preliminary design and construction schedule for the new Taylor Mill Tank.

A. Final design / prepare bidding documents – September through January 2022

B. Perform geotechnical borings –October 2022

C. Permitting – December 2022 through February 2023

D. Bidding – March and April 2023

E. Bid Opening and Bid Approval – April 2023

F. Construction – July 2023 through October 2024

a. Sitework and Foundation – July through September 2023
b. Tank Construction – October through June 2024
c. Painting – June through August 2024
d. Fencing, Paving, Final Sitework – September through October 2024

G. Substantial Completion – November 1, 2024

H. Final Completion – December 15, 2024

5.0 OPINIONS OF PROBABLE COST

See following four pages and below summary in Table 6 for total Opinions of Probable Cost for the 500,000 gallon Multi-Column tank style, Pedesphere tank style and Composite tank style. These total cost estimates include the tank costs as well as site work, valves, piping, electrical and professional services costs. The largest portion of the total project costs are for construction of the tank itself, which are shown in the cost estimates as the preliminary budget pricing provided by Caldwell Tanks for the three tank styles discussed above. Note these total project costs include budget pricing for fluoropolymer exterior coating system. Also shown in Table 6 are typical construction durations from Caldwell Tanks for each tank style.

Table 6
Construction Cost Summary

Tank Style	Total Estimated Construction Cost	Construction Length
Multi-Column	$4,667,000	12 months
Pedesphere	$5,177,000	14 months
Composite	$5,279,000	15 months

Additionally, estimated 60-year life cycle coating costs for each tank style from Caldwell Tanks and Landmark Structures are shown below in Table 7. These costs are estimated in Net Present Value (NPV) for consideration of the estimated costs in today's prices. These life cycle coating costs are based on the square feet of coating surface area for each tank style, assumed touch-up and overcoat coatings costs per square foot of surface area, and assumed full removal and replacement coating costs per square foot of surface area. The below costs assume recoating the interior and exterior surfaces every 20 years (3 recoating cycles over 60 years) which include touching-up and overcoating the exterior coatings twice, full removal and replacement of the exterior coatings once, full removal and replacement of the interior wet coatings three times and one touch-up and overcoat and one full removal and replacement of the interior dry coatings over a 60-year time period.

Through discussions with Caldwell and Landmark, there are many variables that affect the life cycle coating costs such as paint systems used each cycle, life expectancy of each coating, type of coating – overcoat or full removal, etc. Therefore, the below costs are only estimates based on the above and each tank manufacturer's assumptions.

Table 7
60-Year Coating Cost Summary

	500,000 Gallon Multi-Column Tank	500,000 Gallon Pedesphere Tank	500,000 Gallon Composite Tank
Caldwell Tanks	$988,787	$718,342	$579,338
Landmark Structures	$1,713,000	$1,436,000	$990,000
Average	$1,351,000	$1,078,000	$785,000
Total Construction Cost Plus 60 Year Coatings Cost	**$6,018,000**	**$6,255,000**	**$6,064,000**

The bottom of Table 7 above shows the total estimated construction and coating cost for each tank style based on the construction costs from Table 6 above and the average of the 60-year coating costs from Caldwell and Landmark in Table 7. As you can see, based on these figures, the total cost after 60 years is competitive between the Multi-Column and the Composite tank styles. Although the Multi-Column tank has a higher capital cost than the Composite tank, the cost to recoat a Multi-Column tank is more expensive due to its larger steel surface area that requires coatings. For a 500,000 gallon tank of this height, a Multi-

Column tank will have approximately 35,000 square feet of steel surfaces vs. approximately 20,000 square feet for a Composite tank.

* * * * * * * * * * * * *

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/02/22	Dwg. No.:	N/A
	Estimator:	ADH	Type:	PER

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
Site Work, Valves, Piping and Electrical:				
16" DI Site Piping (Tank Site)	220	LF	$ 225.00	$ 49,500.00
16" DI Pipe Bored and Jacked in 24" Steel Casing Pipe under KY 16	120	LF	$ 1,000.00	$ 120,000.00
16" DI Pipe Open Cut in 24" Steel Casing Pipe under Bus/Truck Turnaround	60	LF	$ 500.00	$ 30,000.00
Wet Tap with 16"x16" Tapping Sleeve and Valve (Tank Site)	1	EA	$ 25,000.00	$ 25,000.00
12" DI Site Piping (SCADA Valve Site)	40	LF	$ 200.00	$ 8,000.00
Wet Tap with 16"x12" Tapping Sleeve and Valve (Valve Site)	2	EA	$ 20,000.00	$ 40,000.00
Precast Concrete Valve Vault at Tank Site	1	EA	$ 60,000.00	$ 60,000.00
Precast Concrete Valve Vault at SCADA Valve site	1	EA	$ 36,000.00	$ 36,000.00
Painting Pipe inside Valve Vaults	1	LSUM	$ 8,000.00	$ 8,000.00
Double Leaf Aluminum Access Hatches (Valve Vaults)	2	EA	$ 8,000.00	$ 16,000.00
Excavation for Valve Vaults	300	CY	$ 50.00	$ 15,000.00
Backfill around Valve Vaults	100	CY	$ 15.00	$ 1,500.00
Sidewalk Repair/Replacement	1	LSUM	$ 5,000.00	$ 5,000.00
Site Restoration and Grading	1	LSUM	$ 10,000.00	$ 10,000.00
Tree Clearing	1	LSUM	$ 6,000.00	$ 6,000.00
Overflow Pipe Rip Rap Drainage Channel	200	LF	$ 40.00	$ 8,000.00
Valve Vault 4" PVC Drain Lines	200	LF	$ 30.00	$ 6,000.00
Concrete Drive and Parking Area	400	SY	$ 135.00	$ 54,000.00
Landscaping	1	LSUM	$ 20,000.00	$ 20,000.00
Chain Link Fence and Gate	400	LF	$ 120.00	$ 48,000.00
12" SCADA Controlled Valve (Cla-Val Model 58-01)	1	EA	$ 24,000.00	$ 24,000.00
Valves for Valve Vault Assemblies	1	LSUM	$ 141,000.00	$ 141,000.00
16" MJ Gate Valve and Box (SCADA Valve Site)	1	EA	$ 21,000.00	$ 21,000.00
Fire Hydrant Assembly (Tank Site)	1	EA	$ 6,000.00	$ 6,000.00
DI Flanged Piping and Fittings for Valve Vaults	1	LSUM	$ 25,000.00	$ 25,000.00
DI Fittings	3	TON	$ 8,000.00	$ 24,000.00
Submersible Mixer	1	LSUM	$ 15,000.00	$ 15,000.00
Cellular Equipment Attachments	1	LSUM	$ 65,000.00	$ 65,000.00
Prefabricated Instruments Building	1	LSUM	$ 50,000.00	$ 50,000.00
Final Restoration	1	LSUM	$ 15,000.00	$ 15,000.00
Sediment and Erosion Control	1	LSUM	$ 5,000.00	$ 5,000.00
Electrical and Instrumentation (see attached breakdown)				$ 396,000.00
			Sub-Total	$ 1,353,000.00
Contingency (30%)				$ 405,900.00
			Sub-Total	$ 1,758,900.00
Contractor Overhead & Profit (Prime 15%, Sub 5%)				$ 163,350.00
Sub-Total for Site Work, Valves, Piping and Electrical (Rounded)				**$ 1,923,000.00**

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/02/22	Dwg. No.:	N/A
	Estimator:	ADH	Type:	PER

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
500,000 Gallon Multi-Column Elevated Water Storage Tank				
New Elevated Tank:				
500,000 Multi-Column Elevated Tank*	1	LSUM	$ 2,300,000.00	$ 2,300,000.00
Included: Inlet/outlet and overflow piping, painting, shallow foundation system, standard accessories				
Upcharge for Fluoropolymer Exterior Coating System	1	LSUM	$ 50,000.00	$ 50,000.00
Tank Logo	1	LSUM	$ 20,000.00	$ 20,000.00
			Sub-Total	$ 2,370,000.00
Contingency (10%)				$ 237,000.00
			Sub-Total	$ 2,607,000.00
Sub-Total for New Tank, Site Work, Piping, Valves and Electrical (Rounded)				**$ 4,530,000.00**
Mobilization/Demobilization (1%)				$ 46,000.00
Bonding & Insurance (2%)				$ 91,000.00
Sub-Total for Construction Costs				**$ 4,667,000.00**
Professional Services**				**$ 250,722.00**
TOTAL ESTIMATEDCOSTS FOR 500,000 GALLON MULTI-COLUMN TANK				**$ 4,918,000.00**

* Preliminary budget pricing provided by Caldwell Tanks

** Based on 16 months for construction services

500,000 Gallon Pedesphere Elevated Water Storage Tank				
New Elevated Tank:				
500,000 Pedesphere Elevated Tank*	1	LSUM	$ 2,800,000.00	$ 2,800,000.00
Included: Inlet/outlet and overflow piping, painting, shallow foundation system, standard accessories				
Upcharge for Fluoropolymer Exterior Coating System	1	LSUM	$ 50,000.00	$ 50,000.00
Tank Logo	1	LSUM	$ 20,000.00	$ 20,000.00
Deduct for Instruments Building	1	LSUM	$ (50,000.00)	$ (50,000.00)
			Sub-Total	$ 2,820,000.00
Contingency (10%)				$ 282,000.00
			Sub-Total	$ 3,102,000.00
Sub-Total for New Tank, Site Work, Piping, Valves and Electrical (Rounded)				**$ 5,025,000.00**
Mobilization/Demobilization (1%)				$ 51,000.00
Bonding & Insurance (2%)				$ 101,000.00
Sub-Total for Construction Costs				**$ 5,177,000.00**
Professional Services**				**$ 250,722.00**
TOTAL ESTIMATED COSTS FOR 500,000 GALLON PEDESPHERE TANK				**$ 5,428,000.00**

* Preliminary budget pricing provided by Caldwell Tanks

** Based on 16 months for construction services

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/02/22	Dwg. No.:	N/A
	Estimator:	ADH	Type:	PER

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
500,000 Gallon Composite Elevated Water Storage Tank				
New Elevated Tank:				
500,000 Composite Elevated Tank*	1	LSUM	$ 2,900,000.00	$ 2,900,000.00
Included: Inlet/outlet and overflow piping, painting, shallow foundation system, standard accessories				
Upcharge for Fluoropolymer Exterior Coating System	1	LSUM	$ 40,000.00	$ 40,000.00
Tank Logo	1	LSUM	$ 20,000.00	$ 20,000.00
Deduct for Instruments Building	1	LSUM	$ (50,000.00)	$ (50,000.00)
			Sub-Total	$ 2,910,000.00
Contingency (10%)				$ 291,000.00
			Sub-Total	$ 3,201,000.00
Sub-Total for New Tank, Site Work, Piping, Valves and Electrical (Rounded)				**$ 5,124,000.00**
Mobilization/Demobilization (1%)				$ 52,000.00
Bonding & Insurance (2%)				$ 103,000.00
Sub-Total for Construction Costs				**$ 5,279,000.00**
Professional Services**				**$ 250,722.00**
TOTAL ESTIMATED COSTS FOR 500,000 GALLON COMPOSITE TANK				**$ 5,530,000.00**

* Preliminary budget pricing provided by Caldwell Tanks

** Based on 16 months for construction services

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Project Cost Electrical and Instrumentation	Date:	11/02/22	Dwg. No.:	N/A
	Estimator:	WER	Type:	PER

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
Instrumentation and Electrical - Water Tank Site:				
Grounding:				
Ground Rod	3	EACH	$250	$ 750.00
#2 AWG Bare	50	LF	$2	$ 100.00
Exothermic Weld	3	EACH	$300	$ 900.00
Ground Meter Base/CT Cabinet	1	EACH	$300	$ 300.00
Ground Test/Report	1	LSUM	$750	$ 750.00
Grounding @ Tank:				
Ground Rod	6	EACH	$250	$ 1,500.00
#2 AWG Bare	225	LF	$2	$ 450.00
Exothermic Weld	12	EACH	$300	$ 3,600.00
Service Entrance:				
2" Conduit (Schedule 40 PVC)	75	LF	$14	$ 1,068.75
2" Conduit (Aluminum)	25	LF	$24	$ 600.00
Long Sweep 90 Elbow	2	EACH	$150	$ 300.00
#2 AWG	400	LF	$3	$ 1,100.00
Terminations	8	EACH	$34	$ 268.00
Trenching/Backfill	75	LF	$16	$ 1,200.00
NEMA 1, 100A, 120/240V, 1-Phase, 3-Wire Panelboard	1	EACH	$3,000	$ 3,000.00
Surge Protection Device	1	EACH	$750	$ 750.00
Meter Base	1	EACH	$250	$ 250.00
RTU Cabinet w/PLC, Ethernet Switch, Cellular Modem	1	LSUM	$25,000	$ 25,000.00
Pressure Transmitter	1	EACH	$2,500	$ 2,500.00
Radar Transmitter w/signal suppressor	1	EACH	$2,750	$ 2,750.00
1"C (Aluminum) - 4-20mAdc - Radar to PLC	185	LF	$16	$ 3,006.25
1"C (Schedule 40 PVC) - 4-20mAdc - Radar to PLC	50	LF	$10	$ 475.00
#16 STP (4-20mAdc Signal)	235	LF	$2	$ 411.25
Interference Lighting System - Panel, Luminaires, Wiring	1	LSUM	$13,000	$ 13,000.00
LED Obstruction Light	1	LSUM	$7,000	$ 7,000.00
Hach CL17sc	1	LSUM	$6,000	$ 6,000.00
Hach TU5 Turbidimeter	1	LSUM	$7,500	$ 7,500.00
Hach pH Analyzer/Controller	1	LSUM	$2,000	$ 2,000.00
Verkada Cameras w/Cloud License	3	EACH	$2,250	$ 6,750.00
Camera Pole	2	EACH	$750	$ 1,500.00
Verkada Access Controller (AC41)	1	LSUM	$5,000	$ 5,000.00
3/4"C (Aluminum) - Door Contact - Hatch @ Top of Tank	185	LF	$13	$ 2,451.25
3/4"C (Schedule 40 PVC) - Door Contact - Hatch	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND	705	LF	$1	$ 705.00
3/4"C (Aluminum) - Door Contact - Tank Access Ladder	20	LF	$13	$ 265.00
3/4"C (Schedule 40 PVC) - Door Contact - Tank Ladder	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND	210	LF	$1	$ 210.00
3/4"C (Aluminum) - Door Contact - Overflow	20	LF	$13	$ 265.00

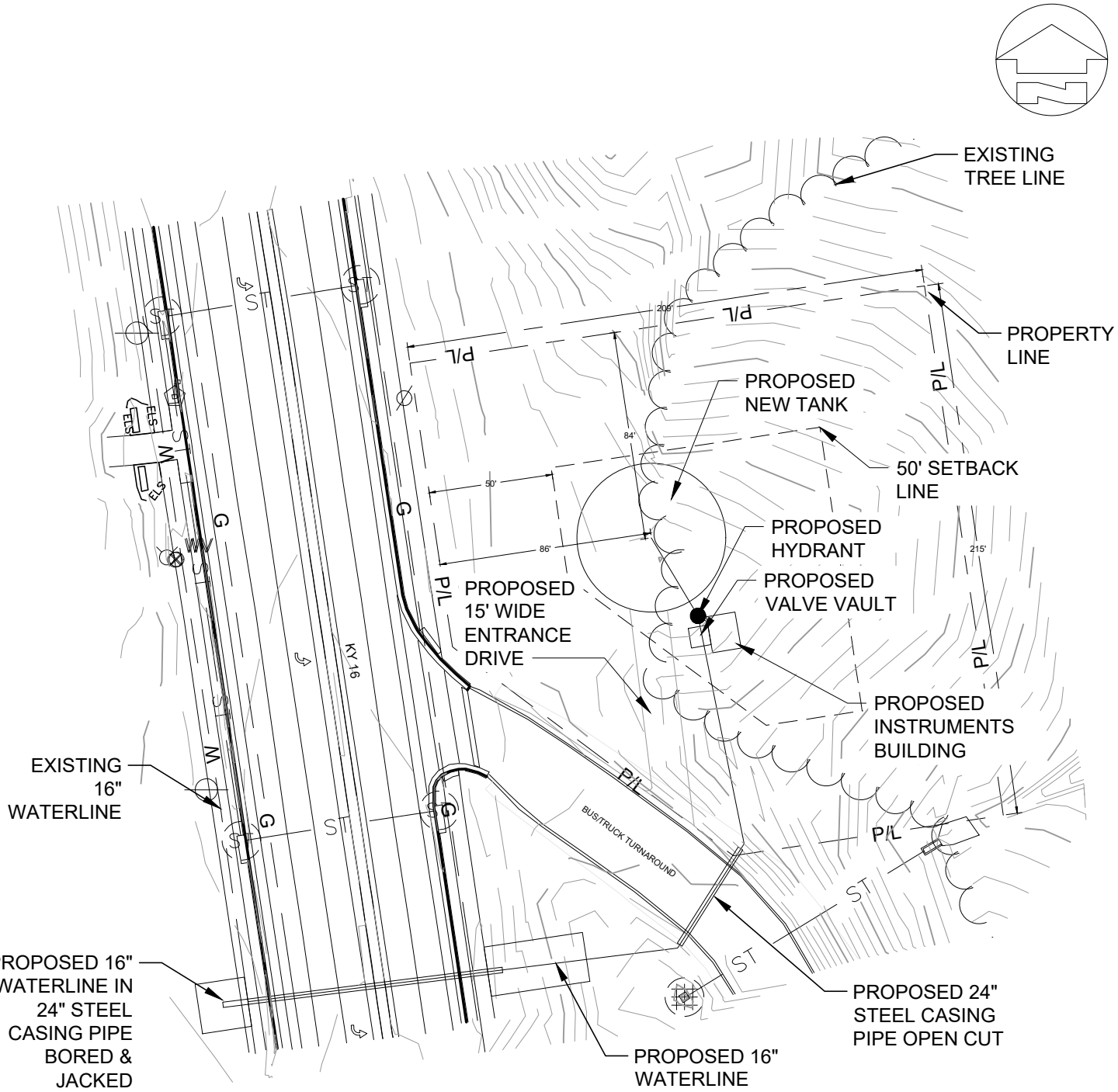
GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Project Cost Electrical and Instrumentation	Date:	11/02/22	Dwg. No.:	N/A
	Estimator:	WER	Type:	PER

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
3/4"C (Schedule 40 PVC) - Door Contact - Overflow	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND	210	LF	$1	$ 210.00
Sump Level Switch	1	EACH	$800	$ 800.00
Misc. Wiring/Conduit to/from Valve Vault	1	LSUM	$750	$ 750.00
Pole-Mounted LED/Pole Base/Wiring	2	EACH	$2,500	$ 5,000.00
3/4"C (Aluminum) - Mixer	185	LF	$13	$ 2,451.25
3/4"C (Schedule 40 PVC) - Mixer	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND	705	LF	$1	$ 705.00
3/4"C (Aluminum) - Gate Controller Power	5	LF	$13	$ 66.25
3/4"C (Schedule 40 PVC) - Gate Controller Power	75	LF	$8	$ 581.25
2#12 AWG + 1#12 GND	240	LF	$1	$ 240.00
3/4"C (Aluminum) - Gate Controller Keypad	5	LF	$13	$ 66.25
3/4"C (Schedule 40 PVC) - Gate Controller Keypad	75	LF	$8	$ 581.25
CAT6	80	LF	$2	$ 140.00
1"C (Aluminum) - Camera	20	LF	$16	$ 325.00
1"C (Schedule 40 PVC) - Camera	100	LF	$10	$ 950.00
CAT6	120	LF	$2	$ 210.00
Camera Mount/Pole	2	EACH	$750	$ 1,500.00
Miscellaneous Small Power/Wiring within Building	1	LSUM	$2,000	$ 2,000.00
Temporary Power	1	LSUM	$1,200	$ 1,200.00
Inspection	1	LSUM	$2,000	$ 2,000.00
Duke Energy Fees (Estimated)	1	LSUM	$5,000	$ 5,000.00
Instrumentation and Electrical - SCADA Valve Site:				
Grounding:				
Ground Rod	3	EACH	$250	$ 750.00
#2 AWG Bare	50	LF	$2	$ 100.00
Exothermic Weld	3	EACH	$300	$ 900.00
Ground Meter Base/CT Cabinet	1	EACH	$300	$ 300.00
Ground Test/Report	1	LSUM	$750	$ 750.00
Service Entrance:				
2" Conduit (Schedule 40 PVC)	75	LF	$14	$ 1,068.75
2" Conduit (Aluminum)	25	LF	$24	$ 600.00
Long Sweep 90 Elbow	2	EACH	$150	$ 300.00
#6 AWG	400	LF	$2	$ 800.00
Terminations	8	EACH	$34	$ 268.00
Trenching/Backfill	75	LF	$16	$ 1,200.00
NEMA 1, 60A, 120/240V, 1-Phase, 3-Wire Panelboard	1	EACH	$2,750	$ 2,750.00
Surge Protection Device	1	EACH	$750	$ 750.00
Meter Base	1	EACH	$250	$ 250.00
RTU Cabinet w/PLC, Ethernet Switch, Cellular Modem	1	LSUM	$25,000	$ 25,000.00
3/4"C (Aluminum) - Door Contact - Hatch @ Vault	10	LF	$13	$ 132.50
3/4"C (Schedule 40 PVC) - Door Contact - Hatch @ Vault	30	LF	$8	$ 232.50
2#12 AWG + 1#12 GND	120	LF	$1	$ 120.00
Sump Level Switch	1	EACH	$800	$ 800.00
Misc. Wiring/Conduit to/from Valve Vault	1	LSUM	$750	$ 750.00

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Project Cost Electrical and Instrumentation	Date:	11/02/22	Dwg. No.:	N/A
	Estimator:	WER	Type:	PER

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
Pole-Mounted LED/Pole Base/Wiring	1	EACH	$2,500	$ 2,500.00
Temporary Power	1	LSUM	$1,200	$ 1,200.00
Inspection	1	LSUM	$2,000	$ 2,000.00
Duke Energy Fees (Estimated)	1	LSUM	$5,000	$ 5,000.00
SCADA Programming	1	LSUM	$75,000	$ 75,000.00
			Sub-Total	$ 253,530.00
Contingency (20%)				$ 50,710.00
			Sub-Total	$ 304,240.00
Subcontractor Overhead & Profit (30%)				$ 91,280.00
TOTAL ESTIMATED ELECTRICAL AND INSTRUMENTATION				**$ 396,000.00**

FIGURES



PLOTTED BY: cknatz

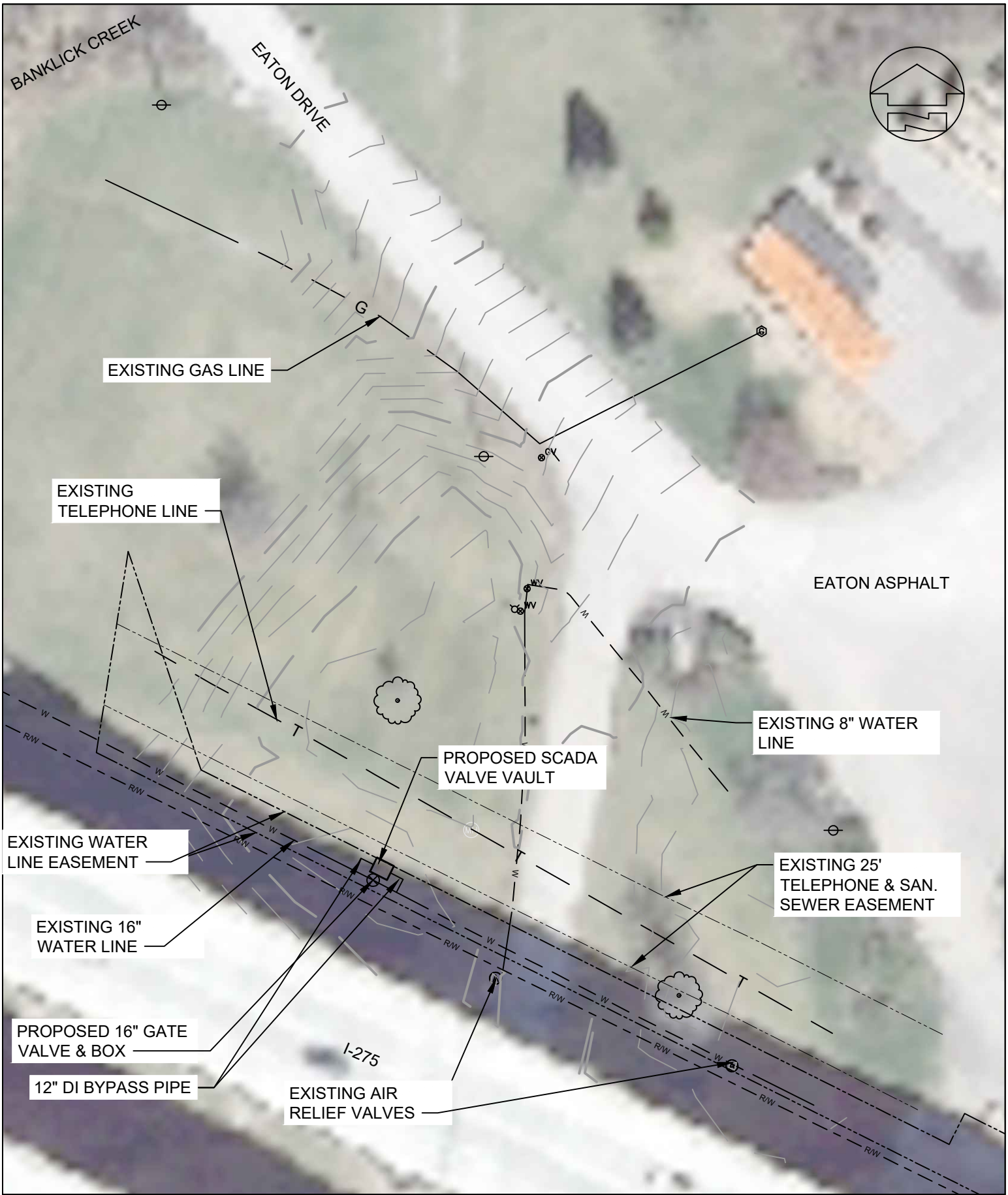
PRINTED: 11/3/2022 @ 3:33PM

FILE NAME: G:\5059-NKWD TaylorMill\Working Drawings\AutoCAD\5059-Fig A.dwg

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	TANK SITE PLAN
REVISIONS		DRAWN: CEK	
NO. / DESCRIPTION / DATE / BY		REVIEWED: ADH	TAYLOR MILL TANK N.K.W.D.
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: 1" = 60'
SHEET NO. A



PLOTTED BY: cknatz

PRINTED: 11/3/2022 @ 11:43AM

FILE NAME: G:\5059-NKWD TaylorMill\Working Drawings\AutoCAD\5059-Fig B.dwg

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	
REVISIONS		DRAWN: CEK	
NO. / DESCRIPTION / DATE / BY		REVIEWED: ADH	
		APPROVED: ADH	

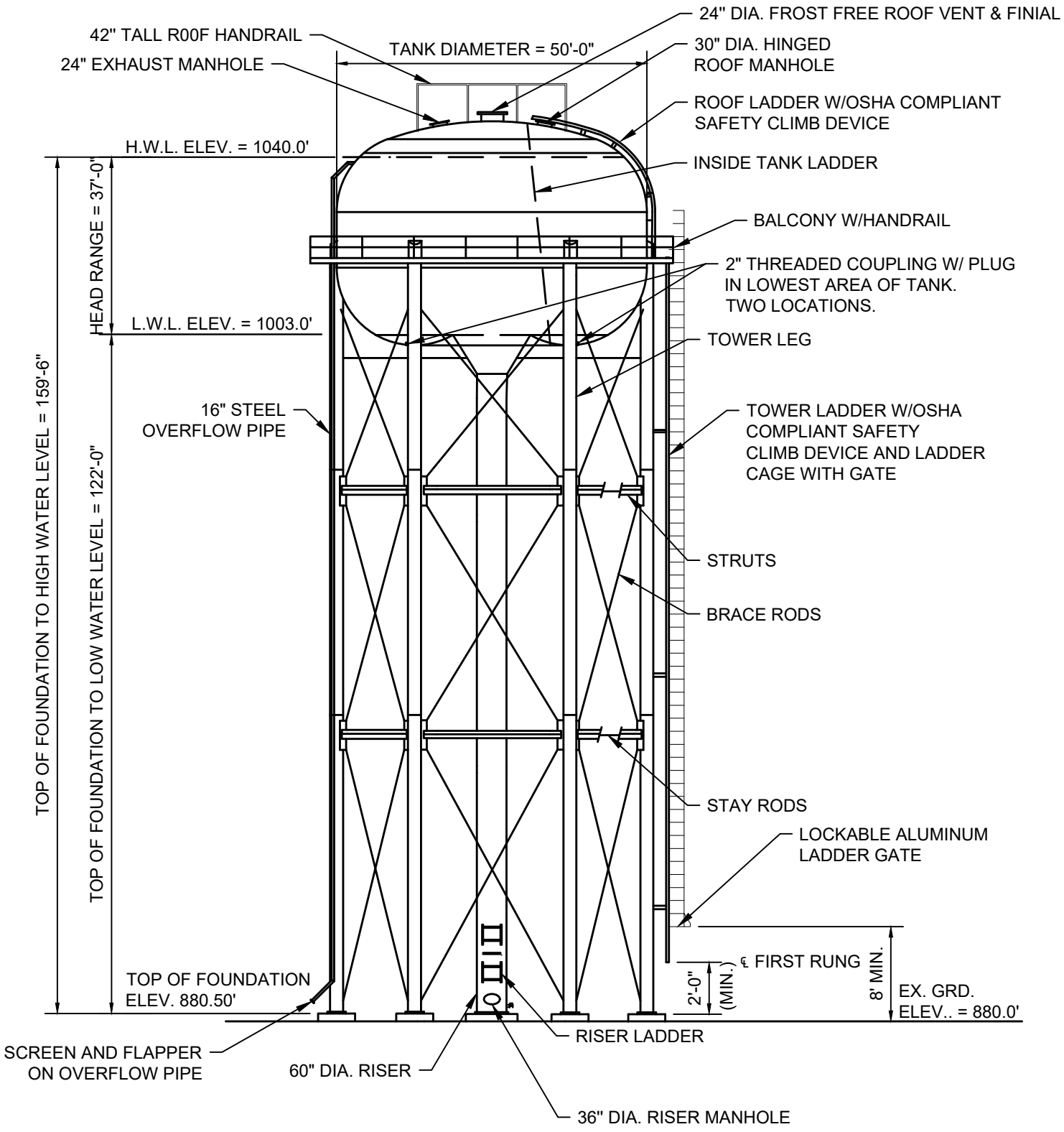
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED

SCADA VALVE SITE PLAN

TAYLOR MILL TANK
N.K.W.D.

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: 1" = 40'
SHEET NO. B



PLOTTED BY: dknatz

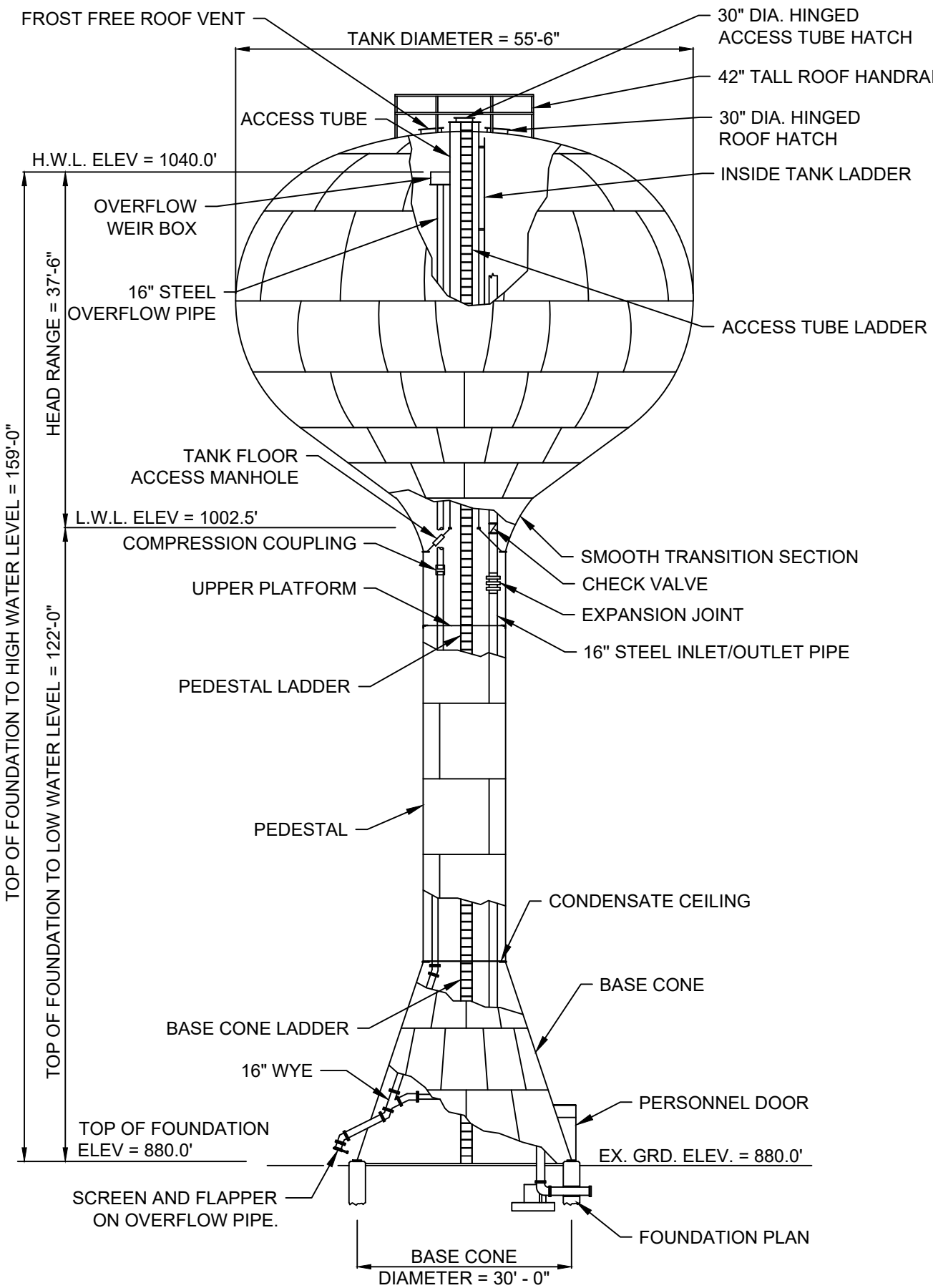
PRINTED: 11/3/2022 @ 11:31AM

FILE NAME: G:\5059-NKWD Taylor\Mill\Working Drawings\AutoCAD\5059-Fig C.dwg

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	
REVISIONS		DRAWN: CEK	MULTI-COLUMN TANK ELEV.
NO. / DESCRIPTION / DATE / BY		REVIEWED: ADH	TAYLOR MILL TANK N.K.W.D.
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

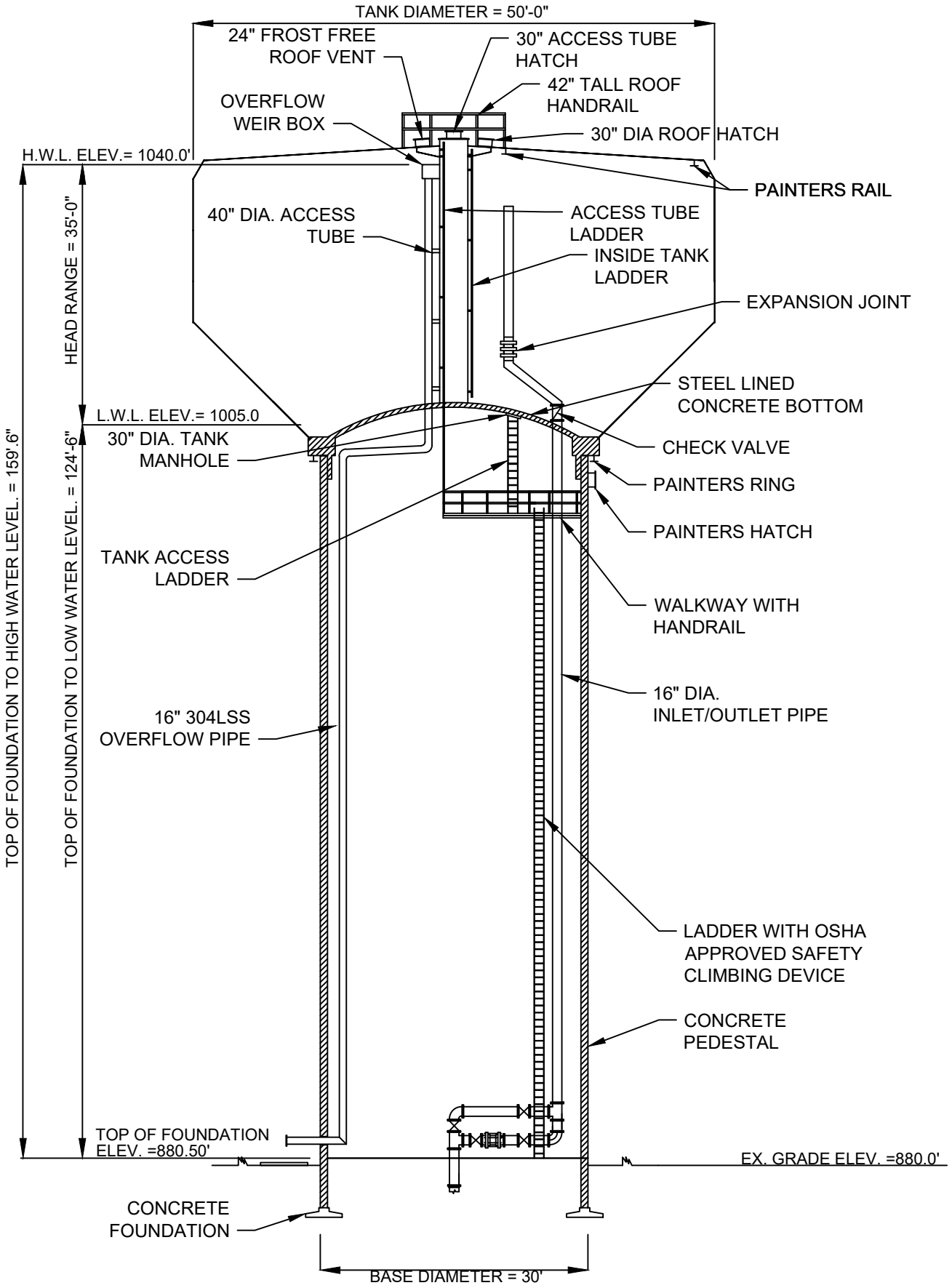
DATE: SEPTEMBER, 2022
SCALE: N.T.S.
SHEET NO. C



GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	
REVISIONS		DRAWN: CEK	PEDESPHERE TANK ELEV.
NO. / DESCRIPTION / DATE / BY		REVIEWED: ADH	TAYLOR MILL TANK N.K.W.D.
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: N.T.S.
SHEET NO. D



PLOTTED BY: cknatz

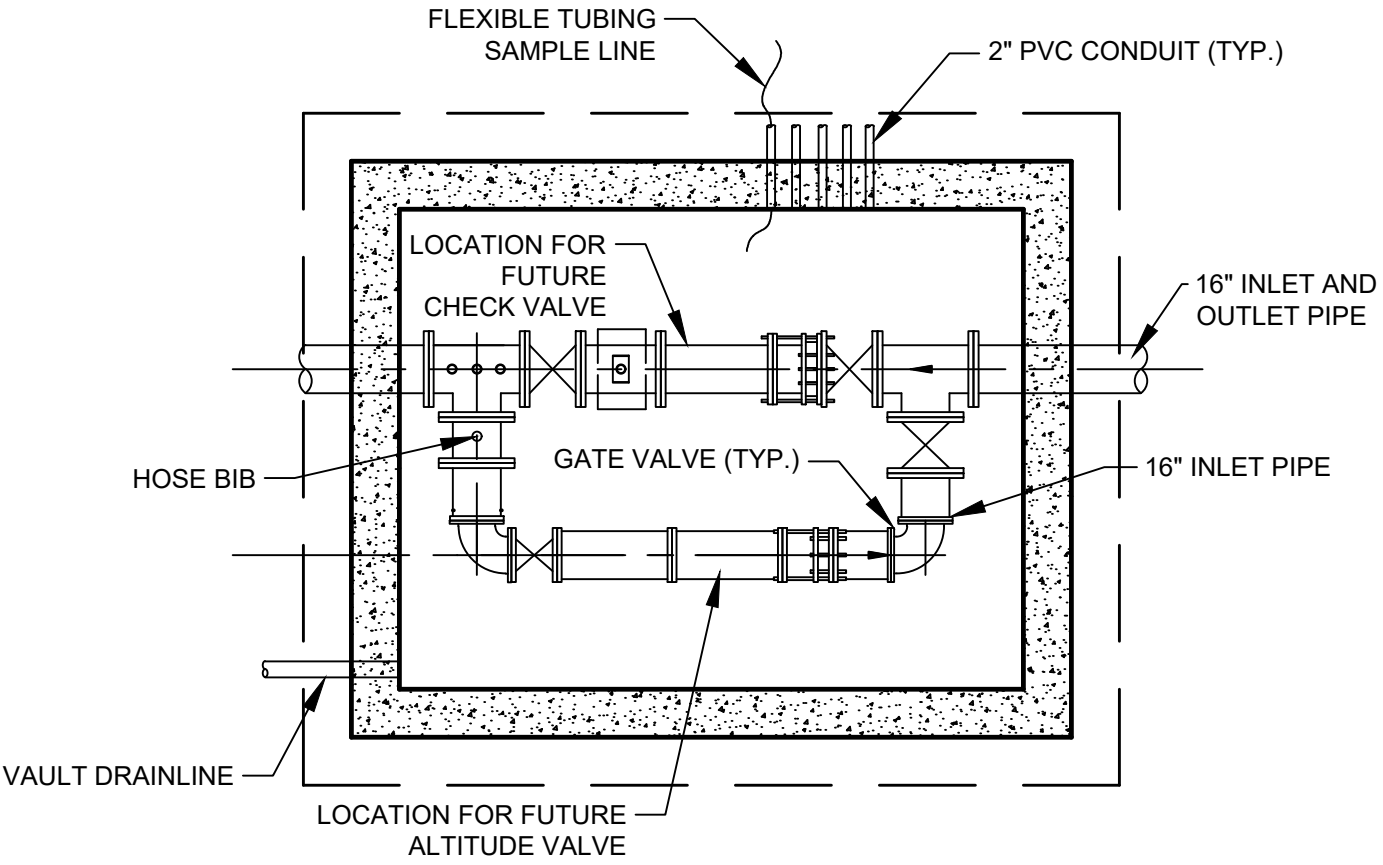
PRINTED: 11/3/2022 @ 11:28AM

FILE NAME: G:\6059-NKWD TaylorMill\Working Drawings\AutoCAD\5059-Fig E.dwg

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	
REVISIONS		DRAWN: CEK	COMPOSITE TANK ELEV.
NO. / DESCRIPTION / DATE / BY		REVIEWED: ADH	TAYLOR MILL TANK N.K.W.D.
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: N.T.S.
SHEET NO. E



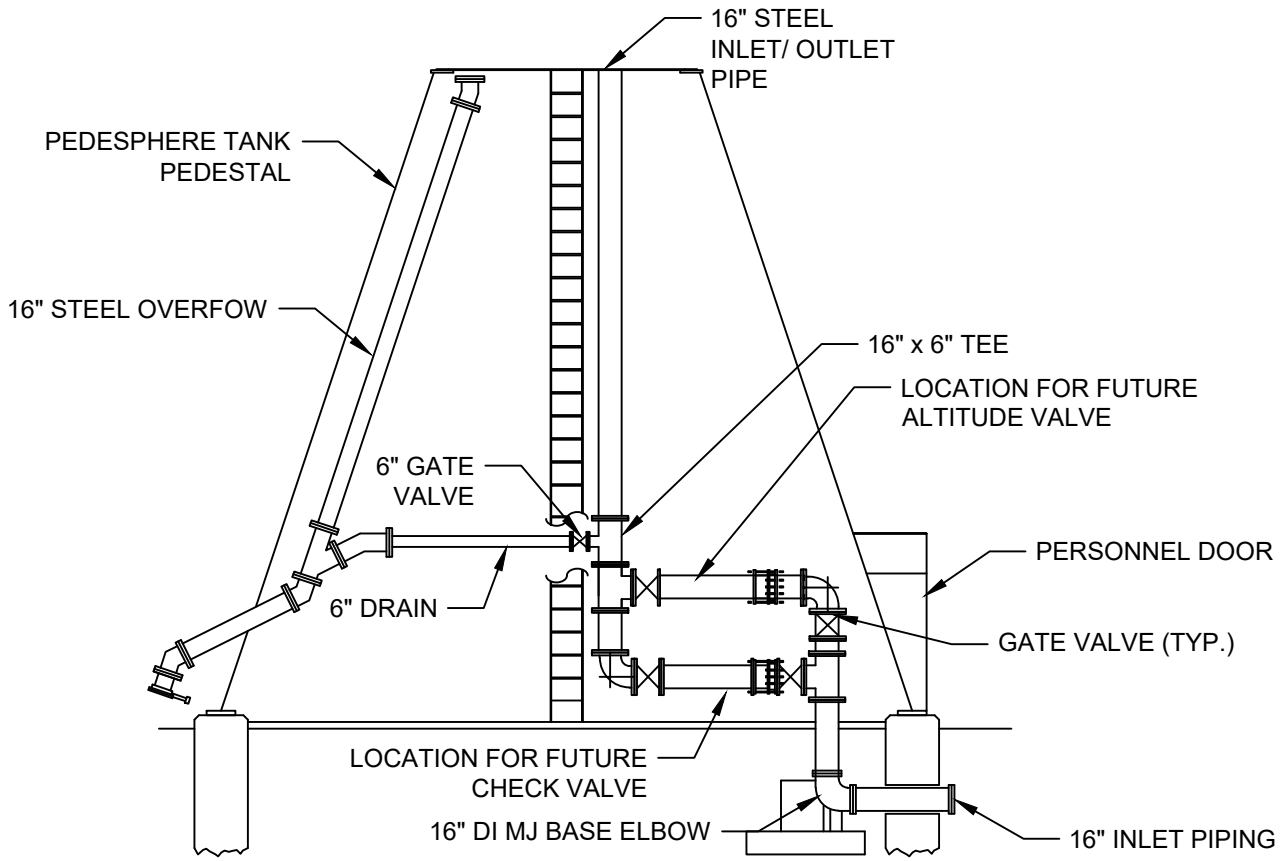
VALVE VAULT

NOT TO SCALE

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	TANK SITE VALVE VAULT TAYLOR MILL TANK N.K.W.D.
REVISIONS: NO. / DESCRIPTION / DATE / BY		DRAWN: CEK	
		REVIEWED: ADH	
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: 1/4"=1'-0"
SHEET NO. F



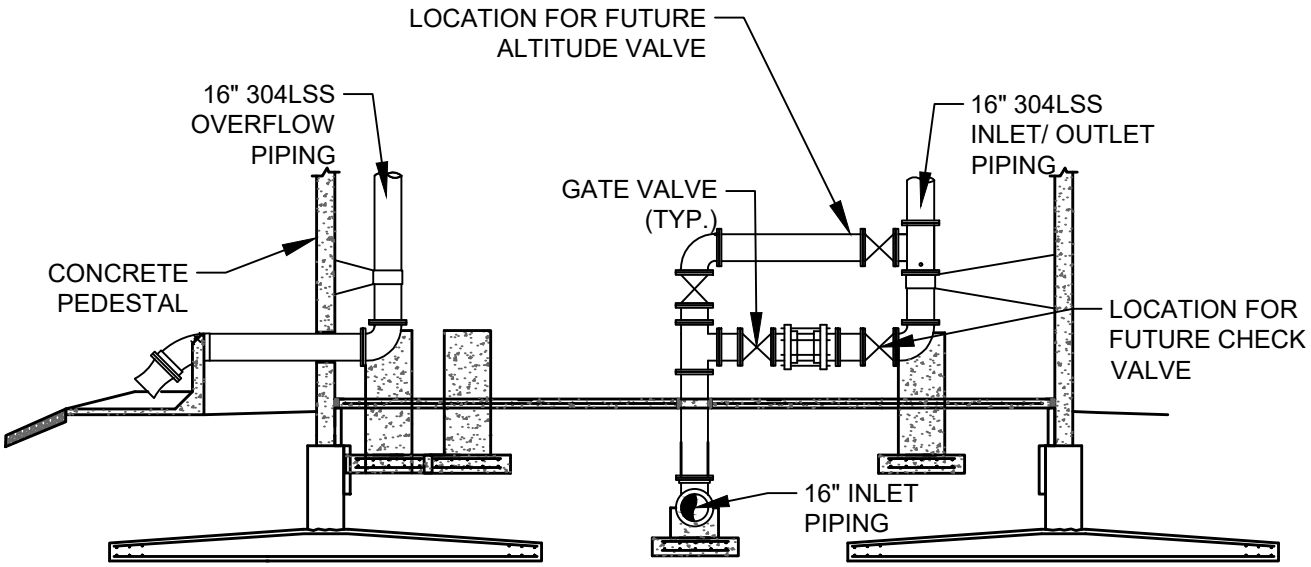
PEDESTAL BASE CONE VALVE ASSEMBLY

NOT TO SCALE

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	PEDESPHERE TANK VALVE ASSEMBLY TAYLOR MILL TANK N.K.W.D.
REVISIONS (NO. / DESCRIPTION / DATE / BY)		DRAWN: CEK	
		REVIEWED: ADH	
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: 1/4"=1'-0"
SHEET NO. G



COMPOSITE BASE VALVE ASSEMBLY

NOT TO SCALE

GRW PROJECT NO. 5059	CLIENT PROJECT NO. XXXX	DESIGNED: ADH	COMPOSITE TANK VALVE ASSEMBLY TAYLOR MILL TANK N.K.W.D.
REVISIONS: NO. / DESCRIPTION / DATE / BY		DRAWN: CEK	
		REVIEWED: ADH	
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: SEPTEMBER, 2022
SCALE: 3/32"=1'-0"
SHEET NO. H

APPENDICES

APPENDIX A

GridBee Submersible Mixer Budget Pricing and Brochure

IXOM Watercare Inc.
3225 Hwy 22, Dickinson ND 58601
866-437-8076 • watercare@ixom.com

GridBee

Budget Estimate - (Bid Specs Vary, Do Not Use for Bid Pricing)

GS-12 / GS-9 Electric Potable Water Tank Mixers

Last Updated: June 8, 2022 - Note: International Pricing Will Vary

Performance guaranteed or your money back! GS Mixers are the most effective and competitively priced mixers on the market with the lowest life cycle cost and the best warranty. Specifications can be found at www.ixomwatercare.com/equipment/gs-series-submersible-mixers
Installing a GS mixer is well within the capabilities of most cities and contractors. GS mixers are usually installed directly under the hatch with no need to center it in tank. A GS Series Electric Mixer Training Video is available at: www.ixomwatercare.com/video/1802/gs-11-minute-installation-training

Description	GS-12	GS-9
GS Submersible Electric Mixer: with 75 ft of in-tank submersible electrical cable	**$12,595**	~~$9,875~~
GS Submersible Electric Mixer: with 150 ft of in-tank submersible electrical cable	**$12,950**	**$9,515**
Freight cost for each basic system:	**$150**	**$130**
Horsepower, Voltage, Phase: GS Mixers are available on request at the same price: 240vAC 1PH and 460vAC 3PH	0.50 hp, 120vAC, 1PH Other voltage / ph available	
Mixer length x diameter, inches: 12" or larger hatch size required, no need to enter or drain the tank	36" x 10"	24" x 10"
Weight: submersible mixer only	75 lbs	65 lbs
Maximum recommended tank volumes for moderate conditions:* * The GS-12 is recommended for higher turnover rate, or ice issues, or areas with high heat.	8 MG (million gallons)	3 MG (million gallons)

Options	
100217 Chemical injection interior hose: per 100 ft:	~~$285~~
100321 Chemical injection hose penetration thru fitting: for steel tanks:	~~$506~~
Chemical injection exterior hose kit: includes 50 ft SS braided hose & valve termination:	~~$798~~
Additional - Chemical injection exterior hose: price per ft:	~~$8.00 per ft~~

102423 Control Box (120v): UL listed, NEMA 4, 120vAC/1ph, with SCADA monitoring, HOA switch, indicator light, locking latch	~~$1,695~~ Shipped with mixer for electrical contractor installation
102424 Control Box (240v): UL listed, NEMA 4, 240vAC/1ph, with SCADA monitoring, HOA switch, indicator light, locking latch	**$1,735** Shipped with mixer for electrical contractor installation
100264 Control Box (120v): UL listed, NEMA 4X, 120vAC/1ph, with timer but No SCADA, on/off switch, indicator light, locking latch	~~$908~~ Shipped with mixer for electrical contractor installation
Factory Delivery & Placement: Installing the above mixer is within the scope of work that most cities/contractors can perform	~~$16,000~~ Varies with tank height and tank construction
DBS - Portable Disinfectant Boost System: An electric or engine-driven air compressor (4 cfm @ 60 psi) is required to operate the air-powered diaphragm pump; air compressor is not included	~~$9,977~~ ~~+ $608 Freight~~ 

$9,515 + $130 + $1,735 = $11,340

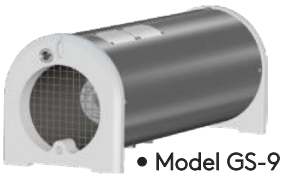
Brochure

IXOM WATERCARE

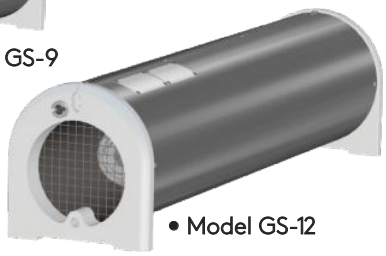
GridBee® GS Series Submersible Mixers

Effective. Efficient. Affordable.

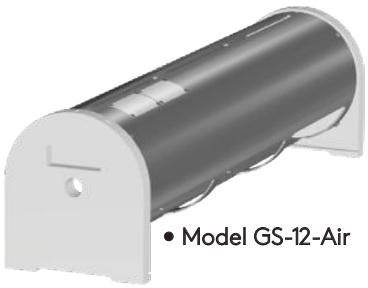
Reliable 24-hour active mixing with the lowest life-cycle cost. The benefits are immediate!



• Model GS-9



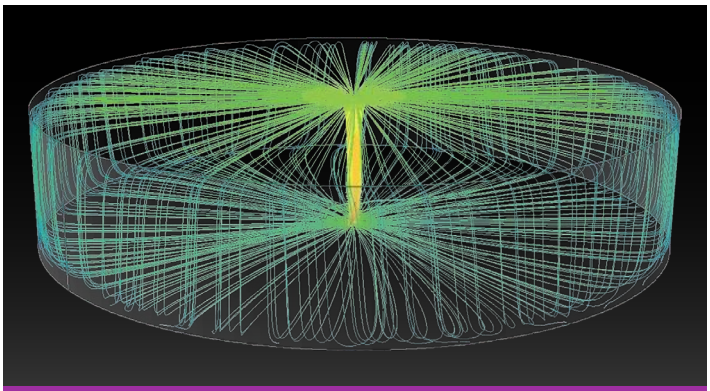
• Model GS-12



• Model GS-12-Air

Benefits

- Prevents stagnation, thermal stratification & short-circuiting.
- Provides uniform water age & equal distribution of disinfectant.
- Minimize chemical disinfectant usage & disinfection by-products.
- Increases contact time (baffle factor) in clearwells.
- Reduces nitrification in chloraminated systems.
- Eliminate energy intensive & costly deep-cycling and/or flushing of tanks.
- Reduces ice buildup & tank damage in cold climates.



CFD of a GS-12 in an 8 million gallon reservoir.

NSF/ANSI Standard 61 Certified By			
	NSF	UL	CSA
GS Mixer	X		
GS Motor		X	X

NSF/ANSI Standard 372 Certified By			
	NSF	UL	CSA
GS Mixer	X		
GS Motor		X	X

Performance Guaranteed.

Features

- Engineered for easy deployment.
- No tank entry required.
- Utilizes efficient sheet mixing technology.
- 316SS Construction.
- Certified to NSF/ANSI 61 and NSF/ANSI 372.
- 120VAC 1Ph Standard.
- 240VAC 1PH or 460vAC 3PH available. (for GS-9 and GS-12 models only)
- 5-Year Warranty.
- Liquid disinfectant boosting port.

Effective mixing for any tank size, any tank build.

1856_20210709

Brochure

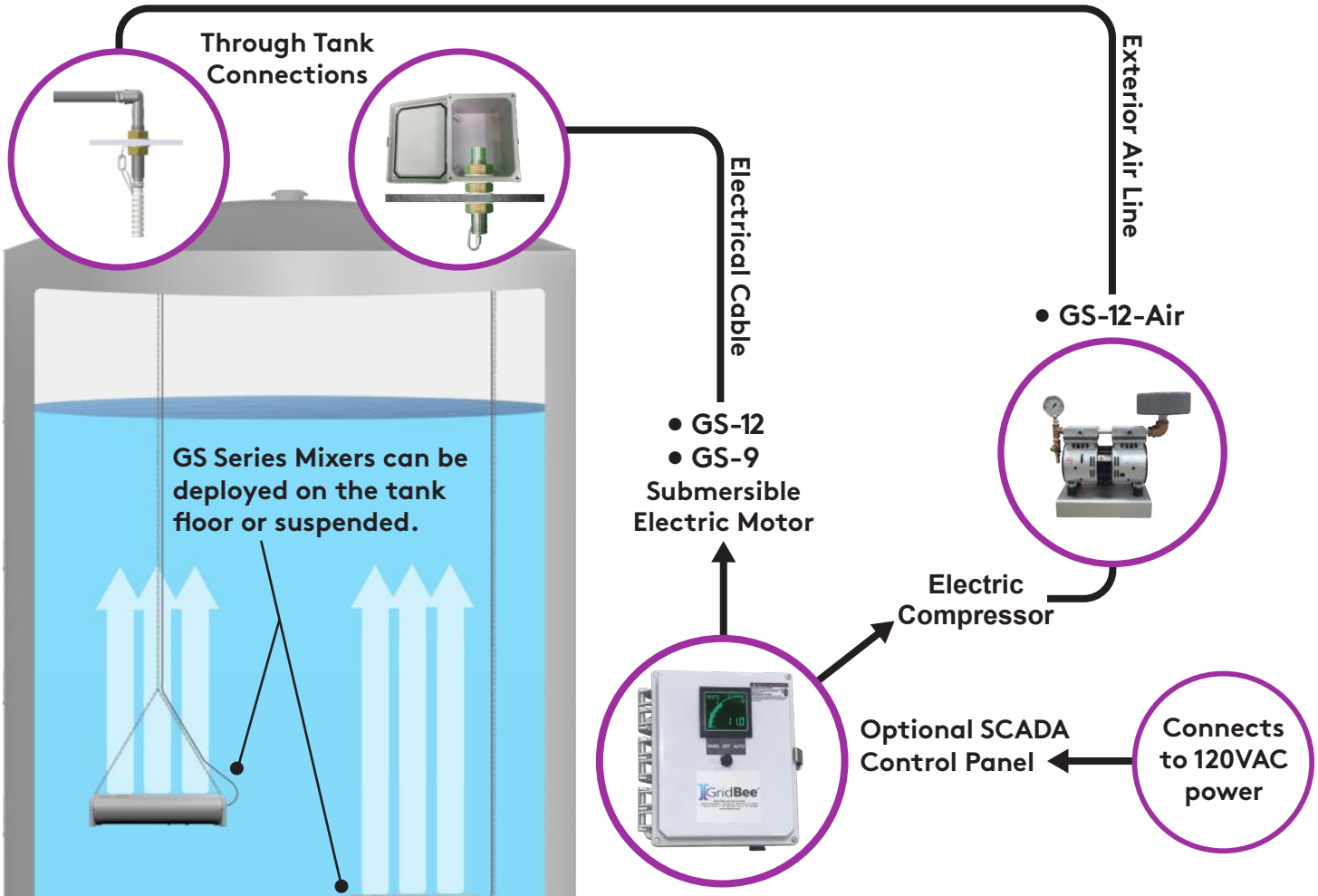
GridBee® GS Series Submersible Mixers

GridBee® GS Series Submersible Tank Mixers are easily deployed through a hatch, vent, or other tank opening twelve (12) inches or larger in diameter. The "GS" thoroughly mixes the entire tank volume from tank floor to water surface resulting in consistent disinfectant residuals, even temperature profiles and uniform water age.

Assembled Machine Dimensions

	Length	Diameter	Weight
GS-9	24 in. (61 cm)	10 in. (25 cm)	65 lbs. (29 kg)
GS-12	36 in. (91 cm)	10 in. (25 cm)	75 lbs. (34 kg)
GS-12-Air	36 in. (91 cm)	10 in. (25 cm)	50 lbs. (23 kg)

Everything you need for a fast & efficient deployment is included!



Learn more at
www.ixomwatercare.com

1856_20210709

APPENDIX B

Pulsed Hydraulics, Inc. Bubble Mixer Budget Pricing and Brochure

VERSION: 03.30.21

PHI 360 STANDARD PRICE WORKSHEET

ENTER INFORMATION IN YELLOW BOXES ONLY

DATE: 07/15/22

Job Name: Northern KY Water District
Water Storage Mixing System

PHI Job #:

REP COMPANY NAME	**ICS, Inc.**	**REP NAME:**	**L Bell**
Purchase order #:			
Purchase order date:			

SELECT SYSTEM FEATURE No Heater E

MIXING VALVE ENCLOSURE (MVE)
BASIC ENCLOSURE
36" x 36" x 8" SST Enclosure, one (1) to eight (8) Valves, Allen Bradley CompactLogic 1769-L16LER PLC, PanelView "7" touchscreen, 50 watt heater, pressure regulator, filter, surge protector, lightning arrestor, 120vac

TOTAL NUMBER OF VALVES	(Enter 1, 2, 3, 4, 5, 6, 7, 8)	1	38,000
PHI 360 MIXING VALVE ENCLOSURE PART NUMBER:	**PHI 360 -**	**1**	
NUMBER OF ENCLOSURES ORDERED		**1**	38,000
BUBBLE FORMING PLATE(S) Stainless steel			
	Enter total number of plates for project in box at right.	1	500
Bubble Forming Plate Material:	Enter SS= Stainless Steel P=PVC		
SPARE PARTS: See spare parts tab below			337
	PHI EQUIPMENT SUB-TOTAL		**38,837**
	PRICING ADJUSTMENT		
	PHI EQUIPMENT TOTAL		**38,837**

OTHER ITEMS:

Engineering submittals: Required?	Enter Y=Yes or N=No in box at right.	Y	3,000
Start-up services: Enter amount in box at right.			1,000
Training services: Enter amount in box at right.			500
Compressor: See Compressor tab below			13,816
Special items: See Special Items tab below			500
PROJECT TOTAL			57,653

SHIPPING INSTRUCTIONS:

SHIP TO:
Name
Address
Contact name and phone

Special Instructions:

Pulsed Hydraulics, Inc.

PHi-350 WATER STORAGE MIXER

Description: The PHI 350 mixer is unique in that it utilizes large air bubbles which are sequentially injected into a liquid to create powerful mixing currents. The system is contained in an NEMA-4X enclosure.

PROVEN TO

- Eliminate thermoclines and stratification of the water in storage tanks
- Prevent nitrification of drinking water
- Keep purification chemicals in solution
- Reduce chlorine use

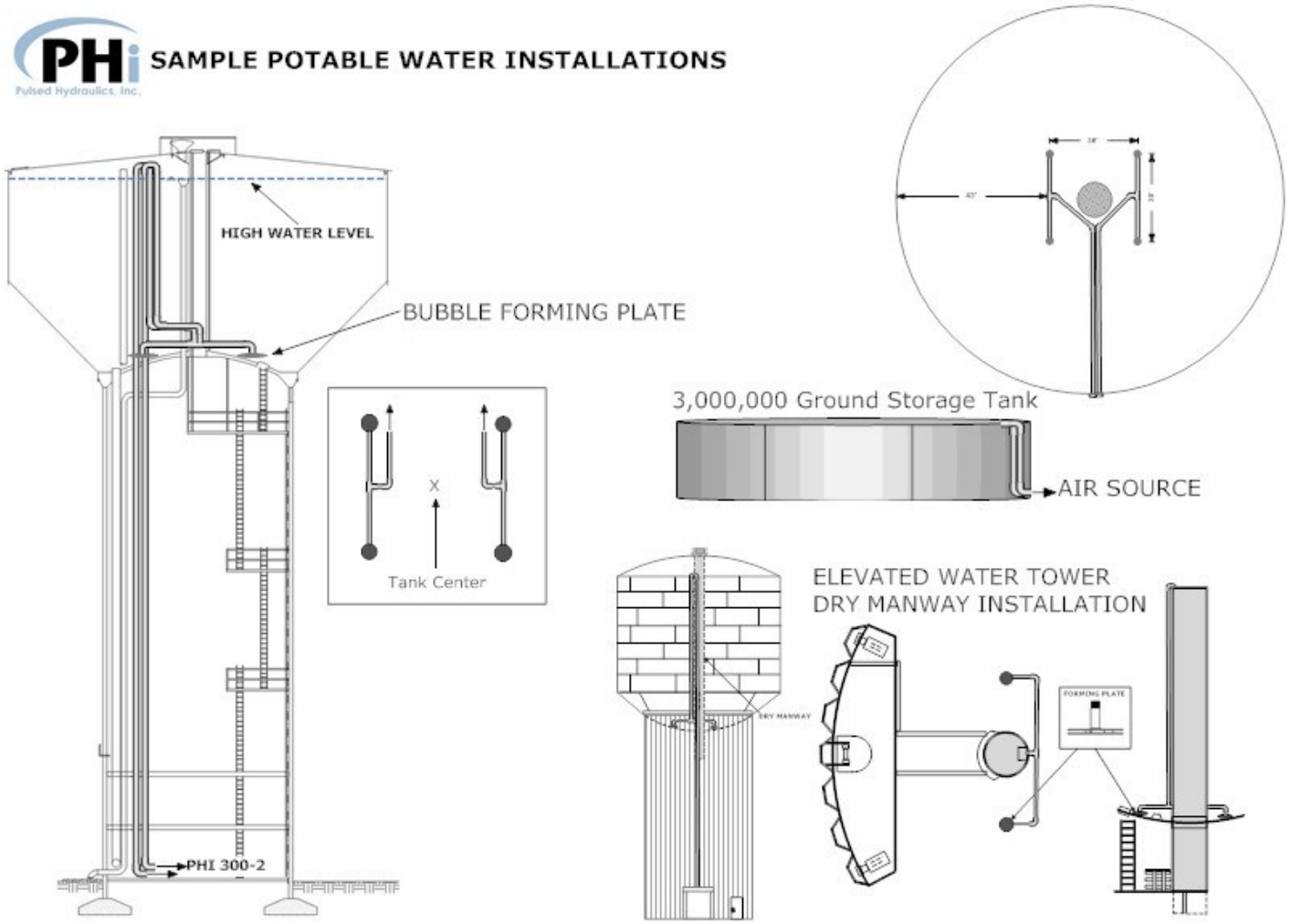
Bubble Forming Plate: The only equipment installed in the vessel is the NSF-61 approved bubble forming plate and piping. The bubble forming plate is an 8-inch disk consisting of two 3/16" SS plates which are separated by 3/16" and connected to a 1-inch NPT pipe. Piping is run from the enclosure and connected to the bubble forming plate. The electro-pneumatic valve delivers the compressed air through the piping to the forming plates where it is squished between the two plates thus creating a large, relatively flat bubble. The mixing is created by the bubble rapidly rising to the top the vessel, forcing the water to the sides of the tank, down the walls and back to the bubble forming plate.

Applications: The PHi-350 is used to mix potable water tanks of any size or shape. The sequenced bubbles quickly mix water tanks to prevent stratification and maintain chlorine residuals equally throughout. Since stratification and residual loss does not typically reoccur within 24 hours, mixing once per day for 60 minutes will keep the potable water within required chlorine specifications without hot spots or bio-film formation.

Energy Savings: Substantial energy is saved as the system typically needs to operate once per day for 60 minutes.

FOR INFORMATION: Visit our website at www.phiwater.com, email info@phiwater.com, call us at (800) 641-1726, or write us at 15 Oro Beach Dr., Oroville, WA 98844

SAMPLE POTABLE WATER INSTALLATIONS



A Pennsylvania water utility compared the chlorine reading of their PHi mixed water tank to their two other non-mixed tanks. They discovered that the mixed tank had a free chlorine reading of .3 ppm in and .2 ppm out. The non-mixed tanks had a free CL reading of .8 ppm in and .03 ppm out and 1.1 ppm in and .15 out, respectively.

FOR INFORMATION: Visit our website at www.phiwater.com, email info@phiwater.com, call us at (800) 641-1726, or write us at 15 Oro Beach Dr., Oroville, WA 98844

APPENDIX C

Cla-Val Model 58-01 Valve and Model X105L Limit Switch Data Sheets

CLA-VAL™

MODEL 58-01

Combination Back Pressure & Solenoid Shut-Off Valve

- **Accurate Pressure Control**
- **Wide Adjustment Ranges**
- **Optional Check Feature Available**
- **Quick Acting Solenoid Shut-Off**
- **Easy Installation and Maintenance**

The Cla-Val Model 58-01 valve performs two separate functions. It maintains a constant back pressure by discharging excess pressure downstream and when the solenoid is activated the valve closes drip-tight.

In operation, the valve is actuated by hydraulic line pressure through the pilot control system. When inlet pressure is greater than the control setting, the valve opens. When inlet pressure is equal to the control setting, the pilot modulates the valve, maintaining the preselected back pressure. When inlet pressure is less than the control setting, the pilot system closes the valve drip tight. Changing the pressure setting simply involves turning an adjusting screw on the pilot control.

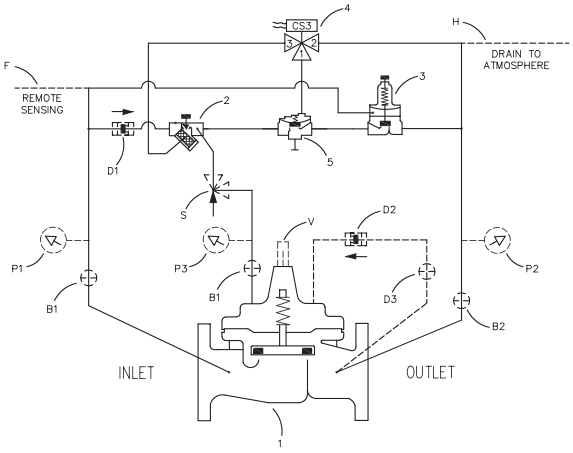
The solenoid control is available in energize to open or de-energize to open models.

Schematic Diagram

Item	Description
1	100-01 Hytrol Main Valve
2	X42N-3 Strainer & Needle Valve
3	CRL-60 Pressure Relief Control
4	CS3 Solenoid Control
5	100-01 Hytrol (Reverse Flow)

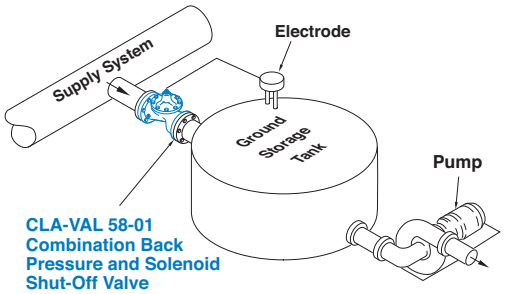
Optional Features

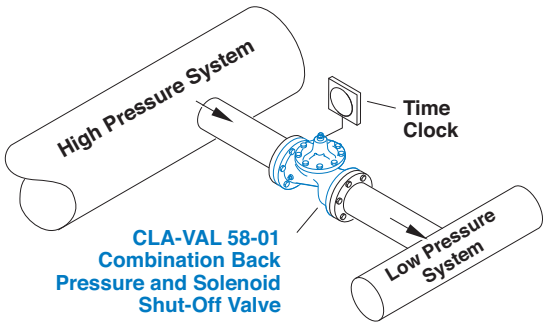
Item	Description
B	Shutoff Isolation Valve
D	Check Valves with Isolation Valve
F	Remote Pilot Sensing
H	Drain to Atmosphere
P	X141 Pressure Gauge
S	CV Speed Control (Opening)
V	X101 Valve Position Indicator



The "D" feature on a vertically installed 6" and larger valve must be horizontally oriented.

Typical Applications





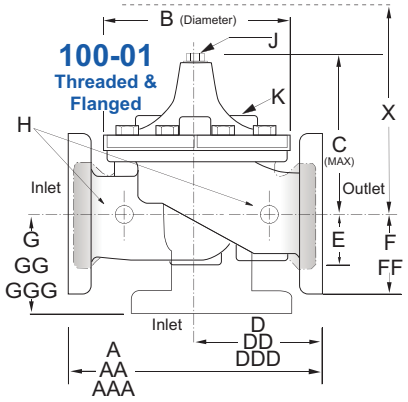
Back Pressure Maintenance Service

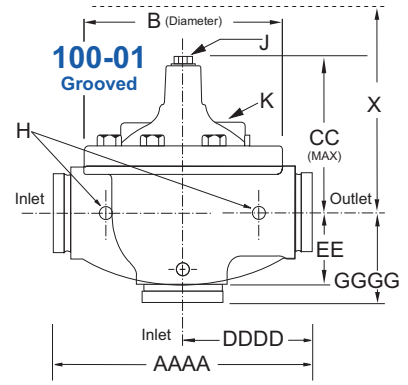
A frequent application of this valve is to maintain minimum back pressure in the system while supplying water to a reservoir. The electrode in the storage tank activates the solenoid shutoff feature when the tank reaches a preset level.

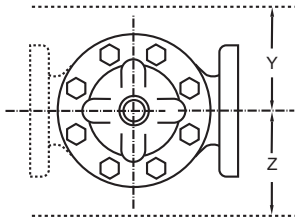
Electronic Control Service

Using a timer connected to the solenoid control of the valve, flow from the high pressure system to the low pressure system can be controlled at certain times during the day.

Model 58-01 (Uses 100-01 Hytrol Main Valve)







For sizes 18 - 36-inches, use 50-66 E-Sheet

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class				
		Flanged			Grooved	Threaded
Grade	Material	ANSI Standards*	150 Class	300 Class	300 Class	End‡ Details
ASTM A536	Ductile Iron	B16.42	250	400	400	400
ASTM A216-WCB	Cast Steel	B16.5	285	400	400	400
UNS 87850	Bronze	B16.24	225	400	400	400

Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
‡ End Details machined to ANSI B2.1 specifications.
Valves for higher pressure are available; consult factory for details

Materials

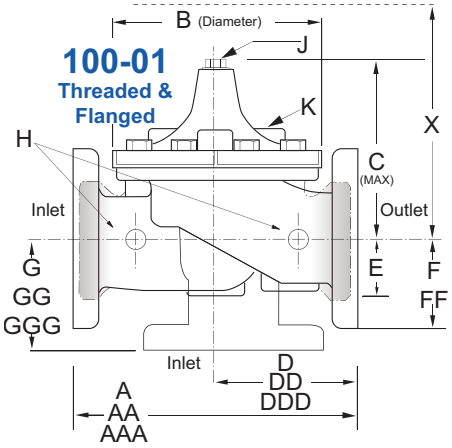
Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	1" - 36" 25 - 900mm	1" - 16" 25 - 400mm	1" - 16" 25 - 400mm
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Bronze is Standard Stainless Steel is Optional		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		

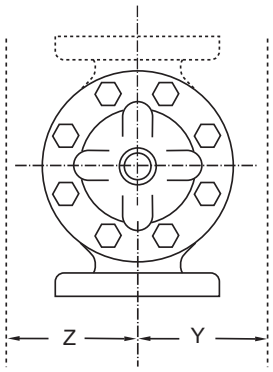
For material options not listed, consult factory.
Cla-Val manufactures valves in more than 50 different alloys.

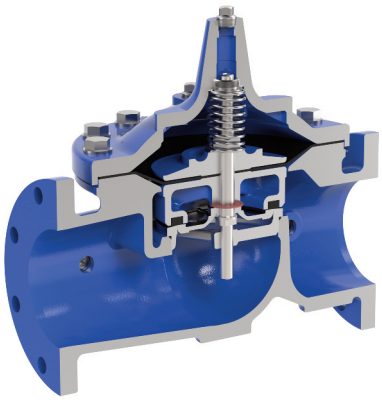
Model 58-01 Dimensions (in inches)

Valve Size (Inches)	1	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
A Threaded	7.25	7.25	7.25	9.38	11.00	12.50	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	41.38	46.00	52.00	61.50	63.00	72.75
AAA 300 ANSI	—	—	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	43.50	47.64	53.62	63.24	64.50	74.75
AAAA Grooved End	—	—	8.50	9.00	11.00	12.50	15.00	20.00	25.38	—	—	—	—	—	—	—	—	—
B Diameter	5.62	5.62	5.62	6.62	8.00	9.12	11.50	15.75	20.00	23.62	28.00	32.75	35.50	41.50	45.00	53.16	56.00	66.00
C Maximum	5.50	5.50	5.50	6.50	7.56	8.19	10.62	13.38	16.00	17.12	20.88	24.19	25.00	39.06	41.90	43.93	54.60	59.00
CC Maximum Grooved End	—	—	4.75	5.75	6.88	7.25	9.31	12.12	14.62	—	—	—	—	—	—	—	—	—
D Threaded	3.25	3.25	3.25	4.75	5.50	6.25	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	4.00	4.75	5.50	6.00	7.50	10.00	12.69	14.88	17.00	19.50	20.81	—	—	30.75	—	—
DDD 300 ANSI	—	—	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56	17.75	20.25	21.62	—	—	31.62	—	—
DDDD Grooved End	—	—	—	4.75	—	6.00	7.50	—	—	—	—	—	—	—	—	—	—	—
E	1.12	1.12	1.12	1.50	1.69	2.06	3.19	4.31	5.31	9.25	10.75	12.62	15.50	12.95	15.00	17.75	21.31	24.56
EE Grooved End	—	—	2.00	2.50	2.88	3.12	4.25	6.00	7.56	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	2.50	3.00	3.50	3.75	4.50	5.50	6.75	8.00	9.50	10.50	11.75	15.00	16.50	19.25	22.50	28.50
FF 300 ANSI	—	—	3.06	3.25	3.75	4.13	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.00	16.50	19.25	24.00	30.00
G Threaded	1.88	1.88	1.88	3.25	4.00	4.50	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88	15.69	—	—	22.06	—	—
GGG 300 ANSI	—	—	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62	16.50	—	—	22.90	—	—
GGGG Grooved End	—	—	—	3.25	—	4.25	5.00	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.25	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	0.40	0.40	0.40	0.60	0.70	0.80	1.10	1.70	2.30	2.80	3.40	4.00	4.50	5.10	5.63	6.75	7.50	8.50
Approx. Ship Weight (lbs)	15	15	15	35	50	70	140	285	500	780	1165	1600	2265	2982	3900	6200	7703	11720
Approx. **X** Pilot System	11	11	11	13	14	15	17	29	31	33	36	40	40	43	47	68	79	85
Approx. **Y** Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	40	45
Approx. **Z** Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	42	47

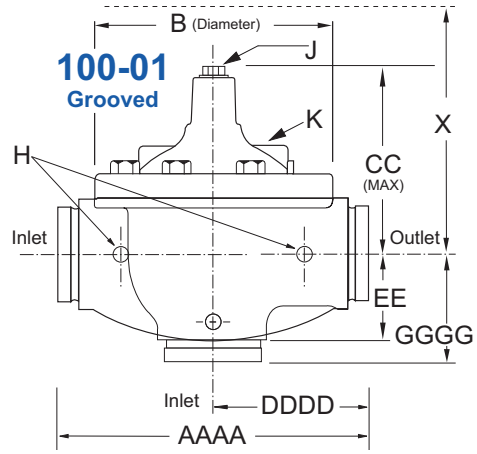
Model 58-01 Metric Dimensions (Uses 100-01 Hytrol Main Valve)







Model 100-01 Full Port Hytrol Main Valve



Model 58-01 Dimensions (in mm)

Valve Size (mm)	**25**	**32**	**40**	**50**	**65**	**80**	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**	**500**	**600**	**750**	**900**
A Threaded	184	184	184	238	279	318	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	216	238	279	305	381	508	645	756	864	991	1051	1168	1321	1562	1600	1848
AAA 300 ANSI	—	—	229	254	295	337	397	533	670	790	902	1029	1105	1210	1326	1606	1638	1899
AAAA Grooved End	—	—	216	228	279	318	381	508	645	—	—	—	—	—	—	—	—	—
B Diameter	143	143	143	168	203	232	292	400	508	600	711	832	902	1054	1143	1350	1422	1676
C Maximum	140	140	140	165	192	208	270	340	406	435	530	614	635	992	1064	1116	1387	1499
CC Maximum Grooved End	—	—	120	146	175	184	236	308	371	—	—	—	—	—	—	—	—	—
D Threaded	83	83	83	121	140	159	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	102	121	140	152	191	254	322	378	432	495	528	—	—	781	—	—
DDD 300 ANSI	—	—	108	127	149	162	200	267	337	395	451	514	549	—	—	803	—	—
DDDD Grooved End	—	—	—	121	—	152	191	—	—	—	—	—	—	—	—	—	—	—
E	29	29	29	38	43	52	81	110	135	235	273	321	394	329	381	451	541	624
EE Grooved End	—	—	52	64	73	79	108	152	192	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	64	76	89	95	114	140	171	203	241	267	298	381	419	489	572	724
FF 300 ANSI	—	—	78	83	95	105	127	159	191	222	260	292	324	381	419	489	610	762
G Threaded	48	48	48	83	102	114	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	102	83	102	102	127	152	203	219	349	378	399	—	—	560	—	—
GGG 300 ANSI	—	—	102	89	110	111	135	165	216	236	368	397	419	—	—	582	—	—
GGGG Grooved End	—	—	—	83	—	108	127	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.25	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	10	10	10	15	18	20	28	43	58	71	86	102	114	130	143	171	190	216
Approx. Ship Weight (kgs)	7	7	7	16	23	32	64	129	227	354	528	726	1027	1353	1769	2812	3494	5316
Approx. **X** Pilot System	280	280	280	331	356	381	432	737	788	839	915	1016	1016	1093	1194	1728	2007	2159
Approx. **Y** Pilot System	229	229	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1016	1143
Approx. **Z** Pilot System	229	229	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1067	1194

58-01 Valve Selection	100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes																		
	Inches	1	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
	mm	25	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
Main Valve 100-01	Pattern	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G	G	G, A	G	G
	End Detail	T	T	T, F, Gr*	T, F, Gr	T, F, Gr*	T, F, Gr	F, Gr	F, Gr*	F, Gr*	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	55	93	125	210	300	460	800	1800	3100	4900	7000	8400	11000	14000	17000	25000	42000	50000
	Maximum Surge	120	210	280	470	670	1000	1800	4000	7000	11000	16000	19000	25000	31000	39000	56500	63000	85000
Suggested Flow (Liters/Sec)	Maximum	3.5	6	8	13	19	29	50	113	195	309	442	530	694	883	1073	1577	2650	3150
	Maximum Surge	7.6	13	18	30	42	63	113	252	441	693	1008	1197	1577	1956	2461	3560	3975	5360

100-01 Series is the full internal port Hytrol. *Globe Grooved Only

Notes:

- For sizes 18 through 36-inches / 450mm though 900 mm, use 50-66 E-Sheet
- Many factors should be considered in sizing pressure reducing valves including inlet pressure, outlet pressure and flow rates.
- For sizing questions or cavitation analysis, consult Cla-Val with system details.

Pilot System Specifications

CRL-60 Pilot Control

Adjustment Ranges

0 to 75 psi Max.
20 to 105 psi
20 to 200 psi *
100 to 300 psi

***Supplied unless otherwise specified. Other ranges are available, please consult factory.**

Temperature Range

Water: to 180°F (82°C)

Materials

Standard Pilot System Materials

Pilot Control: Low Lead Bronze
Trim: Stainless Steel Type 303
Rubber: Buna-N® Synthetic Rubber
Tubing & Fittings: Copper and Bronze

Optional Pilot System Materials

Pilot Systems are available with optional Aluminum, Stainless Steel or Monel materials.

CS3 Solenoid Control

Electrical Ratings:

Voltage:
24, 48, 120, 240, 480 – 60 Hz. VAC
6, 12, 24, 120, 240 VDC

When Ordering, Specify:

1. Catalog No. 58-01
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Threaded or Flanged
6. Trim Material
7. Energized or De-energized to Open Main Valve
8. Adjustment Range
9. Desired Options
10. Electrical Selection
11. When Vertically Installed

Main Valve Options

EPDM Rubber Parts

Optional diaphragm, disc and o-ring fabricated with EPDM synthetic rubber

Viton® Rubber Parts - suffix KB

Optional diaphragm, disc and o-ring fabricated with Viton® synthetic rubber

Epoxy Coating - suffix KC

NSF/ANSI 61 Fusion Bonded Epoxy

Dura-Kleen® Stem - suffix KD

Fluted design prevents dissolved minerals build-up on the stem

LFS Trim

Designed to regulate precisely and smoothly at typical flow rates as well as lower than the industry standard of 1 fps, without decreasing the valve's capacity

CLA-VAL

1701 Placentia Avenue • Costa Mesa, CA 92627

800-942-6326 • Fax: 949-548-5441 • Web Site: cla-val.com • E-mail: info@cla-val.com

CLA-VAL CANADA
4687 Christie Drive
Beamsville, Ontario
Canada L0R 1B4
Phone: 905-563-4963
E-mail sales@cla-val.ca

CLA-VAL EUROPE
Chemin des Mésanges 1
CH-1032 Romanel/
Lausanne, Switzerland
Phone: 41-21-643-15-55
E-mail: cla-val@cla-val.ch

CLA-VAL UK
Dainton House, Goods Station Road
Tunbridge Wells
Kent TN1 2 DH England
Phone: 44-1892-514-400
E-mail: info@cla-val.co.uk

CLA-VAL FRANCE
Porte du Grand Lyon 1
ZAC du Champ du Périer
France - 01700 Neyron
Phone: 33-4-72-25-92-93
E-mail: cla-val@cla-val.fr

CLA-VAL PACIFIC
45 Kennaway Road
Woolston, Christchurch, 8023
New Zealand
Phone: 64-39644860
www.cla-valpacific.com
E-mail: info@cla-valpacific.com

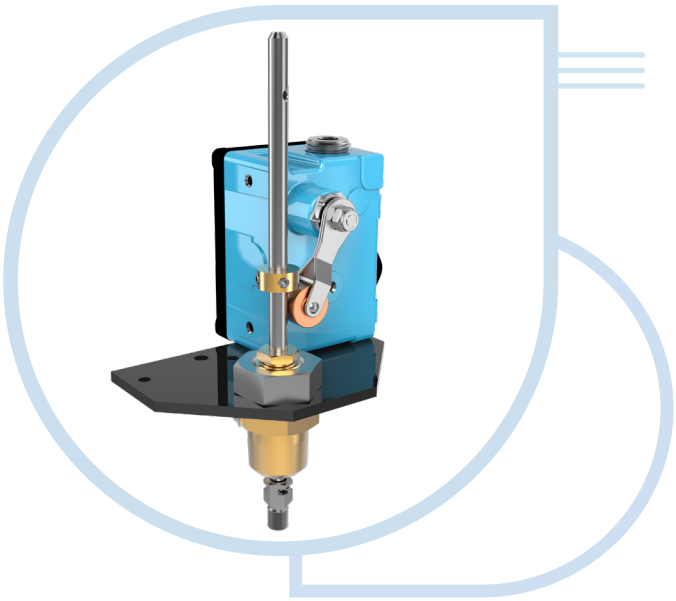
visit www.cla-val-latinamerica.com for Spanish literature

Model X105L

LIMIT SWITCH ASSEMBLY

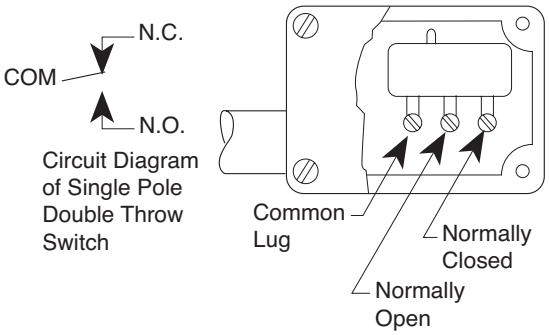
PRODUCT FEATURES

Cla-Val Model X105L Limit Switch Assembly is a rugged, dependable and positive acting switch assembly actuated by the opening or closing of a Cla-Val control valve on which it is mounted. The single pole, double throw micro switch can be connected either to open or to close an electrical circuit when actuated. By loosening the allen screw on the actuating collar and raising or lowering the collar on the stem, the X105L is easily adjusted to signal that the valve has fully reached the desired position (open or closed).

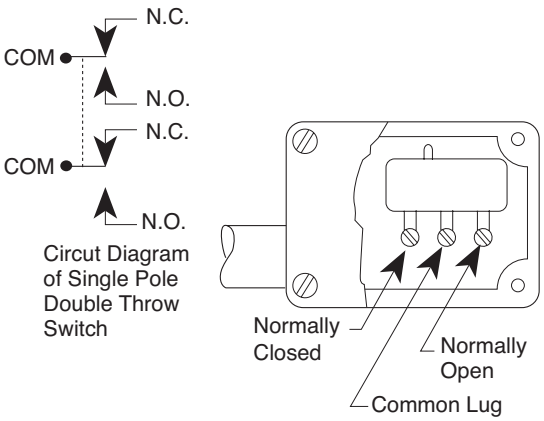


INSTALLATION

Single Pole Double Throw Switch



Double Pole Double Throw Switch



Switches shown in unactivated position.

SPECIFICATIONS

Standard Materials*:	Aluminum switch housing Steel bracket and brass adapter Stainless steel stem
Electrical:	1/2" Conduit connection
Switch Type:	SPDT UL, File No. E12252, CSA Certified, File No. LR57325 Weather proof NEMA 1,3,4, and13
Switch Rating:	UL/CSA rating: L96 15 amp. 125, 250, or 480 volts AC 1/2 amp. 125 volts DC 1/4 amp. 250 volts DC
Switch Options:	DPDT switches available on request UL/CSA Rating: L59, 10 amps Explosion proof micro switches are NEMA 1,7, and 9 UL Listed, File No. E14274 and CSA Certified, File No. LR57324: Class I, Group C and D and Class II, Group E, F and G.

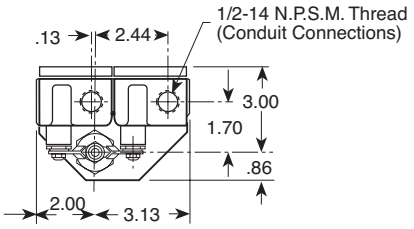
**Optional Materials Available*

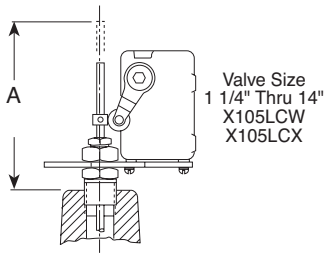
CLA-VAL Company
www.cla-val.com
info@cla-val.com
S-X105L (R-01/2021)

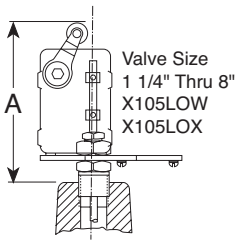
Model X105L

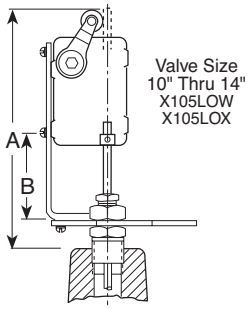
LIMIT SWITCH ASSEMBLY

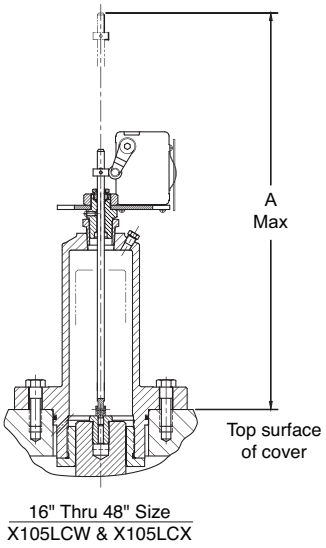
DIMENSIONS

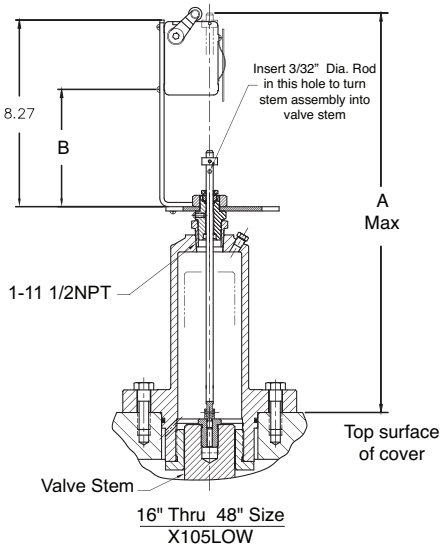












Basic Valve 100-01	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
Dimension “A”	10.19	10.19	7.16	7.16	7.43	7.00	6.69	6.91	9.88	9.59	9.16	10.78	10.78	18.23	19.10	35.07	36.07	36.07	36.07
Dimension “B”							1.69	1.69	2.44	2.94	2.94	2.94	2.94	4.32	5.19	8.40	8.40	8.40	8.40
Basic Valve 100-20					3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
Dimension “A”					7.16	7.34	7.00	6.69	6.91	9.88	9.59	9.59	10.78	10.78	10.78	11.30	35.07	36.07	36.07
Dimension “B”								1.69	1.69	2.44	2.94	2.94	2.94	2.94	2.94	5.19	8.40	8.40	8.40

CATALOG NO.	ACTUATION POSITION	SWITCH ENCLOSURE
X105LCW	Valve Closed	Weather Proof
X105LCX	Valve Closed	Explosion Proof
X105LOW	Valve Open	Weather Proof
X105LOX	Valve Open	Explosion Proof

CLA-VAL Company
www.cla-val.com
info@cla-val.com
S-X105L (R-01/2021)

EXHIBIT A-5

ENGINEER'S OPINION OF PROBABLE TOTAL CONSTRUCTION COST

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/22/23	Dwg. No.:	All
	Estimator:	ADH	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 1 - 500,000 GALLON MULTI-COLUMN TANK				
Site Work, Valves, Piping, Building and Electrical:				
16" DI Site Piping	160	LF	$ 250.00	$ 40,000.00
16" DI Pipe Bored and Jacked in 24" Steel Casing Pipe under KY 16	100	LF	$ 1,000.00	$ 100,000.00
Sidewalk Repair/Replacement and New Sidewalk	1	LSUM	$ 8,000.00	$ 8,000.00
Site Restoration and Grading	800	CY	$ 25.00	$ 20,000.00
Clearing and Grubbing	1	LSUM	$ 6,000.00	$ 6,000.00
Overflow Pipe Rip Rap Drainage Channel	100	TON	$ 40.00	$ 4,000.00
4" PVC Drain Line from Utility Building	100	LF	$ 30.00	$ 3,000.00
Conrete Drive and Parking Area	65	CY	$ 700.00	$ 45,500.00
DGA	100	TON	$ 40.00	$ 4,000.00
Crushed Stone Surface Around Tank	550	TON	$ 40.00	$ 22,000.00
Bollards	4	EA	$ 200.00	$ 800.00
Landscaping	1	LSUM	$ 15,000.00	$ 15,000.00
Steel Security Fence, Swing Gate, Slide Gate and Operator	1	LSUM	$ 125,000.00	$ 125,000.00
12" Solenoid Control Valve (Altitude Valve)	1	EA	$ 25,000.00	$ 25,000.00
Fire Hydrant Assembly	1	EA	$ 6,000.00	$ 6,000.00
16" MJ Gate Valve and Box	3	EA	$ 24,000.00	$ 72,000.00
16" Gate Valve, FLG	2	EA	$ 22,000.00	$ 44,000.00
16" Dismantling Joint	1	EA	$ 5,000.00	$ 5,000.00
16" Transition/Flexible Coupling	2	EA	$ 6,500.00	$ 13,000.00
12" Gate Valve, FLG	2	EA	$ 7,000.00	$ 14,000.00
12" Dismantling Joint	1	EA	$ 4,000.00	$ 4,000.00
16" Flap Valve on Overflow	1	EA	$ 10,000.00	$ 10,000.00
16" Swing Check Valve	1	EA	$ 18,000.00	$ 18,000.00
16" Duckbill Valve	1	EA	$ 10,000.00	$ 10,000.00
16" Outlet Check Valve	2	EA	$ 9,000.00	$ 18,000.00
Paint Interior Piping	1	LSUM	$ 12,000.00	$ 12,000.00
DI Flanged Piping for Utility Building	1	LSUM	$ 20,000.00	$ 20,000.00
DI Fittings (MJ and FLG)	5	TON	$ 15,000.00	$ 75,000.00
Submersible Mixer	1	LSUM	$ 17,000.00	$ 17,000.00
Cellular Equipment Attachments	1	LSUM	$ 65,000.00	$ 65,000.00
Final Restoration	1	LSUM	$ 15,000.00	$ 15,000.00
Sediment and Erosion Control	1	LSUM	$ 8,000.00	$ 8,000.00
Utility Building Concrete Floor & Foundation	50	CY	$ 550.00	$ 27,500.00
Utility Building (see attached breakdown)				$ 156,000.00
Electrical and Instrumentation (see attached breakdown)				$ 230,000.00
			Sub-Total	$ 1,257,800.00
Contingency (10%)				$ 125,780.00
Market Volatility (10%)				$ 125,780.00
			Sub-Total	$ 1,509,360.00
Contractor Overhead & Profit (Prime 15%, Sub 5%)				$ 150,070.00
Sub-Total for Site Work, Valves, Piping, Building and Electrical (Rounded)				**$ 1,660,000.00**

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/22/23	Dwg. No.:	All
	Estimator:	ADH	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 1 - 500,000 GALLON MULTI-COLUMN TANK				
Multi-Column Elevated Tank:				
500,000 Gallon Multi-Column Elevated Tank*	1	LSUM	$ 2,000,000.00	$ 2,000,000.00
Included: Inlet/outlet and overflow piping, painting, shallow foundation system, standard accessories				
Upcharge for Fluoropolymer Exterior Coating System	1	LSUM	$ 50,000.00	$ 50,000.00
Tank Logo	1	LSUM	$ 20,000.00	$ 20,000.00
			Sub-Total	$ 2,070,000.00
Contingency (10%)				$ 207,000.00
			Sub-Total	$ 2,277,000.00
Sub-Total for New Tank, Site Work, Piping, Valves, Building and Electrical (Rounded)				**$ 3,940,000.00**
Mobilization/Demobilization (1%)				$ 40,000.00
Bonding & Insurance (2%)				$ 79,000.00
TOTAL ESTIMATED CONSTRUCTION COSTS FOR BID OPTION NO.1 500,000 GALLON MULTI-COLUMN TANK				**$ 4,060,000.00**

* Budget pricing provided by Caldwell Tanks

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Utility Building	Date:	11/22/23	Dwg. No.:	A, S & H Sheets
	Estimator:	ARN/JRM/CB	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 1 - 500,000 GALLON MULTI-COLUMN TANK				
Utility Building:				
CMU Block	1760	SF	$21	$ 36,960.00
3/4" Roof-Plywood	1840	SF	$5	$ 9,200.00
Roof Trusses	600	SF	$10	$ 6,000.00
2x6 Blocking and Outriggers	330	BF	$8	$ 2,640.00
2x8 Edge Boards	120	BF	$11	$ 1,320.00
Standing Seam Roofing System	870	SF	$14	$ 12,180.00
Gutters and Downspouts	110	In/Ft	$12	$ 1,320.00
Soffit	260	SF	$10	$ 2,600.00
Trim / Flashing	130	In/Ft	$12	$ 1,560.00
HM DBL Door / Frame / Hardware	1	LSUM	$4,500	$ 4,500.00
FE	1	LSUM	$750	$ 750.00
Gypboard Ceiling	410	SF	$8	$ 3,280.00
Attic Access Door	1	LSUM	$2,500	$ 2,500.00
Brick Veneer System	950	SF	$16	$ 15,200.00
Cavity Wall Insulation System	950	SF	$5	$ 4,750.00
Cast Stone Banding	100	In/Ft	$18	$ 1,800.00
Attic Insulation	410	SF	$3	$ 1,230.00
Paint	1750	SF	$3	$ 5,250.00
HVAC	1	LSUM	$22,000	$ 22,000.00
			Sub-Total	$ 135,040.00
Subcontractor Overhead & Profit (15%)				$ 20,260.00
			TOTAL ESTIMATED UTILITY BUILDING	**$ 156,000.00**

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Electrical and Instrumentation	Date:	11/22/23	Dwg. No.:	E & I Sheets
	Estimator:	WER	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 1 - 500,000 GALLON MULTI-COLUMN TANK				
Instrumentation and Electrical - Water Tank Site:				
Ground Test/Report	1	LSUM	$1,000	$ 1,000.00
Grounding @ Tank:				
Ground Rod	4	EACH	$250	$ 1,000.00
#2 AWG Bare	225	LF	$2	$ 450.00
Exothermic Weld	12	EACH	$300	$ 3,600.00
Grounding @ Utility Building:				
Ground Rod	5	EACH	$250	$ 1,250.00
Ground Test Well	1	EACH	$750	$ 750.00
#2 AWG Bare	150	LF	$2	$ 300.00
Exothermic Weld	6	EACH	$300	$ 1,800.00
Service Entrance:				
2" Conduit (Schedule 80 PVC)	330	LF	$14	$ 4,702.50
2" Conduit (Aluminum) @ Pole	30	LF	$24	$ 720.00
Long Sweep 90 Elbow	2	EACH	$150	$ 300.00
#3/0 AWG	1080	LF	$9	$ 9,450.00
Terminations	8	EACH	$34	$ 268.00
Horizontal Directional Drilling	105	LF	$12	$ 1,260.00
Trenching/Backfill	230	LF	$16	$ 3,680.00
Pullbox (Electrical or Comm)	2	EACH	$1,000	$ 2,000.00
Horizontal Directional Drilling - Telecommunications	105	LF	$12	$ 1,260.00
2" Conduit (Schedule 80 PVC) - Telecommunications	330	LF	$14	$ 4,702.50
2" Conduit (Aluminum) - Telecommunications @ Pole	30	LF	$24	$ 720.00
Telecommunications Backboard/Ground Bar	1	LSUM	$500	$ 500.00
NEMA 1, 150A, 120/240V, 1-Phase, 3-Wire Panelboard	1	EACH	$5,975	$ 5,975.00
Surge Protection Device	1	EACH	$750	$ 750.00
Meter Base	1	EACH	$300	$ 300.00
Electrical Equipment Rack - Meter	1	LSUM	$600	$ 600.00
RTU Cabinet w/PLC, Ethernet Switch, Cellular Modem	1	LSUM	$25,000	$ 25,000.00
SCADA Programming (Removed from Project)	1	LSUM	$0	$ -
Treated Wood Backboard for Instrumentation	1	LSUM	$500	$ 500.00
Pressure Transmitter	1	EACH	$2,500	$ 2,500.00
Pressure Gauge	1	EACH	$450	$ 450.00
Radar Transmitter w/signal suppressor + Install Top of Tank	1	EACH	$4,000	$ 4,000.00
1"C (Aluminum) - 4-20mAdc - Radar to PLC	185	LF	$25	$ 4,625.00
1"C (Schedule 40 PVC) - 4-20mAdc - Radar to PLC	50	LF	$10	$ 475.00
#16 STP (4-20mAdc Signal)	235	LF	$2	$ 411.25
Yagi Directional Antenna - 900 MHz & Mounting Hardware	1	EACH	$1,500	$ 1,500.00
Coaxial Cable	250	LF	$8	$ 2,000.00

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Electrical and Instrumentation	Date:	11/22/23	Dwg. No.:	E & I Sheets
	Estimator:	WER	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 1 - 500,000 GALLON MULTI-COLUMN TANK				
Hach CL17sc	1	LSUM	$6,500	$ 6,500.00
Hach TU5 Turbidimeter	1	LSUM	$8,000	$ 8,000.00
Hach pH Analyzer/Controller	1	LSUM	$2,000	$ 2,000.00
Verkada Cameras - Tank Site				
CD42-512E-HW Outdoor Dome Camera	1	EACH	$1,599	$ 1,599.00
CD62-30E-HW Outdoor Dome Camera	2	EACH	$1,699	$ 3,398.00
Pole Mount Adapter, ACC-MNT-9	2	EACH	$209	$ 418.00
Arm Mount Adaptor, ACC-MNT-2	3	EACH	$89	$ 267.00
Video Security Cloud Licensing (3-Year), per camera	3	EACH	$549	$ 1,647.00
Viewing Station Licensing (3-Year), assume use existing	0	EACH	$1,299	$ -
Alarm Licensing (3-Year), per site	1	EACH	$3,999	$ 3,999.00
Camera Pole w/Base	1	EACH	$1,500	$ 1,500.00
Verkada Access Controller (AC41)	1	LSUM	$1,799	$ 1,799.00
Alarm Licensing (3-Year), per site	1	EACH	$3,999	$ 3,999.00
Card Reader	1	EACH	$349	$ 349.00
Battery Backup	1	EACH	$129	$ 129.00
License (3-Year), per door	2	EACH	$599	$ 1,198.00
Lock (Schlage)	1	EACH	$299	$ 299.00
Access Control/Wiring @ Utility Building Entry	1	LSUM	$1,500	$ 1,500.00
3/4"C (Aluminum) - Intrusion - Hatch @ Top of Tank	185	LF	$20	$ 3,700.00
3/4"C (Schedule 80 PVC) - Intrusion - Hatch	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND - Intrusion - Hatch	705	LF	$1	$ 705.00
2#12 AWG + 1#12 GND - Intrusion - Platform	650	LF	$1	$ 650.00
3/4"C (Aluminum) - Intrusion - Tank Access Ladder	20	LF	$13	$ 265.00
3/4"C (Schedule 80 PVC) - Intrusion - Tank Ladder	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND	210	LF	$1	$ 210.00
3/4"C (Aluminum) - Intrusion - Overflow	20	LF	$13	$ 265.00
3/4"C (Schedule 80 PVC) - Intrusion - Overflow	50	LF	$8	$ 387.50
2#12 AWG + 1#12 GND	210	LF	$1	$ 210.00
Sump Level Switch	1	EACH	$1,000	$ 1,000.00
Intrusion Switches	4	EACH	$150	$ 600.00
Receptacle - Weatherproof/Ground Fault Type - Tank	2	EACH	$125	$ 250.00
Receptacle - Weatherproof/Ground Fault Type - Utility Bldg.	6	EACH	$125	$ 750.00
Receptacles - Utility Building	3	EACH	$90	$ 270.00
Toggle Switch - Utility Building	1	EACH	$50	$ 50.00
Photocell - Exterior, Building Mounted	1	EACH	$150	$ 150.00
Pole-Mounted LED/Pole Base/Wiring	3	EACH	$2,500	$ 7,500.00
LED Lighting - Utility Building	6	EACH	$450	$ 2,700.00
LED Lighting w/Battery - Utility Building	3	EACH	$650	$ 1,950.00

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Electrical and Instrumentation	Date:	11/22/23	Dwg. No.:	E & I Sheets
	Estimator:	WER	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 1 - 500,000 GALLON MULTI-COLUMN TANK				
Exterior Lighting	1	EACH	$125	$ 125.00
Battery Backup	1	EACH	$360	$ 360.00
3/4"C (Aluminum) - Mixer	185	LF	$20	$ 3,700.00
3/4"C (Schedule 80 PVC) - Mixer	50	LF	$8	$ 387.50
2#6 AWG + 1#6 GND	705	LF	$2	$ 1,628.55
3/4"C (Aluminum) - Gate Controller Power	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Gate Controller Power	100	LF	$8	$ 775.00
2#6 AWG + 1#6 GND	300	LF	$2	$ 693.00
3/4"C (Aluminum) - Gate Controller Keypad	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Gate Controller Keypad	75	LF	$8	$ 581.25
#18 STP	80	LF	$2	$ 140.00
3/4"C (Aluminum) - Gate Controller Keypad Power	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Gate Controller Keypad Power	75	LF	$8	$ 581.25
2#12 AWG + 1#12 GND	160	LF	$1	$ 160.00
3/4"C (Aluminum) - Gate Position Monitoring	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Intrusion - Gate Position Monitoring	75	LF	$8	$ 581.25
2#12 AWG + 1#12 GND	240	LF	$1	$ 240.00
3/4"C (Aluminum) - Site Lighting	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Site Lighting	300	LF	$8	$ 2,325.00
2#10 AWG + 1#10 GND	900	LF	$1	$ 900.00
1"C (Aluminum) - Camera	20	LF	$16	$ 325.00
1"C (Schedule 80 PVC) - Camera	100	LF	$10	$ 950.00
CAT6	240	LF	$2	$ 420.00
3/4"C (Aluminum) - Receptacle @ Tank Platform	185	LF	$20	$ 3,700.00
3/4"C (Schedule 80 PVC) - Receptacle	50	LF	$8	$ 387.50
2#6 AWG + 1#6 GND - Receptacle	705	LF	$2	$ 1,628.55
3/4"C (Aluminum) - Receptacle @ Tank Base (Leg)	10	LF	$13	$ 132.50
3/4"C (Schedule 80 PVC) - Receptacle	50	LF	$8	$ 387.50
2#6 AWG + 1#6 GND - Receptacle	705	LF	$2	$ 1,628.55
Miscellaneous Small Power/Wiring within Utility Building	1	LSUM	$4,000	$ 4,000.00
Bollards @ Gate Keypad	2	EACH	$600	$ 1,200.00
Vehicle Loop Detector Installation	1	LSUM	$1,500	$ 1,500.00
Site Trenching/Backfill	400	LF	$16	$ 6,400.00
Lightning Protection + Master Label (Install @ Top of Tank)	1	LSUM	$7,500	$ 7,500.00
Temporary Power	1	LSUM	$3,500	$ 3,500.00
Inspection	1	LSUM	$2,500	$ 2,500.00
				$ -
			Sub-Total	$ 199,456.40
Subcontractor Overhead & Profit (15%)				$ 29,920.00
TOTAL ESTIMATED ELECTRICAL AND INSTRUMENTATION				**$ 230,000.00**

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/22/23	Dwg. No.:	All
	Estimator:	ADH	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 2 - 500,000 GALLON PEDESPHERE TANK				
Site Work, Valves, Piping and Electrical:				
16" DI Site Piping	100	LF	$ 250.00	$ 25,000.00
16" DI Pipe Bored and Jacked in 24" Steel Casing Pipe under KY 16	100	LF	$ 1,000.00	$ 100,000.00
HVAC in Base Cone	1	LSUM	$ 30,000.00	$ 30,000.00
Sidewalk Repair/Replacement and New Sidewalk	1	LSUM	$ 8,000.00	$ 8,000.00
Site Restoration and Grading	800	CY	$ 25.00	$ 20,000.00
Clearing and Grubbing	1	LSUM	$ 6,000.00	$ 6,000.00
Overflow Pipe Rip Rap Drainage Channel	60	TON	$ 40.00	$ 2,400.00
4" PVC Drain Line from Utility Building	100	LF	$ 30.00	$ 3,000.00
Conrete Drive and Parking Area	65	CY	$ 700.00	$ 45,500.00
DGA	100	TON	$ 40.00	$ 4,000.00
Crushed Stone Surface Around Tank	550	TON	$ 40.00	$ 22,000.00
Bollards	4	EA	$ 200.00	$ 800.00
Landscaping	1	LSUM	$ 15,000.00	$ 15,000.00
Steel Security Fence, Swing Gate, Slide Gate and Operator	1	LSUM	$ 125,000.00	$ 125,000.00
12" Solenoid Control Valve (Altitude Valve)	1	EA	$ 25,000.00	$ 25,000.00
Fire Hydrant Assembly	1	EA	$ 6,000.00	$ 6,000.00
16" MJ Gate Valve and Box	3	EA	$ 24,000.00	$ 72,000.00
16" Gate Valve, FLG	2	EA	$ 22,000.00	$ 44,000.00
16" Dismantling Joint	1	EA	$ 5,000.00	$ 5,000.00
16" Transition/Flexible Coupling	2	EA	$ 6,500.00	$ 13,000.00
12" Gate Valve, FLG	2	EA	$ 7,000.00	$ 14,000.00
12" Dismantling Joint	1	EA	$ 4,000.00	$ 4,000.00
8" Gate Valve, FLG	1	EA	$ 5,000.00	$ 5,000.00
16" Flap Valve on Overflow	1	EA	$ 10,000.00	$ 10,000.00
16" Swing Check Valve	1	EA	$ 18,000.00	$ 18,000.00
16" Duckbill Valve	1	EA	$ 10,000.00	$ 10,000.00
16" Outlet Check Valve	2	EA	$ 9,000.00	$ 18,000.00
Paint Interior Piping	1	LSUM	$ 12,000.00	$ 12,000.00
DI Flanged Piping for Base Cone	1	LSUM	$ 23,000.00	$ 23,000.00
DI Fittings (MJ and FLG)	5	TON	$ 15,000.00	$ 75,000.00
Submersible Mixer	1	LSUM	$ 17,000.00	$ 17,000.00
Cellular Equipment Attachments	1	LSUM	$ 65,000.00	$ 65,000.00
Final Restoration	1	LSUM	$ 15,000.00	$ 15,000.00
Sediment and Erosion Control	1	LSUM	$ 8,000.00	$ 8,000.00
Electrical and Instrumentation (see attached breakdown)				$ 228,000.00
			Sub-Total	$ 1,093,700.00
Contingency (10%)				$ 109,370.00
Market Volatility (10%)				$ 109,370.00
			Sub-Total	$ 1,312,440.00
Contractor Overhead & Profit (Prime 15%, Sub 5%)				$ 141,260.00
Sub-Total for Site Work, Valves, Piping and Electrical (Rounded)				**$ 1,460,000.00**

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost	Date:	11/22/23	Dwg. No.:	All
	Estimator:	ADH	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 2 - 500,000 GALLON PEDESPHERE TANK				
Pedesphere Elevated Tank:				
500,000 Pedesphere Elevated Tank*	1	LSUM	$ 2,400,000.00	$ 2,400,000.00
Included: Inlet/outlet and overflow piping, painting, shallow foundation system, standard accessories				
Upcharge for Fluoropolymer Exterior Coating System	1	LSUM	$ 50,000.00	$ 50,000.00
Tank Logo	1	LSUM	$ 20,000.00	$ 20,000.00
Base Cone Insulation and Drop Ceiling	1	LSUM	$ 60,000.00	$ 60,000.00
			Sub-Total	$ 2,530,000.00
Contingency (10%)				$ 253,000.00
			Sub-Total	$ 2,783,000.00
Sub-Total for New Tank, Site Work, Piping, Valves and Electrical (Rounded)				**$ 4,250,000.00**
Mobilization/Demobilization (1%)				$ 43,000.00
Bonding & Insurance (2%)				$ 85,000.00
TOTAL ESTIMATED CONSTRUCTION COSTS FOR ALTERNATE BID 500,000 GALLON PEDESPHERE TANK				**$ 4,380,000.00**

* Preliminary budget pricing provided by Caldwell Tanks

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Electrical and Instrumentation	Date:	11/22/23	Dwg. No.:	E & I Sheets
	Estimator:	WER	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 2 - 500,000 GALLON PEDESPHERE TANK				
Instrumentation and Electrical - Water Tank Site:				
Ground Test/Report	1	LSUM	$1,000	$ 1,000.00
Grounding @ Tank:				
Ground Rod	4	EACH	$250	$ 1,000.00
#2 AWG Bare	225	LF	$2	$ 450.00
Exothermic Weld	12	EACH	$300	$ 3,600.00
Service Entrance:				
2" Conduit (Schedule 80 PVC)	330	LF	$14	$ 4,702.50
2" Conduit (Aluminum)	30	LF	$24	$ 720.00
Long Sweep 90 Elbow	2	EACH	$150	$ 300.00
#3/0 AWG	1080	LF	$9	$ 9,450.00
Terminations	8	EACH	$34	$ 268.00
Horizontal Directional Drilling	105	LF	$12	$ 1,260.00
Trenching/Backfill	230	LF	$16	$ 3,680.00
Pullbox (Electrical or Comm)	2	EACH	$1,000	$ 2,000.00
Horizontal Directional Drilling - Telecommunications	105	LF	$12	$ 1,260.00
2" Conduit (Schedule 80 PVC) - Telecommunications	330	LF	$14	$ 4,702.50
2" Conduit (Aluminum) - Telecommunications @ Pole	30	LF	$24	$ 720.00
Telecommunications Backboard/Ground Bar	1	LSUM	$500	$ 500.00
NEMA 1, 150A, 120/240V, 1-Phase, 3-Wire Panelboard	1	EACH	$5,975	$ 5,975.00
Surge Protection Device	1	EACH	$750	$ 750.00
Meter Base	1	EACH	$300	$ 300.00
Electrical Equipment Rack - Meter	1	LSUM	$600	$ 600.00
Electrical Equipment Racks - Base Cone	1	LSUM	$3,500	$ 3,500.00
RTU Cabinet w/PLC, Ethernet Switch, Cellular Modem	1	LSUM	$25,000	$ 25,000.00
SCADA Programming (Removed from Project)	1	LSUM	$0	$ -
Treated Wood Backboard for Instrumentation	1	LSUM	$500	$ 500.00
Pressure Transmitter	1	EACH	$2,500	$ 2,500.00
Pressure Gauge	1	EACH	$450	$ 450.00
Radar Transmitter w/signal suppressor + Intall Top of Tank	1	EACH	$4,000	$ 4,000.00
1"C (Aluminum) - 4-20mAdc - Radar to PLC	200	LF	$25	$ 5,000.00
#16 STP (4-20mAdc Signal)	225	LF	$2	$ 393.75
Yagi Directional Antenna - 900 MHz & Mounting Hardware	1	EACH	$1,500	$ 1,500.00
Coaxial Cable	225	LF	$8	$ 1,800.00
Hach CL17sc	1	LSUM	$6,500	$ 6,500.00
Hach TU5 Turbidimeter	1	LSUM	$8,000	$ 8,000.00
Hach pH Analyzer/Controller	1	LSUM	$2,000	$ 2,000.00
Verkada Cameras - Tank Site				
CD62-30E-HW Outdoor Dome Camera	2	EACH	$1,699	$ 3,398.00
Pole Mount Adapter, ACC-MNT-9	2	EACH	$209	$ 418.00
Arm Mount Adaptor, ACC-MNT-2	2	EACH	$89	$ 178.00
Video Security Cloud Licensing (3-Year), per camera	2	EACH	$549	$ 1,098.00
Viewing Station Licensing (3-Year), assume use existing	0	EACH	$1,299	$ -
Alarm Licensing (3-Year), per site	1	EACH	$3,999	$ 3,999.00
Camera Pole w/Base	1	EACH	$1,500	$ 1,500.00

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Electrical and Instrumentation	Date:	11/22/23	Dwg. No.:	E & I Sheets
	Estimator:	WER	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 2 - 500,000 GALLON PEDESPHERE TANK				
Verkada Access Controller (AC41)	1	LSUM	$1,799	$ 1,799.00
Alarm Licensing (3-Year), per site	1	EACH	$3,999	$ 3,999.00
Card Reader	1	EACH	$349	$ 349.00
Battery Backup	1	EACH	$129	$ 129.00
License (3-Year), per door	2	EACH	$599	$ 1,198.00
Lock (Schlage)	1	EACH	$299	$ 299.00
Access Control/Wiring @ Tank Entry	1	LSUM	$1,500	$ 1,500.00
3/4"C (Aluminum) - Intrusion - Hatches @ Top of Tank	185	LF	$20	$ 3,700.00
2#12 AWG + 1#12 GND - Intrusion - Hatch	925	LF	$1	$ 925.00
3/4"C (Aluminum) - Intrusion - Overflow	20	LF	$13	$ 265.00
3/4"C (Schedule 80 PVC) - Intrusion - Overflow	20	LF	$8	$ 155.00
2#12 AWG + 1#12 GND	120	LF	$1	$ 120.00
Sump Level Switch	1	EACH	$1,000	$ 1,000.00
Intrusion Switches	3	EACH	$150	$ 450.00
Receptacle - Weatherproof/Ground Fault Type - Base Cone	4	EACH	$125	$ 500.00
Receptacle - Weatherproof/Ground Fault Type - Exterior	1	EACH	$125	$ 125.00
Toggle Switch	1	EACH	$50	$ 50.00
Photocell - Exterior	1	EACH	$150	$ 150.00
Pole-Mounted LED/Pole Base/Wiring	3	EACH	$2,500	$ 7,500.00
LED Lighting - Base Cone	6	EACH	$450	$ 2,700.00
LED Lighting w/Battery - Base Cone	3	EACH	$650	$ 1,950.00
LED Lighting - Access Tube	16	EACH	$150	$ 2,400.00
Lighting Inverter	1	EACH	$1,250	$ 1,250.00
Exterior Lighting	1	EACH	$125	$ 125.00
Battery Backup	1	EACH	$360	$ 360.00
3/4"C (Aluminum) - Mixer	185	LF	$20	$ 3,700.00
2#6 AWG + 1#6 GND	705	LF	$2	$ 1,628.55
3/4"C (Aluminum) - Gate Controller Power	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Gate Controller Power	100	LF	$8	$ 775.00
2#6 AWG + 1#6 GND	300	LF	$2	$ 693.00
3/4"C (Aluminum) - Gate Controller Keypad	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Gate Controller Keypad	75	LF	$8	$ 581.25
#18 STP	80	LF	$2	$ 140.00
3/4"C (Aluminum) - Gate Controller Keypad Power	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Gate Controller Keypad Power	75	LF	$8	$ 581.25
2#12 AWG + 1#12 GND	160	LF	$1	$ 160.00
3/4"C (Aluminum) - Gate Position Monitoring	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Intrusion - Gate Position Monitoring	75	LF	$8	$ 581.25
2#12 AWG + 1#12 GND	240	LF	$1	$ 240.00
3/4"C (Aluminum) - Site Lighting	5	LF	$13	$ 66.25
3/4"C (Schedule 80 PVC) - Site Lighting	300	LF	$8	$ 2,325.00
2#10 AWG + 1#10 GND	900	LF	$1	$ 900.00
1"C (Aluminum) - Camera	20	LF	$16	$ 325.00
1"C (Schedule 80 PVC) - Camera	100	LF	$10	$ 950.00
CAT6	240	LF	$2	$ 420.00
3/4"C (Aluminum) - Receptacle @ Top of Tank	185	LF	$20	$ 3,700.00
2#6 AWG + 1#6 GND - Receptacle	705	LF	$3	$ 1,762.50

GRW Engineers, Inc.	Project:	Taylor Mill Tank		
	Owner:	Northern Kentucky Water District		
	Project No.:	5059		
Opinion of Probable Cost Electrical and Instrumentation	Date:	11/22/23	Dwg. No.:	E & I Sheets
	Estimator:	WER	Type:	100% Design

Item Description	No. of Units	Units of Measure	Unit Cost	Total Cost
BID OPTION NO. 2 - 500,000 GALLON PEDESPHERE TANK				
3/4"C (Aluminum) - Receptacle @ OU-1	10	LF	$13	$ 132.50
3/4"C (Schedule 80 PVC) - Receptacle @ OU-1	25	LF	$8	$ 193.75
2#12 AWG + 1#12 GND	705	LF	$1	$ 705.00
3/4"C (Aluminum) - OU-1 Power	10	LF	$13	$ 132.50
3/4"C (Schedule 80 PVC) - OU-1 Power	50	LF	$8	$ 387.50
2#8 AWG + 1#10 GND	180	LF	$2	$ 306.00
Miscellaneous Small Power/Wiring within Base Cone	1	LSUM	$4,000	$ 4,000.00
NEMA 4X, 60A Disconnect Switch	1	EACH	$1,550	$ 1,550.00
Bollards @ Gate Keypad	2	EACH	$600	$ 1,200.00
Vehicle Loop Detector Installation	1	LSUM	$1,500	$ 1,500.00
Site Trenching/Backfill	400	LF	$16	$ 6,400.00
Lightning Protection + Master Label (Install @ Top of Tank)	1	LSUM	$7,500	$ 7,500.00
Temporary Power	1	LSUM	$3,500	$ 3,500.00
Inspection	1	LSUM	$2,500	$ 2,500.00
				$ -
			Sub-Total	$ 197,772.05
Subcontractor Overhead & Profit (15%)				$ 29,670.00
			TOTAL ESTIMATED ELECTRICAL AND INSTRUMENTATION	**$ 228,000.00**

EXHIBIT A-6

SPECIFICATIONS AND PLANS PREPARED AND DIGITALLY SIGNED BY A P.E.

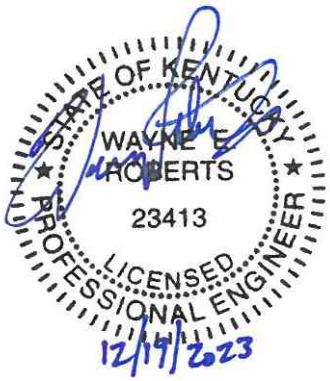
SPECIFICATIONS

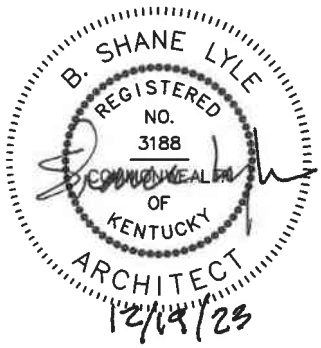
NORTHERN KENTUCKY WATER DISTRICT

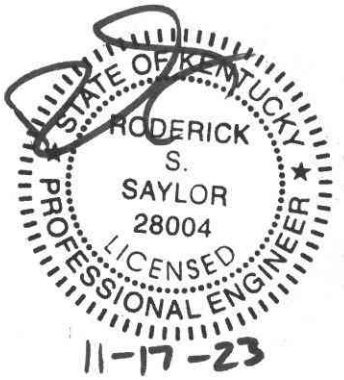
New Taylor Mill Tank
City of Taylor Mill
Kenton County, Kentucky

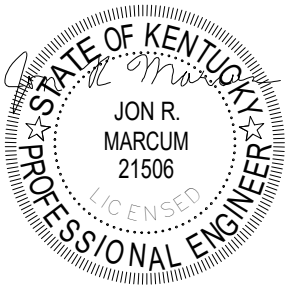
December 2023

COMPILED BY:
Northern Kentucky Water District (Owner)
2835 Crescent Springs Road
Erlanger, Kentucky 41018









12/21/23

TABLE OF CONTENTS

Bidding and Contract Requirements

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

Technical Specifications

DIVISION 01 – GENERAL REQUIREMENTS

DIVISION 01 – GENERAL REQUIREMENTS (CONTINUED)

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 – CONCRETE

DIVISION 05 – METALS

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

DIVISION 09 – FINISHES

DIVISION 23 – HVAC

DIVISION 26 – ELECTRICAL

DIVISION 26 – ELECTRICAL (CONTINUED)

DIVISION 31 – EARTHWORK

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILTIES

DIVISION 40 – PROCESS INTEGRATION

****

S P E C I F I C A T I O N S

FOR

NORTHERN KENTUCKY WATER DISTRICT

New Taylor Mill Tank
City of Taylor Mill
Kenton County, Kentucky

December 2023

GOVERNING BODY

COMMISSIONERS:

JOSEPH J. KOESTER – CHAIR
FRED MACKE, JR – VICE CHAIR
JODY R. LANGE, CPA, CGMA - SECRETARY
DOUG WAGNER - TREASURER
GARY HOLLAND - COMMISSIONER
NICHOLAS WINNIKE – COMMISSIONER

LINDSEY RECHTIN, PRESIDENT/CEO

COMPILED BY:
Northern Kentucky Water District (Owner)
2835 Crescent Springs Road
Erlanger, Kentucky 41018

TABLE OF CONTENTS

Section 00020

INVITATION TO BID

Date: December 21, 2023

The Northern Kentucky Water District (Owner) is requesting Bids for the construction of the following Project:

PROJECT: New Taylor Mill Tank
City of Taylor Mill, Kenton County, Kentucky

BID SUBMISSION: SEALED BIDS WILL BE RECEIVED BY THE NORTHERN KENTUCKY WATER DISTRICT (OWNER) ONLY THROUGH THE ONLINE QUEST CDN WEBSITE (www.questcdn.com)

UNTIL: Date: February 1, 2024
Time: 2:00 PM (Local Time)

At said place and time, and promptly thereafter, all Bids that have been duly received will be opened. Entities on the registered list of plan holders will be sent a link to attend the virtual bid opening. The public may access the virtual bid opening by emailing Cassandra Zoda at czoda@nkywater.org to get the meeting number and password.

BRIEF PROJECT DESCRIPTION: The proposed Work is generally described as follows: Construction of a new 500,000 gallon elevated water tank, associated site piping, instrumentation, and electrical work at 5421 Pride Parkway in the City of Taylor Mill, Kenton County, Kentucky.

PROJECT DOCUMENTS: To view the bid documents, go to Northern Kentucky Water District (nkywater.org/procurement) in the section labeled “Current Procurement Items” at the top of the page and click the link to be click the link titled “Quest CDN Online Interface” redirected to the Quest CDN Electronic Bid Online Interface.

This bid is listed as Quest eBid Doc **# [8775675]**

The project documents may be downloaded by registering with Quest CDN online at www.questcdn.com or by calling 952-233-1632. After registration is complete, an On-Line Bid ID code must be created by clicking on “My Account”, then the “User Info” tab. A prospective bidder will create this code in the designated field per requirements noted. To be considered a Plan-holder, a bidder must complete registration and download the Proposal Documents in digital form for a $22.00 charge. There will be a charge of $42.00 to submit a bid. Plan-holders will receive addenda and other proposal document updates via Quest CDN. Prospective bidders must be on the plan holders list through Quest CDN for a bid to be accepted.

BIDDER QUALIFICATIONS & AWARD: All Bids must be in accordance with the Bidding and Contract Documents. Bids will be received on a unit price and/or lump sum basis as described in the Contract Documents.

Bid security, in the form of an electronic Bid Bond (insuring/bonding company shall be rated “A” by AM Best) in the amount of ten percent (10%) of the maximum total bid price, must accompany each Bid.

The Successful Bidder will be required to furnish a Construction Payment Bond and a Construction Performance Bond (insuring/bonding company shall be rated “A” by AM Best) as security for the faithful performance of the contract and the payment of all bills and obligations arising from the performance of the Contract.

Evaluation of Bids and the awarding of a final contract are subject to the reciprocal preference for Kentucky resident bidders pursuant to KRS 45A490 to 45A.494 and (KAR 200 5:400).

Owner reserves the right to reject any or all Bids, including without limitation the right to reject any or all nonconforming, non-responsive, incomplete, unbalanced, or conditional Bids, to waive informalities, and to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of Owner to make an award to that Bidder. Owner also reserves the right to negotiate with the apparent successful Bidder(s) to such an extent as may be determined by Owner.

Minority Bidders are encouraged to bid.

Bids shall remain subject to acceptance for 90 days after the day of bid opening or for such longer period of time to which a Bidder may agree in writing upon request of the Owner. If a Contract is to be awarded, the Owner will give the successful Bidder a Notice of Award during the period of time during which the successful Bidder’s bid remains subject to acceptance.

PRE-BID CONFERENCE: A pre-bid conference for the Project will be held on Tuesday, January 9, 2024 at 10:00am at Northern Kentucky Water District Central Facility, located at 2835 Crescent Springs Road, Erlanger, KY 41018. Following the meeting at the Central Facility, will be a site visit at 5421 Pride Parkway, Taylor Mill, KY 41015. Attendance at the pre-bid conference is encouraged but not required.

SALES TAX EXEMPTION: The Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by the Successful Bidder which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. The Successful Bidder agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases for the Work.

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

End of Section

KRS 424.145 NOTICE OF ADVERTISEMENT

Northern Kentucky Water District Invitation to Bid – New Taylor Mill Tank –Construction of a new 500,000 gallon elevated water tank, associated site piping, instrumentation, and electrical work at 5421 Pride Parkway in the City of Taylor Mill, Kenton County, Kentucky.

Access to the Invitation to Bid can be found on the Northern Kentucky Water District website (https://nkywater.org/procurement) by clicking the section labeled “Quest CDN Online Interface” or at https://tinyurl.com/NKWDbids.

Alternatively potential bidders may contact Cassandra Zoda at czoda@nkywater.org, 859-578-5455, or by visiting 2835 Crescent Springs Rd., Erlanger, KY 41018 for delivery of the Invitation to Bid.

Section 00100

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS. Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

   a. *Bidder* - The individual or entity who submits a Bid directly to Owner.

   b. *Successful Bidder* - The Bidder submitting a responsive Bid to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award.

2. COPIES OF CONTRACT DOCUMENTS. Complete sets of Contract Documents must be used in preparing Bids; Bidder shall have sole responsibility for errors or misrepresentations resulting from the use of incomplete sets of Bidding Documents.

Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

Contract Documents are available electronically via QuestCDN. In accord with NKWD Open Record Policy, planholders may request larger plan drawings in paper form by submitting an open records request form.

3. QUALIFICATIONS OF BIDDERS. Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders to perform the services in accordance with the Contract Documents. To demonstrate Bidder's qualifications to perform the Work, within five days of Owner's request Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be requested by Owner. Bidders who have not, in the Owner's opinion, had sufficient experience in the size and type of work involved may not be considered.

Each Bid must contain evidence of Bidder's qualifications to transact business in the State of Kentucky or covenant to obtain such qualifications prior to award of the Contract. The Bidder's Organization Number from the Kentucky's Secretary of State and principal place of business as filed with Kentucky's Secretary of State must be included where applicable.

Each Bidder must be registered as a plan holder with Owner via QuestCDN. There shall be no substitution of bidders without proper registration with the Owner.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE. It is the responsibility of each Bidder, before submitting a Bid, to:

   a. thoroughly examine and study the Instructions to Bidders and the Contract Documents, including any Addenda;

b. visit the Site and become familiar with and satisfy Bidder as to the general, local, and site conditions that may affect cost, progress, performance, or furnishing of the Work;

c. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, or furnishing of the Work;

d. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Contract Documents;

e. correlate the information known to Bidder, information and observations obtained from visits to the Site, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents;

f. promptly give Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Contract Documents and confirm that the written resolution thereof by Owner is acceptable to Bidder; and

g. determine that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.01. Underground Facilities. Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner or others, and Owner and Engineer disclaim responsibility for the accuracy or completeness thereof, unless it is expressly provided otherwise in the Supplementary Conditions.

4.02. Additional Information. Before submitting a Bid, each Bidder may, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to subsurface or physical conditions at or contiguous to the Site or otherwise, which may affect cost, progress, performance, or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents. Each Bidder shall be responsible for any claims for personal injury, death or damage to property caused by Bidder's entry on public or private property and shall defend and indemnify Owner and all other parties against any such claims.

4.03. Bidder's Representation. The submission of a Bid will constitute an incontrovertible representation and covenant by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Contract Documents, that Bidder has given Owner written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Contract Documents and the written resolutions thereof are acceptable to Bidder, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

5. SITE AND OTHER AREAS. The Site is identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Contract Documents.

6. INTERPRETATIONS AND ADDENDA. All questions about the meaning or intent of the Bidding Documents are to be submitted to Owner in writing. Any interpretations or clarifications that are considered necessary by Owner in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Owner as having received the Bidding Documents. Questions received less than 72 hours prior to the date for opening of Bids may not be answered. The person submitting questions shall be responsible for their prompt delivery. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

Owner will not be responsible for explanations or interpretations of the Bidding Documents or Contract Documents except as issued in accordance herewith.

7. BID SECURITY. Each Bid must be accompanied by Bid security made payable to Owner in an amount of 10 percent of Bidder's maximum Bid price and in the form of a Bid Bond (on the form attached) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions and shall be rated “A” by AM BEST.

Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may annul the Notice of Award and Bid security of that Bidder will be forfeited. Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or one day after the last day the Bids remain subject to acceptance, whereupon Bid security furnished by such Bidders will be returned.

8. CONTRACT TIMES. The numbers of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

9. LIQUIDATED DAMAGES. Provisions for liquidated damages, if any, are set forth in the Agreement.

10. SUBSTITUTE OR "OR-EQUAL" ITEMS. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be

furnished or used by Contractor if acceptable to Owner, application for such acceptance will not be considered by Owner until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Owner is set forth in the General Conditions and may be supplemented in the General Requirements.

11. SUBMITTING AN ONLINE BID. Proceed to the QuestCDN website at www.questcdn.com. You will be asked to sign into your account or create a free QUESTCDN account by clicking the 'join' link. Contact QUESTCDN at 952-233-1632 or info@questcdn.com for assistance in membership registration, downloading the project and vbid online bid submittal.

The QUESTCDN eBid Doc number for this project is: **#[8775675]**

To access the bid form, click the online bidding button at the top of bid advertisement. The on-line bid button will be available when the project is published and open for bidding. There is a fee of $42.00 to submit your bid.

12. PREPARATION OF BID. In addition to the Bid Worksheet in QuestCDN, a Bid Disclosure Form is included with the Bidding Documents. The Bid Disclosure Form must be submitted via QuestCDN.

All blanks on the Bid Disclosure Form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each lump sum bid item and/or unit price item listed therein, or the words "No Bid", "No Change", or "Not Applicable" entered.

A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

A Bid by a limited liability company shall be executed in the name of the firm by a member (if member-managed) or manager (if manager-managed) and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

A Bid by an individual shall show the Bidder's name and official address.

A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Disclosure Form. The official address of the joint venture must be shown below the signature.

All names shall be typed or printed in ink below the signatures.

The QuestCDN system will require Bidders to download and acknowledge all addenda prior to submitting a Bid.

The address, email, and telephone number for communications regarding the Bid shall be shown on the Bid Disclosure Form.

The Bid shall identify whether the Bidder is a resident or nonresident bidder for purposes of Kentucky's reciprocal preference statute (KRS 45A.490 to 45A.494 and 200 KAR 5:400). If the Bidder is claiming a "resident bidder" status as defined in KRS 45A.494(2), the Bid shall include a properly executed and notarized affidavit affirming that it meets the criteria to be considered such a resident bidder. If requested by Owner, Bidder shall also provide documentation proving such resident bidder status; failure to do so shall result in disqualification of the Bidder or contract termination.

While the Bidder should consult the applicable statutes and regulation, generally speaking, a "resident bidder" is an individual or business entity that, on the date the contract is first advertised or announced as available for bidding: (a) is authorized to transact business in the Commonwealth; AND (b) has for one (1) year prior to and through the date of the advertisement, (i) filed Kentucky corporate income taxes, (ii) made payments to the Kentucky unemployment insurance fund established in KRS 341.490, and (iii) maintained a Kentucky workers' compensation policy in effect. A "nonresident bidder" is any other individual or business entity.

13. BASIS OF BID. Bidders shall submit a Bid on the specified unit price and/or lump sum basis (as specified) for each item of Work listed in the Bid schedule. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit and/or lump sum price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions and as amended in the Supplemental Conditions.

Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words. Discrepancies between the QuestCDN bid worksheet and the Bid Disclosure Form shall be resolved in favor of the QuestCDN bid worksheet.

14. SUBMITTAL OF BID. A Bid shall be submitted via QuestCDN no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid. Bidder shall assume full responsibility for timely submission of Bids. Bids will not be accepted after the time and date for receipt of Bids. Paper, oral, telephone, facsimile, email, or telegraph Bids are invalid and will not receive consideration.

15. MODIFICATION AND WITHDRAWAL OF BIDS. Prior to the bid opening, a Bid may be modified or withdrawn via the QuestCDN electronic bid service only. For a period ending 72 hours after Bids are opened, any Bidder may request the withdrawal of its Bid by filing with Owner a duly signed written notice and otherwise demonstrating by clear and convincing evidence to the reasonable satisfaction of Owner that the Bid was submitted in good faith but there was a material and/or substantial mistake in the preparation of its Bid. If the withdrawal of the Bid is approved by the Owner in its sole discretion, the Bid security will be returned. Without the advanced full disclosure by the withdrawing Bidder to and written consent of the Owner, (a) no Bid shall be withdrawn under this section when the result would be the

awarding of the contract on another Bid of the same Bidder or of another Bidder in which the withdrawing Bidder has a direct or indirect equitable interest and (b) no Bidder who is permitted to withdraw a Bid shall, for compensation, supply any material or labor to or perform any subcontract or other work agreement for the Bidder to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the Project.

16. OPENING OF BIDS. Bids will be opened electronically via Microsoft Teams meeting at the time indicated in the advertisement or Invitation to Bid. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

17. BIDS TO REMAIN SUBJECT TO ACCEPTANCE. All Bids will remain subject to acceptance for the period of time stated in the Bid Disclosure Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

18. AWARD OF CONTRACT. Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, non-responsive, incomplete, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder which it finds, after reasonable inquiry and evaluation, to be non-responsive. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Owner to make an award to that Bidder. Owner also reserves the right to waive all and to negotiate with the apparent Successful Bidder(s) to such an extent as may be determined by Owner. The Owner also reserves the right to increase or decrease the quantities of work per the General Conditions.

In evaluating Bids, Owner will consider, among other lawful considerations, the following:

a. Whether or not the Bid complies with the prescribed requirements, and provides such alternates, unit prices and other information or data as may be requested in the Bid Form or prior to the Notice of Award.

b. The qualifications of the Bidder.

c. If the Bidder maintains a permanent place of business.

d. If the Bidder has adequate personnel and equipment to perform the Work properly and expeditiously.

e. Bidder's financial status to meet all obligations and incidentals to the Work.

f. Whether the Bidder has appropriate technical expertise and experience.

g. Bidder's performance record.

h. The amount of the TOTAL BASE BID, exclusive of any additive alternates, if applicable. Any additive alternates will be considered after selection of the lowest Total Base Bid. Each additive alternate will be considered and selected or not selected individually, at Owner's discretion, for inclusion in the work.

In addition, the evaluation of Bids will be subject to the reciprocal preference for Kentucky resident bidders pursuant to KRS 45A.490 to 45A.494 and KAR 200 5:400. These statutes

and regulation provide in part as follows: (a) a resident bidder of the Commonwealth shall be given a preference against a nonresident bidder registered in any state that gives or requires a preference to bidders from that state; (b) the preference shall be equal to the preference given or required by the state of the nonresident bidder; (c) this preference shall not be applied against nonresident bidders residing in states that do not give preference against Kentucky bidders; (d) if a procurement determination results in a tie between a resident bidder and a nonresident bidder, preference shall be given to the resident bidder; and (e) the preference shall not result in a nonresident bidder receiving a preference over another nonresident bidder.

Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders to perform the Work in accordance with the Contract Documents, including, without limitation, a Bidder's claim that it is a resident bidder for purposes of Kentucky's preference statute.

19. CONTRACT SECURITY AND INSURANCE. Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by such Bonds.

20. SIGNING OF AGREEMENT. When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents identified in the Agreement as attached thereto. Within **15 days** thereafter, the Successful Bidder shall sign, leaving the dates blank, and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within **15 days** thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

21. SALES TAX EXEMPTION. The Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by the Successful Bidder which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. The Successful Bidder agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases for the Work.

22. RETAINAGE. Provisions concerning retainage are set forth on the Agreement.

End of Section

Section 00300

BID DISCLOSURE FORM

PROJECT IDENTIFICATION: ***New Taylor Mill Tank***
City of Taylor Mill, Kenton County, Kentucky

THIS BID IS SUBMITTED ELECTRONICALLY VIA QUEST CDN TO THE NORTHERN KENTUCKY WATER DISTRICT

THIS BID IS SUBMITTED BY: _____
(Bidder's Company Name)

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Contract Documents to perform all Work as specified or indicated in the Contract Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Invitation to Bid and the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 calendar days after the Bid opening, or for such longer period of time to which the Bidder may agree in writing upon request of Owner. Bidder understands that certain extensions to the time for acceptance of this Bid may require the consent of the surety for the Bid Bond.

3. In submitting this Bid, Bidder represents and covenants, as set forth in the Agreement, that:

    a. Bidder has examined and carefully studied the Contract Documents, the other related data identified in the Contract Documents, and all Addenda, receipt of all of which is hereby acknowledged.

    b. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

    c. Bidder is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

    d. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary explorations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

e. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

f. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

g. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

h. Bidder has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Owner is acceptable to Bidder.

i. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

j. Bidder's Organization Number from Kentucky's Secretary of State is #_____ [if applicable] and Bidder is qualified to transact business in the State of Kentucky or hereby covenants to obtain such qualifications prior to award of the Contract.

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

5. The Bidder understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Site which will allow it to respond to an emergency at the Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Bidder shall provide a list of emergency phone numbers for such purposes. If the Bidder does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in its sole discretion, prior to the project pre-construction meeting.

6. Bidder will complete the Work for the following prices. Unit prices will be computed in accordance with paragraph of the General Conditions. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents.

Note: Bidder agrees to perform all the following work described in the specifications and shown on the plans, for the following lump sum price(s):

Bid Schedule	
Bid Option	**Lump Sum Price**
Bid Option No. 1 - Multi-Column Tank	
Bid Option No. 2 - Pedesphere Tank	

Bid Form Instructions: Bidder may provide pricing for one or both Bid Options. Lump Sum Price indicated above for each Bid Option shall include all work associated with the Bid Option tank style indicated on the design drawings and in the specifications (including all tank site work, piping/valves, electrical and instrumentations, etc.). The Owner reserves the right to select the Bid Option at their discretion based on conditions most advantageous to the needs of the project.

PROPOSED EQUIPMENT MANUFACTURERS:

The Bidder's proposed major equipment manufacturers included in the above Bid Option Lump Sum price shall be listed below for the requested items. The Owner reserves the right to reject any equipment manufacturers not listed in the Specifications. Unless rejected or otherwise permitted by the Owner, no substitutions or changes to the listing of the major equipment manufacturers will be allowed following opening of the Bids.

Bid Option No. 1 - Multi-Column Tank	
Major Equipment Item	**Name of Manufacturer**
Elevated Water Tank	
Tank Coatings	
Solenoid Control Valve	

Bid Option No. 2 - Pedesphere Tank	
Major Equipment Item	**Name of Manufacturer**
Elevated Water Tank	
Tank Coatings	
Solenoid Control Valve	

7. Bidder agrees that the Work will be substantially complete within 425 calendar days for Bid Option No. 1 and within 480 calendar days for Bid Option No. 2 after the date when the Contract Times commence to run as provided in paragraph 4.01 of the General Conditions, and completed and ready for final payment in accordance with paragraph 15.06.B of the General Conditions within 455 calendar days for Bid Option No. 1 and within 510 calendar days for Bid Option No. 2 after the date when the Contract Times commence to run.

The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions. The terms in this Bid, which are defined in the General Conditions included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

8. References

	Contact Person	Company Name	Phone No.	Project Name
1.				
2.				
3.				
4.				

SUBMITTED on _____, 202_.

9. Communications concerning this Bid shall be sent to Bidder at the following address:

_____

_____

_____

_____

Phone: _____

Email: _____

AUTHORIZED SIGNATURE OF BIDDER

(see signature instructions below)

Individual/Entity Name/DBA _____(print)

By:_____(sign)
(Attach evidence of authority to sign if a corporation, LLC, joint venture, or partnership)

Title:_____

Business address _____

_____

Phone No.: _____Fax No.: _____

Email Address for Electronic Signatures: _____

Date _____

Signatures should meet the following requirements:

- Signatures for partnerships must be made by a general partner.
- Signatures for LLCs must be made by a manager or member, as dictated by the entity's Articles of incorporation/bylaws.
- If a joint venture, each venturer must complete the above complete the above authorized signature of bidder form and attach a copy to the Bid Disclosure Form.

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: _____

Address: _____

_____

_____

2. SUBMITTED TO: _____

3. SUBMITTED FOR: _____

Owner: _____

Project Name: _____

_____

_____

_____

TYPE OF WORK: _____

_____

_____

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: _____

Title: _____

Phone: _____

Email: _____

5. AFFILIATED COMPANIES:

Name: _____

Address: _____

_____

_____

6. AGE OF COMPANY:

How many years has firm been in business as a General Contractor?

_____

7. SUBCONTRACTORS:

Does the firm plan to sublet any part of the work in this Contract? If so, please provide details.

_____

_____

_____

_____

8. BONDING INFORMATION

Bonding Company: _____

Address: _____

_____

Bonding Agent: _____

Address: _____

_____

_____

Contact Name: _____

Phone: _____

Aggregate Bonding Capacity: _____

Available Bonding Capacity as of date of this submittal: _____

9. SUPPLIER INFORMATION (please provide two supplier references)

Company: _____

Address: _____

_____

Contact Name: _____

Phone: _____

Company: _____

Address: _____

_____

Contact Name: _____

Phone: _____

10. FINANCIAL INFORMATION

Financial Institution: _____

Address: _____

_____

Account Manager: _____

Phone: _____

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List as **Schedule A** all uncompleted projects currently under contract.

Previous Experience:

List as **Schedule B** all projects completed within the last 5 Years .

Include the following information on both schedules:

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone: e-mail:	Name: Company: Telephone: e-mail:				

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1?

☐ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. EQUIPMENT:

MAJOR EQUIPMENT:

List as **Schedule C** all pieces of major equipment available for use on Owner's Project. Include the following information:

ITEM	PURCHASED OR RENTED?	DATE	CONDITION	ACQUIRED VALUE

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: _____

BY: _____

TITLE: _____

DATED: _____

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS _____ DAY OF _____, 20___

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES: _____

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.

BID BOND

BIDDER (Name and Address)

_____
_____
_____

SURETY (Name and Address of Principal Place of Business)

_____
_____
_____

OWNER (Name and Address)

_____
_____
_____

BID

BID DUE DATE _____

PROJECT (Brief Description Including Location)

_____
_____
_____

BOND

BOND NUMBER _____

DATE (Not later than Bid due date) _____

PENAL SUM _____ _____
(Words) (Figures)

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

BIDDER	SURETY
_____(Seal)	_____(Seal)
Bidder's Name and Corporate Seal	Surety s Name and Corporate Seal
By _____	By _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest _____	Attest _____
Signature and Title	Signature and Title

Note (1) Above addresses are to be used for giving required notice
(2) Any singular reference to Bidder Surety OWNER or other party shall be considered plural where applicable

1 Bidder and Surety jointly and severally bind themselves their heirs executors administrators successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond

2 Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents

3 This obligation shall be null and void if

3 1 OWNER accepts Bidder s Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents or

3 2 All Bids are rejected by OWNER or

3 3 OWNER fails to issue a Noti e of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and if applicable consented to by Surety when required by paragraph 5 hereof)

4 Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER which notice will be given with reasonable promptness identifying this Bond and the Project and including a statement of the amount due

5 Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety s written consent

6 No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date

7 Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located

8 Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond Such notices may be sent by personal delivery commercial courier or by United States Registered or Certified Mail return receipt requested postage pre paid and shall be deemed to be effective upon receipt by the party concerned

9 Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer agent or representative who executed this Bond on behalf of Surety to execute seal and deliver such Bond and bind the Surety thereby

10 This Bond is intended to conform to all applicable statutory requirements Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length If any provision of this Bond conflicts with any applicable statute then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect

11 The term Bid as used herein includes a Bid offer or proposal as applicable

Section 00460

NON-COLLUSION AFFIDAVIT

STATE OF: _____)

COUNTY OF: _____) SS

_____, being first duly sworn, deposes

and says that he/she is the _____ of
(sole owner, a partner, president, secretary, etc.)

_____, the party making the foregoing bid; that such bid is genuine and not collusive or sham; that said bidder is not financially interested in, or otherwise affiliated in a business way with any other bidder on the same contract; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other person shall refrain from bidding, and has not in any manner directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the price or affidavit of any other bidder, or that of any other bidder, or to secure any advantage against Owner, or any person or persons interested in the proposed Contract; and that all statements contained in said bid are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information of data relative thereto to any association or to any member or agent thereof.

_____
AFFIANT

Sworn to and subscribed before me, a Notary Public in and for the above named

State and County, this _____ day of _____, 20 ____.

_____
Notary Public

Notary ID Number:_____

My Commission Expires:_____

End of Section

Bid Description: [New Taylor Mill Tank]

REQUIRED NOTARIZED AFFIDAVIT FOR BIDDERS, OFFERORS AND CONTRACTORS CLAIMING KENTUCKY RESIDENT BIDDER STATUS

A. IS THE BIDDER OR OFFER CLAIMING KENTUCKY RESIDENT BIDDER STATUS? CHECK YES OR NO.

YES _____ NO _____

If yes, please proceed to complete Section B, a signed and notarized resident bidder affidavit is required.
If no, do not complete Section B, no resident bidder affidavit is required.

B. FOR BIDS AND CONTRACTS IN GENERAL:

The bidder or offeror hereby swears and affirms under penalty of perjury that, in accordance with KRS 45A.494(2), the entity bidding is an individual, partnership, association, corporation, or other business entity that, on the date the contract was first advertised or announced as available for bidding:

Is authorized to transact business in the Commonwealth of Kentucky; AND
Has for one year prior to and through the date this contract was first advertised or announced as available for bidding:
Filed Kentucky corporate income taxes;
Made payments to the Kentucky unemployment insurance fund established in KRS 341.490; and
Maintained a Kentucky workers' compensation policy in effect.

The undersigned acknowledges that the District reserves the right to request documentation supporting a bidder's claim of resident bidder status. Failure to provide such documentation upon request shall result in disqualification of the bidder or contract termination.

_____ _____
Signature Printed Name

_____ _____
Title (if signing on behalf of an entity) Date

State of _____)
)ss.
County of _____)

Sworn to and subscribed before me, a Notary Public in and for the above named State and County, this _____ day of _____, 20 ____.

_____
Notary Public
Notary ID Number:_____
My Commission Expires:_____

(Note: The following standard form will be used for
Preparation of the agreement, after award of contract.)

Section 00500

AGREEMENT
New Taylor Mill Tank
(184-4018)

THIS AGREEMENT is by and between the Northern Kentucky Water District (herein called Owner) and_____(herein called Contractor).

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

Article 1. WORK.

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: Construction of a new 500,000 gallon elevated water tank, associated site piping, instrumentation, and electrical work at 5421 Pride Parkway in the City of Taylor Mill, Kenton County, Kentucky.

Article 2. ENGINEER.

The Project has been designed by **GRW Engineers, Inc.**, who is referred to in the Contract Documents as Engineer.

Article 3. CONTRACT TIMES, LIQUIDATED DAMAGES, DELAYS, AND DAMAGES.

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

3.1. Contract Times. The Work will be substantially completed within 425 calendar days for Bid Option No. 1 and within 480 calendar days for Bid Option No. 2 after the date when the Contract Times commence to run as provided in paragraph 2.03.A of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within 455 calendar days for Bid Option No. 1 and within 510 calendar days for Bid Option No. 2 after the date when the Contract Times commence to run.

3.2. Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expenses, and difficulties involved in proving in a legal proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner $ 500.00 for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect,

refuse, or fail to complete the remaining Work within the Contract Times or any proper extension thereof granted by Owner, Contractor shall pay Owner as liquidated damages (but not as a penalty) $ 500.00 for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment until the Work is completed and ready for final payment.

Owner shall have the right to deduct the liquidated damages from any money in its hands, otherwise due, or to become due, to Contractor, or to initiate action to recover liquidated damages for nonperformance of this Contract within the time stipulated.

3.3. Delays and Damages. In the event Contractor is delayed in the prosecution and completion of the Work because of any delays caused by Owner or Engineer, Contractor shall have no claim against Owner or Engineer for damages (including but not limited to acceleration costs or damages) or contract adjustment other than an extension of the Contract Times and the waiving of liquidated damages during the period occasioned by the delay.

Contractor shall provide advance written notice to Owner and Engineer of Contractor's intention to accelerate the Work prior to commencing any acceleration. Such written notice shall include a detailed explanation of the nature and scope of the acceleration, the reason for the acceleration, the anticipated duration of the acceleration, and the estimated additional costs to Contractor, if any, related to the acceleration. This requirement shall not in any way affect or alter the agreement of Owner and Contractor with respect to delays and damages as set forth above and in Article 7 of the General Conditions.

Article 4. CONTRACT PRICE.

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in the Contractor's Bid, attached hereto as an exhibit, for the total amount of:

_____ _____

(words) **(figures)**

As provided in paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made as provided in paragraph 9.08 of the General Conditions and as modified by the Supplementary Conditions. Unit Prices have been computed as provided in paragraph 11.03 of the General Conditions.

Contractor acknowledges that the Contract Price shall not include sales tax for building materials, fixtures, or supplies purchased by Contractor which will be permanently incorporated into a structure or improvement to real property, or will be completely consumed, in fulfilling a construction contract for the purpose of furnishing water or sewer services to the general public under KRS 139.480. Contractor agrees to utilize Kentucky Department of Revenue Form 51A383 when making sales tax exempt purchases under this Agreement.

Article 5. PAYMENT PROCEDURES.

Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Owner as provided in the General Conditions and as modified by the Supplementary Conditions.

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

5.2. Retainage. In addition to any amounts withheld from payment in accordance with Paragraph 14.02 of the General Conditions, Owner shall retain from progress payments amounts equal to the following percentages:

a. Ten percent (10%) of the amount of the Work completed. This amount may be reduced by the Owner in its sole and absolute discretion, if the project is substantially completed; and

b. Ten percent (10%) of the value of materials and equipment that are not incorporated in the Work but are delivered, suitably stored, and accompanied by documentation satisfactory to Owner as provided in paragraph 14.02 of the General Conditions. Retainage for stored materials and equipment will be released when the materials and equipment are incorporated in the Work.

All retainage will be paid to Contractor when the Work is completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions. Consent of the Surety shall be obtained before retainage is paid by Owner. Consent of the Surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the Surety.

5.3. Final Payment. Upon final completion and acceptance of the Work in accordance with paragraphs 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as provided in said paragraph 14.07.

Article 6. CONTRACTOR'S REPRESENTATION.

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

a. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents

b. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

c. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

d. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary explorations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by Contractor, and safety precautions and programs incident thereto.

e. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

f. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

g. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

h. Contractor has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Owner is acceptable to Contractor.

i. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

Article 7. CONTRACT DOCUMENTS.

The Contract Documents, which are incorporated as part of the Agreement, consist of the following:

A. This Agreement;
B. Performance Bond;
C. Payment Bond;
D. General Conditions;
E. Supplementary Conditions;
F. Specifications as listed in the table of contents of the Project Manual;
G. Drawings consisting of a cover sheet and sheets numbered **G-00-001** through **I-00-801** inclusive, with each sheet bearing the following general title;

H. Addenda (numbers ___ to ___, inclusive);

I. Exhibits to this Agreement (enumerated as follows):
   1. Notice to Proceed;
   2. Contractor's Bid;
   3. Documentation submitted by Contractor prior to Notice of Award;

J. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
   1. Written Amendments;
   2. Work Change Directives;
   3. Change Orders.

There are no Contract Documents other than those listed above in this Article 7. The Contract Documents may only be amended, modified, or supplemented as provided in paragraphs 3.05 of the General Conditions.

Article 8. CONTRACT CORRECTION PERIOD.

Notwithstanding the reference to "one year after the date of Substantial Completion" at the beginning of paragraph 13.07.A of the General Conditions, the Contractor's Correction Period with respect to the obligations set forth in paragraph 13.07.A of the General Conditions shall be twenty-four (24) months after the issuance of "Certificate of Substantial Completion" for all machinery, piping, materials, equipment, fittings, roadway pavement work, general restoration, shoulder & ditch restoration furnished under the Contract Documents. The correction period referenced in paragraph 13.07.C of the General Conditions shall be twenty-four (24) months for all machinery, piping, materials, equipment, fittings and all roadway pavement work.

Article 9. COMPLIANCE WITH KENTUCKY LAW.

Contractor represents and warrants that it has revealed to Owner any and all final determinations of a violation of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 by Contractor or any subcontractor within the past five years. Contractor further represents and warrants that it and each of its subcontractors will remain in continuous compliance with the provisions of KRS Chapters 136, 139, 141, 337, 338, 341 and 342 for the duration of this Agreement. Contractor understands that its failure to reveal a final determination of a violation or to comply with the above statutory requirements constitutes grounds for cancellation of the Agreement and for disqualification of Contractor from eligibility for any contracts for a period of two years.

Article 10. EQUAL OPPORTUNITY.

Unless exempted under KRS 45.590, during the performance of the Agreement, the Contractor agrees as follows:

a. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, age forty (40) and over, disability, veteran status, or national origin;

b. Contractor will take affirmative action in regard to employment, upgrading, demotion, transfer, recruitment, recruitment advertising, layoff, termination, rates of pay or other forms of compensation, and selection for training, so as to ensure that applicants are employed and that employees during employment are treated without regard to their race, color, religion, sex, age forty (40) and over, disability, veteran status, or national origin;

c. Contractor will state in all solicitations or advertisements for employees placed by or on behalf of Contractor that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, age forty (40) or over, disability, veteran status, or national origin;

d. Contractor will post notices in conspicuous places, available to employees and applicants for employment, setting forth the provisions of the nondiscrimination clauses required by this section; and

e. Contractor will send a notice to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding advising the labor union or workers' representative of Contractor's commitments under the nondiscrimination clauses.

Article 11. MISCELLANEOUS.

a. Terms used in this Agreement will have the meanings indicated in the General Conditions.

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

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

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

[Signature page follows.]

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement. One counterpart each has been delivered to Owner, Contractor, Surety, and Engineer.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER: **Northern Kentucky Water District**

_____

Amy Stoffer
Vice President of Engineering, Production and Water Quality

Address for giving notices

2835 Crescent Springs Road
PO Box 18640
Erlanger, Kentucky 41018

CONTRACTOR:_____

By:_____
Signature

_____
Printed Name

_____
Title

(Corporate Seal)

Address for giving notices

_____

_____

_____

Joint Venture

CONTRACTOR:_____

By:_____
(Corporate Seal)

Address for giving notices

_____

_____

Northern Kentucky Water District

NOTICE OF AWARD

To: XXXXXXXXXXXXXX
XXXXXXXXXXXXXX
XXXXXXXXXXXXXX

Description of Work: _____

The Owner represented by the undersigned has considered the Bid submitted by you on __(insert bid opening date)_____ for the above described work in response to its Invitation to Bid and Instructions to Bidders.

It appearing that it is to the best interest of said Owner to accept your Bid in the amount of Words ($ Number), you are hereby notified that your Bid has been accepted for the above referenced project. You are required by the Notice and Instructions to Bidders to execute the formal Agreement with the undersigned Owner and to furnish the required Contractor's Performance and Payment Bond and proper Insurance Certificate within fifteen (15) days from the date of delivery of this Notice to you. **You are required to return an acknowledged copy of this Notice of Award and all copies of the signed Agreement (leave dates blank) to the Owner for execution.**

If you fail to execute said Agreement and to furnish said bonds and certificates within 15 days from the date of delivery of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Bid as abandoned and as a forfeiture of your Bid Security. The Owner will be entitled to such other rights as may be granted by law and to award the work covered by your Bid to another, or to re-advertise the work or otherwise dispose thereof as the Owner may see fit.

Dated this ___ day of _____, 20___.

Owner
Northern Kentucky Water District

By:_____
Amy Stoffer, V.P. of Engineering, Production, & Water Quality

ACCEPTANCE OF NOTICE

Receipt of the above Notice of
Award is hereby acknowledged this

_____day of _____,20___.

By: _____

_____ Title

2835 Crescent Springs Rd. PO Box 18640 Erlanger, KY 41018 (859) 578-9898 Fax (859) 578-7893

Northern Kentucky Water District

NOTICE TO PROCEED
New Taylor Mill Tank

To: Contractor Name
Street Address
City, State, Zip Code

Description of Work: Construction of a new 500,000 gallon elevated water tank, associated site piping, instrumentation, and electrical work at 5421 Pride Parkway in the City of Taylor Mill, Kenton County, Kentucky.

You are hereby notified to commence WORK on or before **[Month, Day, 2024]**. The Work will need to be substantially completed within **_#_** calendar days after the date when the Contract Times commence to run as provided in paragraph 2.03(A) of the General Conditions and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within **_#_** calendar days after the date when the Contract Times commence to run. The date of substantial completion of the WORK is **[Month, Day, 2024]** and the date of final completion of all WORK is therefore **[Month, Day, 2024]**.

Dated this _____ day of _____, 20__.

Owner
Northern Kentucky Water District

By:_____
Amy Stoffer, V.P. of Engineering, Production & Water Quality

ACCEPTANCE OF NOTICE
Receipt of the above Notice to
Proceed is hereby acknowledged this

_____day of _____, 2024.

By: _____

Title: _____

Performance Bond

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

---

CONTRACTOR (Name and Address)

SURETY (Name and Address of Principal Place of Business)

OWNER (Name and Address)

CONTRACT
Date
Amount
Description (Name and Location)

BOND
Date (Not earlier than Contract Date)
Amount
Modifications to this Bond Form

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

CONTRACTOR AS PRINCIPAL
Company (Corp Seal)

Signature _____
Name and Title

SURETY
Company (Corp Seal)

Signature _____
Name and Title
(Attach Power of Attorney)

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

CONTRACTOR AS PRINCIPAL
Company (Corp Seal)

Signature _____
Name and Title

SURETY
Company (Corp Seal)

Signature _____
Name and Title

EJCDC No 1910 28 A (1996 Edition)
Originally prepared through the joint efforts of the Surety Association of America Engineers Joint Contract Documents Committee the Associated General Contractors of America and the American Institute of Architects

1 The CONTRACTOR and the Surety jointly and severally bind themselves their heirs executors administrators successors and assigns to the Owner for the performance of the Contract which is incorporated herein by reference

2 If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond except to participate in conferences as provided in paragraph 3 1

3 If there is no OWNER Default, the Surety s obligation under this Bond shall arise after

3 1 The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract If the OWNER the CONTRACTOR and the Surety agree the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER s right if any subsequently to declare a CONTRACTOR Default and

3 2 The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR s right to complete the Contract Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3 1 and

3 3 The OWNER has agreed to pay the Balance of the Contract Price to

3 3 1 The Surety in accordance with the terms of the Contract,

3 3 2 Another contractor selected pursuant to paragraph 4 3 to perform the Contract

4 When the OWNER has satisfied the conditions of paragraph 3 the Surety shall promptly and at the Surety s expense take one of the following actions

4 1 Arrange for the CONTRACTOR, with consent of the OWNER to perform and complete the Contract, or

4 2 Undertake to perform and complete the Contract itself through its agents or through independent contractors or

4 3 Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER s concurrence to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default or

4 4 Waive its right to perform and complete arrange for completion or obtain a new contractor and with reasonable promptness under the circumstances

4 4 1 After investigation, determine the amount for which it may be liable to the OWNER and as soon as practicable after the amount is determined tender payment therefor to the OWNER, or

4 4 2 Deny liability in whole or in part and notify the OWNER citing reasons therefor

5 If the Surety does not proceed as provided in paragraph 4 with reasonable promptness the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond and the OWNER shall be entitled to enforce any remedy available to the OWNER If the Surety proceeds as provided in paragraph 4 4 and the OWNER refuses the payment tendered or the Surety has denied liability in whole or in part without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER

6 After the OWNER has terminated the CONTRACTOR s right to complete the Contract, and if the Surety elects to act under paragraph 4 1 4 2 or 4 3 above then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract To a limit of the amount of this Bond but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract the Surety is obligated without duplication for

6 1 The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract

6 2 Additional legal design professional and delay costs resulting from the CONTRACTOR s Default and resulting from the actions or failure to act of the Surety under paragraph 4 and

6 3 Liquidated damages or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non performance of the CONTRACTOR

7 The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs executors administrators or successors

8 The Surety hereby waives notice of any change including changes of time to the Contract or to related subcontracts purchase orders and other obligations

9 Any proceeding legal or equitable under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond whichever occurs first If the provisions of this paragraph are void or prohibited by law the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable

10 Notice to the Surety the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page

11 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was be performed any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein The intent is that this Bond shall be construed as a statutory bond and not as a common law bond

12 Definitions

12 1 Balance of the Contract Price The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract

12 2 Contract The agreement between the OWNER and the CONTRACTOR identified on the signature page including all Contract Documents and changes thereto

12 3 CONTRACTOR Default. Failure of the CONTRACTOR, which has neither been remedied nor waived to perform or otherwise to comply with the terms of the Contract

12 4 OWNER Default. Failure of the OWNER, which has neither been remedied nor waived to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof

(FOR INFORMATION ONLY Name Address and Telephone)
AGENT or BROKER OWNER S REPRESENTATIVE (Engineer or other party)

Payment Bond

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

---

CONTRACTOR (Name and Address)

SURETY (Name and Address of Principal Place of Business)

OWNER (Name and Address)

CONTRACT
Date
Amount
Description (Name and Location)

BOND
Date (Not earlier than Contract Date)
Amount
Modifications to this Bond Form

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

CONTRACTOR AS PRINCIPAL		SURETY	
Company	(Corp Seal)	Company	(Corp Seal)
Signature _____		Signature _____	
Name and Title		Name and Title (Attach Power of Attorney)	

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

CONTRACTOR AS PRINCIPAL		SURETY	
Company	(Corp Seal)	Company	(Corp Seal)
Signature _____		Signature _____	
Name and Title		Name and Title	

EJCDC No 1910 28 B (1996 Edition)
Originally prepared through the joint efforts of the Surety Association of America Engineers Joint Contract Documents Committee the Associated General Contractors of America the American Institute of Architects the American Subcontractors Association, and the Associated Specialty Contractors

1 The CONTRACTOR and the Surety jointly and severally bind themselves their heirs executors administrators successors and assigns to the OWNER to pay for labor materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference

2 With respect to the OWNER this obligation shall be null and void if the CONTRACTOR

2 1 Promptly makes payment directly or indirectly for all sums due Claimants and

2 2 Defends indemnifies and holds harmless the OWNER from all claims demands liens or suits by any person or entity who furnished labor materials or equipment for use in the performance of the Contract provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims demands liens or suits and tendered defense of such claims demands liens or suits to the CONTRACTOR and the Surety and provided there is no OWNER Default

3 With respect to Claimants this obligation shall be null and void if the CONTRACTOR promptly makes payment directly or indirectly for all sums due

4 The Surety shall have no obligation to Claimants under this Bond until

4 1 Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy or notice thereof to the OWNER stating that a claim is being made under this Bond and with substantial accuracy the amount of the claim

4 2 Claimants who do not have a direct contract with the CONTRACTOR.

1 Have furnished written notice to the CONTRACTOR and sent a copy or notice thereof to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating with substantial accuracy the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed and

2 Have either received a rejection in whole or in part from the CONTRACTOR or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly and

3 Not having been paid within the above 30 days have sent a written notice to the Surety and sent a copy or notice thereof to the OWNER stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR

5 If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety that is sufficient compliance

6 When the Claimant has satisfied the conditions of paragraph 4 the Surety shall promptly and at the Surety s expense take the following actions

6 1 Send an answer to the Claimant with a copy to the OWNER within 45 days after receipt of the claim stating the amounts that are undisputed and the basis for challenging any amounts that are disputed

6 2 Pay or arrange for payment of any undisputed amounts

7 The Surety s total obligation shall not exceed the amount of this Bond and the amount of this Bond shall be credited for any payments made in good faith by the Surety

8 Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims if any under any Performance Bond By the CONTRACTOR furnishing and the OWNER accepting this Bond they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond subject to the OWNER s priority to use the funds for the completion of the Work

9 The Surety shall not be liable to the OWNER Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond and shall have under this Bond no obligations to make payments to give notices on behalf of or otherwise have obligations to Claimants under this Bond

10 The Surety hereby waives notice of any change including changes of time to the Contract or to related Subcontracts purchase orders and other obligations

11 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4 1 or paragraph 4 2 3 or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs If the provisions of this paragraph are void or prohibited by law the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable

12 Notice to the Surety the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page Actual receipt of notice by Surety the OWNER or the CONTRACTOR however accomplished shall be sufficient compliance as of the date received at the address shown on the signature page

13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond

14 Upon request of any person or entity appearing to be a potential beneficiary of this Bond the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made

15 DEFINITIONS

15 1 Claimant An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor materials or equipment for use in the performance of the Contract The intent of this Bond shall be to include without limitation in the terms labor materials or equipment that part of water gas power light, heat, oil gasoline telephone service or rental equipment used in the Contract architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR s Subcontractors and all other items for which a mechanic s lien may be asserted in the jurisdiction where the labor materials or equipment were furnished

15 2 Contract. The agreement between the OWNER and the CONTRACTOR identified on the signature page including all Contract Documents and changes pthereto

15 3 OWNER Default. Failure of the OWNER which has neither been remedied nor waived to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof

(FOR INFORMATION ONLY--Name Address and Telephone)
AGENCY or BROKER OWNER S REPRESENTATIVE (Engineer or other party)

CERTIFICATE OF INSURANCE

Issue Date:

PRODUCER:

Code Sub-Code

INSURED:

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

COMPANIES AFFORDING COVERAGE

COMPANY LETTER A	
COMPANY LETTER B	
COMPANY LETTER C	
COMPANY LETTER D	
COMPANY LETTER E	

COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES.

CO LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE	POLICY EXPIRATION DATE	ALL LIMITS IN THOUSANDS	
	GENERAL LIABILITY				GENERAL AGGREGATE	$1,000,
	[X] COMMERCIAL GENERAL LIABILITY				PRODUCTS-COMP/OPS AGGREGATE	$1,000,
	[X] OCCURRENCE	(Completed Operations & Products Liability remains			PERSONAL & ADVERTISING INJURY	$1,000,
	[X] BLANKET CONTRACTUAL	in force for 2 years after final payment)			EACH OCCURRENCE	$1,000,
	[ ] _____					
	AUTOMOBILE LIABILITY					
	[X] ANY AUTO				COMBINED SINGLE LIMIT EACH OCCURRENCE Bodily Injury & Property Damage	$1,000,
	[X] HIRED AUTOS					
	[X] NON-OWNED AUTOS					
	EXCESS LIABILITY				EACH OCCURRENCE	$4,000,
	[X] UMBRELLA FORM	(Follows Form of the Primary)			AGGREGATE	$4,000,
	WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY	
					EACH ACCIDENT	$1,000,
		(Includes US Longshoremen and Harbor Workers Act and Maritime Coverage Where Applicable and All States Endorsement)			DISEASE-POLICY LIMIT	$1,000,
					DISEASE-EACH EMPLOYEE	$1,000,
	OTHER				EACH OCCURRENCE	
	[ ] _____				AGGREGATE	

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS:

1. Certificate Holder(s) & their Officers, Directors, Partners, Employees, & Agents Named as Additional Insured (all policies except WC). The coverage afforded the Additional Insured under these policies shall be primary insurance. If the Additional Insured has other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. (Copy of Additional Insured Endorsement attached.)
2. Blanket Coverage for XCU Hazards (General Liability & Excess Liability).
3. Waiver of Subrogation Against Certificate Holder(s), Their Officers, Directors, Partners, Employees, & Agents (all policies).
4. Contractual Coverage covers liability assumed in the Indemnification Clause of the Contract between Certificate Holder and Insured (General Liability & Excess Liability).
5. General and Products/Completed Operations aggregates apply for each Certificate Holder contract(s) or amendments (General Liability & Excess Liability).
6. Contractual Liability Limitation Endorsement CG2139 or its equivalent is not included in either General or Excess Liability policies.
7. Severability of Interest or Cross Liability clause or endorsement included (General Liability & Excess Liability).

CERTIFICATE HOLDERS	CANCELLATION
1.	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELED, TERMINATED, OR MATERIALLY CHANGED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL MAIL 30 DAYS' WRITTEN NOTICE TO THE CERTIFICATE HOLDERS NAMED TO THE LEFT. ANY IMPAIRMENT OR EXHAUSTION OF AGGREGATES WILL BE THE SUBJECT OF IMMEDIATE NOTICE TO THE CERTIFICATE HOLDERS.
2.	AUTHORIZED REPRESENTATIVE

CERTIFICATE OF PROPERTY INSURANCE

ISSUE DATE _____ (mm/dd/yy)

THIS IS EVIDENCE THAT INSURANCE AS IDENTIFIED BELOW HAS BEEN ISSUED IS IN FORCE AND CONVEYS ALL THE RIGHTS AND PRIVILEGES AFFORDED UNDER THE POLICY

PRODUCER	COMPANY
Code Sub-Code	
INSURED	POLICY NUMBER
	EFFECTIVE DATE (mm/dd/yy) / EXPIRATION DATE (mm/dd/yy)

PROPERTY INFORMATION

LOCATION/DESCRIPTION

COVERAGE INFORMATION

COVERAGES/PERILS/FORMS	AMOUNT OF INSURANCE	DEDUCTIBLE
BUILDERS RISK/INSTALLATION FLOATER All Risk of Physical Damage or Loss to Equipment and Materials at or Incidental to the Jobsite on Completed Value Form	Insurable value of completed work.	

REMARKS (Including Special Conditions)

1 Certificate Holder and others identified in the property insurance paragraph of the Contract Documents are Named Insureds
2 Waiver of Subrogation against Named Insureds
3 Any similar insurance carried by Named Insureds is excess of coverage described hereon
4 Losses are payable to Owner as fiduciary for the Named Insureds

CANCELLATION

THIS POLICY IS SUBJECT TO THE PREMIUMS FORMS AND RULES IN EFFECT FOR EACH POLICY PERIOD SHOULD THE POLICY BE TERMINATED OR MATERIALLY CHANGED THE COMPANY WILL GIVE THE CERTIFICATE HOLDERS IDENTIFIED BELOW 30 DAYS' WRITTEN NOTICE AND WILL SEND NOTIFICATION OF ANY CHANGES TO THE POLICY THAT WOULD AFFECT THAT INTEREST IN ACCORDANCE WITH THE POLICY PROVISIONS OR AS REQUIRED BY LAW

CERTIFICATE HOLDERS

Name and Address	Nature of Interest
1	X Additional Named Insured
2	SIGNATURE OF AUTHORIZED AGENT OF THE COMPANY

Engineers Joint Documents Committee
Design and Construction Related Documents
Instructions and License Agreement

Instructions

Before you use any EJCDC document:

1. Read the License Agreement. You agree to it and are bound by its terms when you use the EJCDC document.

2. Make sure that you have the correct version for your word processing software.

How to Use:

1. While EJCDC has expended considerable effort to make the software translations exact, it can be that a few document controls (e.g., bold, underline) did not carry over.

2. Similarly, your software may change the font specification if the font is not available in your system. It will choose a font that is close in appearance. In this event, the pagination may not match the control set.

3. If you modify the document, you must follow the instructions in the License Agreement about notification.

4. Also note the instruction in the License Agreement about the EJCDC copyright.

License Agreement

You should carefully read the following terms and conditions before using this document. Commencement of use of this document indicates your acceptance of these terms and conditions. If you do not agree to them, you should promptly return the materials to the vendor, and your money will be refunded.

The Engineers Joint Contract Documents Committee ("EJCDC") provides **EJCDC Design and Construction Related Documents** and licenses their use worldwide. You assume sole responsibility for the selection of specific documents or portions thereof to achieve your intended results, and for the installation, use, and results obtained from **EJCDC Design and Construction Related Documents**.

You acknowledge that you understand that the text of the contract documents of **EJCDC Design and Construction Related Documents** has important legal consequences and that consultation with an attorney is recommended with respect to use or modification of the text. You further acknowledge that EJCDC documents are protected by the copyright laws of the United States.

License:

You have a limited nonexclusive license to:

1. Use **EJCDC Design and Construction Related Documents** on any number of machines owned, leased or rented by your company or organization.

2. Use **EJCDC Design and Construction Related Documents** in printed form for bona fide contract documents.

3. Copy **EJCDC Design and Construction Related Documents** into any machine readable or printed form for backup or modification purposes in support of your use of **EJCDC Design and Construction Related Documents**.

You agree that you will:

1. Reproduce and include EJCDC's copyright notice on any printed or machine-readable copy, modification, or portion merged into another document or program. All proprietary rights in **EJCDC Design and Construction Related Documents** are and shall remain the property of EJCDC.

2. Not represent that any of the contract documents you generate from **EJCDC Design and Construction Related Documents** are EJCDC documents unless (i) the document text is used without alteration or (ii) all additions and changes to, and deletions from, the text are clearly shown.

You may not use, copy, modify, or transfer EJCDC Design and Construction Related Documents, or any copy, modification or merged portion, in whole or in part, except as expressly provided for in this license. Reproduction of EJCDC Design and Construction Related Documents in printed or machine-readable format for resale or educational purposes is expressly prohibited.

If you transfer possession of any copy, modification or merged portion of EJCDC Design and Construction Related Documents to another party, your license is automatically terminated.

Term:

The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

Limited Warranty:

EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and

workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EJCDC does not warrant that the functions contained in **EJCDC Design and Construction Related Documents** will meet your requirements or that the operation of **EJCDC Design and Construction Related Documents** will be uninterrupted or error free.

Limitations of Remedies:

EJCDC's entire liability and your exclusive remedy shall be:

1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or

2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

General:

You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

Arthur Schwartz, Esq.
General Counsel
National Society of Professional Engineers
1420 King Street
Alexandria, VA 22314

Phone: (703) 684-2845
Fax: (703) 836-4875
e-mail: aschwartz@nspe.org

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement.

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

ACEC
American Council of Engineering Companies

The Associated General Contractors of America
SKILL RESPONSIBILITY INTEGRITY

ASCE American Society of Civil Engineers

PE National Society of Professional Engineers
Professional Engineers in Private Practice

AMERICAN COUNCIL OF ENGINEERING COMPANIES

_____

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

_____

AMERICAN SOCIETY OF CIVIL ENGINEERS

_____

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by

CSI

CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

Page

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. *Unit Price Work*—Work to be paid for on the basis of unit prices.

50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

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

2.02 *Copies of Documents*

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

2.03 *Commencement of Contract Times; Notice to Proceed*

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

2.04 *Starting the Work*

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

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

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

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of

the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

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

3.02 *Reference Standards*

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

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

   a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

   b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

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

4.01 *Availability of Lands*

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

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

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

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

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

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

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

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

   a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

   b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

   a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

   b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

   c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

   a. reviewing and checking all such information and data;

   b. locating all Underground Facilities shown or indicated in the Contract Documents;

   c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

   d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

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

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

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

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to

permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

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

5.03 *Certificates of Insurance*

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

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

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

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

   a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

   b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners,

employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

   a. Such insurance shall remain in effect for two years after final payment.

   b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

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

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of

them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

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

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

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

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

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

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

   a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

   b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

   c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

   d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

      1) shall certify that the proposed substitute item will:

         a) perform adequately the functions and achieve the results called for by the general design,

         b) be similar in substance to that specified, and

         c) be suited to the same use as that specified;

      2) will state:

         a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

         b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

         c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

      3) will identify:

         a) all variations of the proposed substitute item from that specified, and

         b) available engineering, sales, maintenance, repair, and replacement services; and

      4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or

entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

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

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

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

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

6.08 *Permits*

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

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner

and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

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

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

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

6.12 *Record Documents*

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

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts

any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

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

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the

Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

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

6.18 *Continuing the Work*

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

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe

access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

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

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

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

8.02 *Replacement of Engineer*

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

8.03 *Furnish Data*

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

8.04 *Pay When Due*

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

8.05 *Lands and Easements; Reports and Tests*

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

8.06 *Insurance*

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

8.07 *Change Orders*

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

8.08 *Inspections, Tests, and Approvals*

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

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws

and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

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

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

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

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

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

9.04 *Authorized Variations in Work*

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

9.05 *Rejecting Defective Work*

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

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations

on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

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

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of,

and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

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

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of

executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

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

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

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

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

    g. The cost of utilities, fuel, and sanitary facilities at the Site.

    h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

    i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

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

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in

the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

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

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

   b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

   c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

   d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

   e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

   f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 *Notice of Defects*

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

13.02 *Access to Work*

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

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

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

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

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

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers,

architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

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

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

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

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

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

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's

review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

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

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

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

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

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

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment:*

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

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

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

C. *Payment Becomes Due:*

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

14.08 *Final Completion Delayed*

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

14.09 *Waiver of Claims*

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

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

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

15.02 *Owner May Terminate for Cause*

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

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

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

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other

dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

17.06 *Headings*

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

Section 00800

SUPPLEMENTARY CONDITIONS

SCOPE. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (C-700, 2007 Edition) and other provisions of the Contract Documents as indicated herein. All provisions which are not so amended or supplemented remain in full force and effect.

SC-1. DEFINITIONS AND TERMINOLOGY.

SC-1.01. DEFINED TERMS. The terms used in these Supplementary Conditions which are defined in the Standard General Conditions of the Construction Contract (C-700, 2007 Edition) have the meanings assigned to them in the General Conditions.

Amend the terms as follows:

3. Application for Payment: Strike out the word “Engineer” and insert the word “Owner” in its place.

9. Change Order: Strike out the words “recommended by Engineer”.

12. Contract Documents: In the first sentence, strike out the word “Engineer’s” and insert the word “Owner’s” in its place.

14. Contract Times: Strike out the words “as evidenced by Engineer’s written recommendation of final payment”.

15. Contractor: Delete the term “Contractor” and substitute therefore the terms “Contractor or Prime Contractor.”

17. Drawings: Add the following sentence to the definition: “Drawings may also be described as Plans.”

20. Field Order: Strike out the word “Engineer” and insert the word “Owner” in its place.

22. Hazardous Environmental Conditions: Delete the words “ or Radioactive Material” and substitute therefore the words “Radioactive Material or other pollutants or contaminants”.

44. Substantial Completion: Strike out the word “Engineer” and insert the word “Owner” in its place. Add the following to the first sentence: "and a Certificate of Substantial Completion has been completed."

51. Work Change Directive: In the first sentence strike out the words “and recommended by Engineer”.

Additional terms used in these Supplementary Conditions have the meanings indicted herein, which are applicable to both the singular and plural thereof.

Add the following new definitions to paragraph 1.01:

"52. Final Completion – The time when all work is complete, including all punch list items, and all documents required for occupancy of the facility are completed and submitted to the OWNER. These documents include, but are not limited to, Certificate of Occupancy, Letters of Approval from various regulatory agencies, inspection certificates, and all other items as required in paragraph 14.07."

"53. General Contractor – The person, firm, or corporation with whom OWNER has entered into an Agreement for a complete project, general trades, or complete project less a part of the project."

"54. Without exception – The term "without exception", when used in the Contract Documents following the name of a Supplier or a proprietary item of equipment, product, or material, shall mean that the sources of the product are limited to the listed Suppliers or products and that no like, equivalent, or "or-equal" item and no substitution will be considered."

"55. Written Notice – Notice to any party which is in writing and which shall be considered delivered and the service thereof completed once posted by certified or registered mail to the party to whom the notice is sent at its last given address or delivered in person to said party or its authorized representative on the work."

SC-102. TERMINOLOGY. Add the following paragraphs G, H, and I.

"G. Imperative Mood. These specifications are written to the BIDDER before the award of the Contract and to the CONTRACTOR after award of the Contract. The sentences that direct the CONTRACTOR to perform work are mostly written as commands. For example, a requirement to provide cold-weather protection would be expressed as, 'Provide cold-weather protection for concrete,' rather than 'The Contractor shall provide cold-weather protection for concrete.' In the imperative mood, the subject "the Bidder" or "the Contractor" is understood.

SC-2. PRELIMINARY MATTERS.

SC-2.02. Copies of Documents. Delete the second sentence of paragraph 2.02.A and insert the following new sentence in its place:

"Two (2) sets of contract drawings and specifications will be furnished the Contractor without charge. Additional sets will be furnished upon request at the cost of reproduction. The Contractor shall keep one (1) set of approved plans and specifications on the site of the work. This set shall be kept current by addition of all approved changes, addenda and amendments thereto. One set of as-built plans shall be returned to the Owner after the project is complete."

The plans and specifications are intended to be complementary; but should any discrepancy appear or any misunderstanding arise as to the import of anything

contained in either, the decision of the District shall be final and binding on the Contractor. The District may make any corrections of errors or omissions in the drawings and specifications when such corrections are necessary for the proper fulfillment of their intention as construed by the District.

All work or materials shown on the plans and not mentioned in the specifications or any work specified and not shown on the plans, shall be furnished, performed and done by the Contractor as if the same were both mentioned in the specifications and shown on the plans.

Should the Contractor in preparing its bid find anything necessary for the construction of the project that is not mentioned in the specifications or shown on the plans, or any discrepancy, it shall notify the District so that such items may be included. Should the Contractor fail to notify the District of such items, it will be assumed that its bid included everything necessary for the complete construction in the spirit and intent of the designs shown.

In case of discrepancy, figure dimensions shall govern over scale dimensions, large-scale details shall govern over small-scale drawings, plans shall govern over specifications, detailed technical specifications shall govern over general specifications, and the more restrictive specifications shall prevail."

SC-2.03. Commencement of Contract Times; Notice to Proceed. Delete the paragraph and insert in its place:

"A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. The date for the Contract Times may be extended by mutual agreement between the OWNER and the CONTRACTOR."

SC-2.05. Before Starting Construction. Amend paragraphs 2.05.A and 2.05.B by striking out the word "Engineer" in all locations where it appears in the paragraphs and inserting the word "Owner" in its place.

SC-2.06. Preconstruction Conference. Delete paragraph 2.06.A in its entirety and insert the following new paragraph in its place:

If requested by Owner, within 20 days after the Contract Times start to run, but before any work at the Site is started, a conference attended by Contractor, Owner, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

SC-2.07. Initial Acceptance of Schedules. Amend paragraph 2.07.A, including paragraphs 2.07.A.1, 2.07.A.2, and 2.07.A.3, by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE.

SC-3.01. Intent. Amend paragraph 3.01.C by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-3.03. Reporting and Resolving Discrepancies. Amend paragraph 3.03.A by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-3.04. Amending and Supplementing Contract Documents. Amend paragraph 3.04.B by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS.

SC-4.02. Subsurface and Physical Conditions. Delete Paragraph 4.02.A in its entirety and insert the following new paragraph in its place:

A. *Reports and Drawings*: No reports of explorations and tests of subsurface conditions at or contiguous to the Site have been prepared, and no drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site are available.

SC-4.03. Differing Subsurface or Physical Conditions.

Replace paragraph 4.03.A with the following:

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

"1. Is of such nature as to require a change in the Contract Documents; or

"2. Differs materially from that shown or indicated in the Contract Documents; or

"3. Is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent on work of the character provided for in the Contract Documents;

"then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any work in connection therewith (except as aforesaid) until receipt of written order to do so."

Delete paragraph 4.03.B in its entirety and insert the following new paragraph in its place:

B. *Owner’s Review*. After receipt of written notice as required by paragraph 4.03.A, Owner will promptly review the pertinent condition, determine the necessity if obtaining additional explorations or tests with respect thereto, and advise Contractor in writing of Owner’s findings and conclusions.

SC-4.04. Underground Facilities.

Add the following immediately after paragraph 4.04.A.2.

"4.04.A.3 Location of Subsurface Utilities.

"a. The location of subsurface utilities is shown on the plans from information furnished by the utility owners.

"b. The CONTRACTOR shall, no later than 2 working days, excluding Saturdays, Sundays, and legal holidays, prior to construction in the area of the subsurface utility, notify the subsurface utility Owner in writing, by telephone, or in person. The marking or locating shall be coordinated to stay approximately 2 days ahead of the planned construction.

"c. The CONTRACTOR shall alert immediately the occupants of nearby premises as to any emergency that it may create or discover at or near such premises.

"d. The CONTRACTOR shall have full responsibility for coordination of the work with owners of such underground facilities during construction, for the safety and protection thereof as provided in paragraph 6.13 and repairing any damage thereto resulting from the work, the cost of all of which will be considered as having been included in the Contract Price.

"4.04.A.4 Where existing utilities and structures are indicated as being in the line of the proposed improvement, the CONTRACTOR shall expose them sufficiently in advance of the construction operations to permit adjustments in line or grade, if required, to eliminate interferences.

"4.04.A.5 Existing pipes or conduits crossing a trench, or otherwise exposed, shall be adequately braced and supported to prevent movement during construction.

"4.04.A.6 Broken Utility Services.

"a. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers and utility owners.

"b. Temporary arrangements, as approved by the ENGINEER, may be used until any damaged items can be permanently repaired.

"c. All items damaged or destroyed by construction and subsequently repaired must be properly maintained by the CONTRACTOR.

"d. CONTRACTOR must work 24 hours a day until service is restored to a damaged utility.

"4.04.A.7 Existing Utility Relocation.

"a. Where it is necessary to relocate an existing utility or structure, the work shall be done in such manner as is necessary to restore it to a condition equal to that of the original utility or structure.

"b. No such relocation shall be done until approval is received from the authority responsible for the utility or structure being changed."

Amend the first sentence of paragraph 4.04.B.1 by striking out the words “and Engineer”.

Amend the second sentence of paragraph 4.04.B.2 by striking out the word “Engineer” and inserting the word “Owner” in its place.

Amend the first sentence of paragraph 4.04.B.2 by striking out the word “Engineer” and inserting the word “Owner” in its place.

Add the following new paragraph immediately after paragraph 4.04.B:

Generally, service connections are not indicated on the Drawings. Contractor shall be responsible for discovery of existing underground installations, in advance of excavating or trenching, by contacting all local utilities and by prospecting.

SC-4.06 Hazardous Environmental Conditions at Site.

Delete paragraph 4.06.A. in it entirety and substitute the following paragraph therefore:

A. The following reports and drawings related to Hazardous Environmental Conditions identified at the Site are known to Owner: (None).

Amend paragraph 4.06.B by adding the words “that is created by, or” immediately after the words “a Hazardous Environmental Condition” in the fourth line.

Amend paragraph 4.06.G by deleting all words following the words “Hazardous Environmental Condition” in the seventh line and substituting therefore the following words: “was created by Owner or by anyone for whom Owner is responsible, other than Contractor and all persons, subcontractors and entities for which Contractor is responsible.”

SC-5. BONDS AND INSURANCE.

SC-5.02. Licensed Sureties and Insurers. Add the following new sentence at the end of paragraph 5.02.A:

The surety company shall be rated “A” by AM BEST.

SC-5.03. Certificates of Insurance. Add the following new sentence at the end of paragraph 5.03.A:

Contractor shall deliver to Owner properly completed certificates of insurance prior to the start of any Work at the Site, on the forms included in the Contract Documents.

SC-5.04. Contractor's Insurance.

Add the following new paragraphs immediately after paragraph 5.04.A.6:

7. Claims arising out of pollution and excluded from the Contractor's general liability and comprehensive automobile liability policies. This insurance shall be coordinated with the Contractor's general liability policy and shall provide bodily injury and property damage coverage similar to the Contractor's general liability policy. Coverage shall include contractual liability.

Add the following new paragraphs immediately after paragraph 5.04.B.6:

7. contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;

8. with respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, and all other liability insurance specified herein to be provided by Contractor, Contractor shall require its insurance carriers to waive all rights of subrogation against Owner, Engineer, and their respective officers, directors, partners, employees, and agents.

Add the following new paragraphs immediately after paragraph 5.04.B:

C. The insurance required by paragraph 5.04 shall include coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. This policy shall include an "all states" endorsement.

D. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts but shall provide coverage in greater amounts where required by Laws and Regulations. This coverage may be primary or a combination of primary and umbrella excess liability.

1. Workers' Compensation, and related coverage under paragraphs 5.04.A.1 and 5.04.A.2 of the General Conditions:

a.	State	Statutory
b.	Applicable Federal (e.g., Longshoreman's)	Statutory
b.	Employer's Liability	$1,000,000 each occurrence

2. Commercial General Liability under paragraphs 5.04.A.3 through 5.04.A.6 of the General Conditions shall be occurrence type, written in comprehensive form, and shall protect Contractor, Owner, and Engineer as additional insureds, against claims arising from injuries, sickness, disease, or death of

any person or damage to property arising out of performance of the Work. The policy shall also include a per project aggregate limit endorsement, personal injury liability coverage, contractual liability coverage for blasting, explosion, collapse of buildings, and damage to underground property.

a.	General Aggregate	$1,000,000
b.	Products – Completed Operations Aggregate	$1,000,000
c.	Personal and Advertising Injury	$1,000,000
d.	Each Occurrence (Bodily Injury and Property Damage)	$1,000,000

e. Property Damage liability insurance will provide Explosion, Collapse and Underground coverage's where applicable.

3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions shall be occurrence type, written in comprehensive form, and shall protect Contractor, Owner, and Engineer as additional insureds, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the project site whether they are owned, nonowned, or hired. The liability limit shall be not less than:

a.	Bodily Injury	
	Each Person	$1,000,000
	Each Accident	$1,000,000
b.	Property Damage	
	Each Accident	$1,000,000
c.	Combined Single Limit	$1,000,000

4. Umbrella Liability Insurance shall protect Contractor, Owner, and Engineer as additional insureds, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the forms of the primary insurance, including the application of the primary limits. The liability limits shall be not less than:

Bodily injury and Property damage	$4,000,000 combined single limit for each occurrence
	$4,000,000 general aggregate

SC-5.05. Owner's Liability Insurance. Delete paragraph 5.05 in its entirety and insert the following new paragraph in its place:

5.05. *Owner's Liability Insurance*. This insurance shall be obtained by Contractor and issued in the name of Owner, and shall protect and defend Owner against claims arising as a result of the operations of Contractor or Contractor's Subcontractors. The liability limits shall be not less than:

a.	Bodily Injury	
	Each Occurrence	$1,000,000
	General Aggregate	$1,000,000
b.	Property Damage	
	Each Occurrence	$1,000,000
	General Aggregate	$1,000,000

SC-5.06. Property Insurance. Delete paragraph 5.06 in its entirety and insert the following new paragraphs in their place:

5.06. *Property Insurance*

A. Contractor shall purchase and maintain property insurance coverage upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, flood, damage caused by frost and freezing, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment accepted by Owner;

4. include expenses incurred in the repair or replacement of any insured property (including, but not limited to, fees and charges of engineers and architects);

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer, with 30 days' written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Contractor shall be responsible for any deductible or self-insured retention.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 shall contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. If Owner requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, Contractor shall, if possible, include such insurance, and the cost thereof will be charged to Owner by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, Contractor shall in writing advise Owner whether or not Contractor has procured such other special insurance.

SC-6. CONTRACTOR'S RESPONSIBILITIES.

SC-6.02. Labor; Working Hours. Add the following new paragraphs immediately after paragraph 6.02.B:

C. No Work shall be done between 6:00 p.m. and 7:00 a.m. without permission of Owner. However, emergency work may be done without prior permission.

D. Night Work may be undertaken as a regular procedure with the permission of Owner; such permission, however, may be revoked at any time by Owner if Contractor fails to maintain adequate equipment and supervision for the proper prosecution and control of the Work at night.

SC-6.03. Services, Materials, and Equipment. Amend the second sentence of paragraph 6.03.B by striking out the word "Engineer" and inserting the word "Owner" in its place.

SC-6.04. Progress Schedule. Amend the first sentence of paragraph 6.04.A.1 by striking out the word "Engineer" and inserting the word "Owner" in its place.

SC-6.05. Substitutes and "Or-Equals'. Amend paragraph 6.05, including paragraphs 6.05.A, 6.05.A.1, 6.05.A.1.a, 6.05.A.1.b, 6.05.A.2, 6.05.A.2.a, 6.05.A.2.b, 6.05.A.2.c, 6.05.A.2.d, 6.05.B, 6.05.C, 6.05.D, and 6.05.E by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owner's", respectively, in their place.

Add the following new paragraph after paragraph 6.05.A.2.d:

e. "If a proposed substitute item is accepted, all incidental costs associated with the use of the substitute including, but not limited to, redesign, claims of other Contractors, changes to electrical supply equipment, additional equipment or material required for the installation, etc., shall be at the expense of the Contractor proposing the substitute unless otherwise agreed to by the Owner."

SC-6.08. Permits. Add the following new paragraph immediately after paragraph 6.08.A:

B. Owner will obtain and pay for the following permits: Road & Highway Encroachment Permits, Kentucky Division of Water, and Stream Crossing Permits.

SC-6.09. Laws and Regulations. Add the following new paragraph immediately after paragraph 6.09.C:

D. Employment requirements shall be as specified herein and in the attachments at the end of the Supplementary Conditions.

SC-6.10. Taxes. Add the following new paragraph immediately after Paragraph 6.10.A of the General Conditions:

B. Portions of this project may be exempt from taxes. It is the Contractor's responsibility to determine any applicable exemptions.

SC-6.12. Record Documents. Amend the second sentence of paragraph 6.12.A by striking out the word "Engineer" and inserting the word "Owner" in its place.

Amend the third sentence of paragraph 6.12.A by striking out the words "Engineer for".

SC-6.16. Emergencies. Amend paragraph 6.16 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

Add the following new paragraph immediately after paragraph 6.16.A:

B. The Contractor understands and agrees that during the performance of the Contract, it shall maintain a presence within such proximity of the Work Site which will allow it to respond to an emergency at the Work Site within one hour of receiving notice of an emergency, including emergencies occurring during non-working hours. The Contractor shall provide a list of emergency phone numbers for such purposes. If the Contractor does not have such a presence, it may satisfy this requirement by sub-contracting with a sub-contractor that does have such a presence, provided that any such sub-contractor must be approved by the Owner, in tits sole discretion, prior to the project pre-construction meeting.

SC-6.17. Shop Drawings and Samples. Amend paragraph 6.17, including paragraphs 6.17.A, 6.17.B, 6.17.C, 6.17.D, 6.17.D.1, 6.17.D.1.a, 6.17.D.1.b, 6.17.D.1.c, 6.17.D.1.d, 6.17.D.2, 6.17.D.3, 6.17.E.1, 6.17.E.2, 6.17.E.3, and 6.17.F.1 by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owner's", respectively, in their place.

SC-6.19. Contractor's General Warranty and Guarantee. Amend paragraph 6.19.C.1 by adding the words "or Owner" at the end of the paragraph.

Amend paragraph 6.19.C.2 by striking out the words "recommendation by Engineer or".

Amend paragraph 6.19.C.3 by striking out the words "by Engineer".

Amend paragraph 6.19.C.6 by striking out the word "Engineer" and inserting the word "Owner" in its place.

Delete paragraph 6.19.C.7 and substitute the following new paragraph therefore:

7. any correction of defective Work by Owner; or

Add the following new paragraph immediately after paragraph 6.19.C.7:

8. any expiration of a correction period.

SC-7. OTHER WORK.

SC-7.01. Related Work at Site. Amend paragraphs 7.01.B and 7.01.C by striking out the word "Engineer" in all locations where it appears in the paragraphs and inserting the word "Owner" in its place.

SC-8. OWNER'S RESPONSIBILITIES.

SC-8.01. Communications to Contractor. Amend paragraph A by striking out "through Engineer".

SC-8.02. Replacement of Engineer. Delete paragraph 8.02 in its entirety.

SC-9. ENGINEER'S STATUS DURING CONSTRUCTION.

SC-9.01. Owner's Representative. Delete paragraph 9.01 in its entirety.

SC-9.02. Visits to Site. Amend paragraphs 9.02.A and 9.02.B by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owners", respectively, in their place. Add following new paragraph:

B. Engineer may make visits to the Site as Owner deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, at the request and benefit of Owner, may determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will advise Owner of the progress of the Work and will endeavor to guard Owner against defective Work.

SC-9.04. Clarifications and Interpretations. Amend paragraph 9.04 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-9.05. Authorizing Variations in Work. Amend paragraph 9.05 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-9.06. Rejecting Defective Work. Amend paragraph 9.06 by striking out the word "Engineer" in all locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-9.07. Shop Drawings, Change Orders and Payments. Delete paragraph 9.07 in its entirety.

SC-9.08. Determinations for Unit Price Work. Delete paragraph 9.08 in its entirety.

SC-9.09. Decisions on Requirements of Contract Documents and Acceptability of Work. Delete paragraph 9.09 in its entirety.

SC-9.10. Limitations on Engineer's Authority and Responsibilities. Delete paragraph 9.10.D in its entirety.

SC-10. CHANGES IN THE WORK.

SC-10.03. Execution of Change Orders. Amend paragraph 10.03.A by striking out the words "recommended by Engineer".

Amend paragraph 10.03.A.3 by striking out the word "Engineer" and inserting the word "Owner" in its place.

SC-10.05. Claims and Disputes. Amend paragraph 10.05 by deleting paragraphs 10.05.A, 10.05.B, 10.05.B.1, 10.05.B.2, and 10.05.C in their entirety and inserting the following new paragraphs in their place:

A. *Notice*. Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by Contractor to Owner no later than 30 days after the start of the event giving rise thereto. Notice of the amount of extent of the Claim, dispute, or other matter with supporting data shall be delivered to Owner within 60 days after the start of such event, unless the Owner allows, in writing, additional time for Contractor to submit additional or more accurate data in support of such Claim, dispute, or other matter. A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by Contractor's written statement that the adjustment claimed is the entire adjustment to which Contractor believes it is entitled as a result of said event.

B. *Owner's Decisions*. Owner will render a formal decision in writing within 30 days after receipt of the last submittal of Contractor.

C. If Owner does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of Contractor, unless Owner notifies Contractor in writing that a formal decision is pending and will be rendered within a specified number of days or by a specified date.

SC-11. COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK.

SC-11.01. Cost of the Work. Amend the second sentence of paragraph 11.01.A.3 by striking out the words “with the advice of Engineer”.

Amend paragraph 11.01.D by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-11.02. Cash Allowances. Amend paragraph 11.02.A by striking out the words “and Engineer”.

Amend paragraph 11.02.B by striking out the words “as recommended by Engineer”.

SC-11.9. Unit Price Work. Add the following new paragraph immediately after paragraph 11.9.3.3

11.9.4. The unit price of an item of Unit Price Work shall be subject to reevaluation and adjustment by Change Order if the variation in the actual quantity of an item of Unit Price Work performed by Contractor differs by more than 25 percent from the estimated quantity of that item indicated in the Bid.

SC-12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES.

SC-12.01. Change of Contract Price. Delete paragraph 12.01.A in its entirety and insert the following new paragraph in its place:

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by Contractor to Owner in accordance with the provisions of paragraph 10.05.

SC-12.02. Change of Contract Times. Delete paragraph 12.02.A in its entirety and insert the following new paragraph in its place:

A. The Contract Times (or Milestones) may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by Contractor to owner in accordance with the provisions of paragraph 10.05.

SC-12.03. Delays. Insert the following new sentence following the first sentence of paragraph 12.03.A:

This extension shall be Contractor’s sole and exclusive remedy for such delay.

Insert the following new paragraph 12.03.F immediately after paragraph 12.03.E:

F. In no event shall Owner be liable to Contractor, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages (including acceleration costs) arising out of or resulting from any delay.

SC-13. TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK.

SC-13.02. Access to Work. Add the following new paragraph immediately after paragraph 13.02.A:

B. Authorized representatives of the U.S. Environmental Protection Agency and the Kentucky Division of Water shall have access to the Work whenever it is in preparation or progress. Contractor shall provide proper facilities for such access and inspection.

SC-13.03. Tests and Inspections. Amend paragraph 13.03.A by striking out the word "Engineer" and inserting the word "Owner" in its place.

Amend paragraph 13.03.C by striking out the word "Engineer" and inserting the word "Owner" in its place.

Amend paragraph 13.03.E by striking out the word "Engineer" in both locations where it appears in the paragraph and inserting the word "Owner" in its place.

Amend paragraph 13.03.F by striking out the word "Engineer" in both locations where it appears in the paragraph and inserting the word "Owner" in its place.

SC-13.04. Uncovering Work. Amend paragraph 13.04.A by striking out the words "Engineer" and "Engineer's" in all locations where they appear in the paragraph and inserting the words "Owner" and "Owner's", respectively, in their place.

Delete paragraph 13.04.B in its entirety and insert the following new paragraph in its place:

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

parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in paragraph 10.05.

SC-13.06. Correction or Removal of Defective Work. Amend paragraph 13.06.A by inserting the words “or Owner” following the word “Engineer”.

SC-13.07. Correction Period. Add the following new paragraph after paragraph 13.07.E:

F. Nothing in Article 13 concerning the correction period shall establish a period of limitation with respect to any other obligation which Contractor has under the Contract Documents. The establishment of time periods relates only to the specific obligations of Contractor to correct the Work, and has no relationship to the time within which Contractor's obligations under the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations other than to specifically correct the Work.

All machinery, piping, materials, equipment, fittings, and restoration of every kind furnished under this Contract by the Contractor shall be free from defects of manufacture and/or workmanship. The Contractor agrees to replace materials, workmanship, and restoration, which includes all roadway pavement work, shoulder and ditch restoration and repairs, which are found to be defective within twenty four (24) months after issuance of the “Certificate of Substantial Completion”. In cases where such defects shall be caused by forces beyond the Contractor’s control, as judged by the Owner, the replacements will not have to be made by the Contractor.

SC-13.08. Acceptance of Defective Work. Delete paragraph 13.08.A in its entirety and insert the following new paragraph in its place:

A. If, instead of requiring correction or removal and replacement of defective Work, Owner, prior to making final payment, prefers to accept it, Owner may do so. Contractor shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner’s evaluation of and determination to accept such defective Work and the diminished value of the Work to the extent not other wise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Owner making final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of the Work so accepted. If the acceptance occurs after making final payment, an appropriate amount will be paid by Contractor to Owner.

SC-13.09. Owner May Correct Defective Work. Amend paragraph 13.09.A by striking out the word “Engineer” in all locations where it appears in the paragraph and inserting the word “Owner” in its place.

SC-14. PAYMENTS TO CONTRACTOR AND COMPLETION.

SC-14.01. Schedule of Values. Amend paragraph 14.01.A by striking out the word “Engineer” and inserting the word “Owner” in its place.

SC-14.02. Progress Payments. Amend paragraph 14.02.A by striking out the word "Engineer" and inserting the word "Owner" in its place.

Add the following new paragraphs immediately after paragraph 14.02.A.3:

4. Contractor's Applications for Payment shall be accompanied by the documentation specified herein.

5. Payments for stored materials and equipment shall be based only upon the actual cost to Contractor of the materials and equipment and shall not include any overhead or profit to Contractor. Partial payments will not be made for undelivered materials or equipment.

6. During the progress of the Work, each Application for Payment shall be accompanied by Contractor's updated schedule of operations, or progress report, with such shop drawings schedules, procurement schedules, value of material on hand included in application, and other data specified in Contract Documents or reasonably required by Owner.

Delete paragraphs 14.02.B and 14.02.C in their entirety and insert the following new paragraphs in their place:

B. *Review of Applications*

1. Owner will, within 10 days after receipt of each Application for Payment, either begin processing the Application for Payment to Contractor or return the Application to Contractor indicating in writing Owner's reasons for refusing payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Owner's review of Contractor's Application for Payment will consider whether the following have been achieved:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications as reasonably applied by Owner); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as Owner or Engineer has observed the Work.

3. By processing and making such payment Owner will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Owner's review of Contractor's Work for the purposes of processing payments nor Owner's making any such payments, including final payment, will impose responsibility on Owner:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's performance of the Work.

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Owner may refuse to process or make the whole or any part of any payment if, in Owner's opinion, the criteria referred to in paragraph 14.02.B.2 has not been met. Owner may also refuse to process or make any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment previously made, to such extent as may be necessary in Owner's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

Delete paragraphs 14.02.C in its entirety and insert the following new paragraphs in its place:

C. *Payment Becomes Due*

1. Twenty-five days after presentation of the Application for Payment to Owner, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

Amend paragraph 14.02.D.1 by striking out the words “recommended by Engineer” and inserting the words “requested by Contractor” in their place.

Delete paragraph 14.02.D.2 in its entirety and insert the following new paragraph in its place:

2. If Owner refuses to make payment of the full amount requested by Contractor, Owner must give Contractor immediate written notice stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner’s satisfaction the reasons for such action.

SC-14.04. Substantial Completion. Delete paragraph 14.04.A in its entirety and insert the following new paragraph in its place:

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Owner issue a certificate of Substantial Completion.

B. Promptly thereafter, Owner and Contractor shall make an inspection of the Work to determine the status of completion. If Owner does not consider the Work substantially complete, Owner will notify Contractor in writing giving the reasons therefor.

C. If Owner considers the Work substantially complete, Owner will within 14 days after the inspection of the Work execute and deliver to Contractor a statement of Substantial Completion.

D. At the time of delivery of the certificate of Substantial Completion, Owner will deliver to Contractor a statement as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor subsequently agree otherwise in writing, Owner’s aforesaid statement will be binding on Owner and Contractor until final payment.

Add the following new paragraphs following paragraph 14.04.A:

To be considered substantially complete, the following portions of the Work must be operational and ready for Owner's continuous use as intended: Water main is tested and placed into service, services are connected to the new main if applicable to the project, and rough restoration is complete.

Portions of the Work not essential to operation, which can be completed without interruption of the Owner’s operation, may be completed after the Work is accepted as

substantially complete, and may include the following items: final restoration such as seeding and sodding.

SC-14.05. Partial Utilization. Amend paragraph 14.05.A by striking out the word “Engineer”.

SC-14.06. Final Inspection. Delete paragraph 14.06.A in its entirety and insert the following new paragraph in its place:

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

SC-14.07. Final Application for Payment. Amend paragraph 14.07.A.1 by striking out the word “Engineer” and inserting the word “Owner” in its place.

Add the following new sentence immediately after the last sentence of paragraph 14.07.A.2.b.:

Consent of the surety, signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the surety. The Contractor shall be responsible for providing all of the documents identified in this paragraph.

Delete paragraph 14.07.B in its entirety and insert the following new paragraph in its place:

B. *Review of Application and Acceptance*. If, on the basis of Owner’s observation of the Work during construction and final inspection, and Owner’s review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Owner is satisfied that the Work has been completed and Contractor’s other obligations under the Contract Documents have been fulfilled, Owner will process the final Application for Payment. Otherwise, Owner will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to process final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

Amend paragraph 14.07.C by striking out the words “recommended by Engineer” and inserting the words “requested by Contractor” in their place.

SC-14.08. Final Completion Delayed. Delete paragraph 14.08.A in its entirety and insert the following new paragraph in its place:

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, Owner shall, upon receipt of Contractor’s final Application for Payment, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Owner with the Application

for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

SC-15. SUSPENSION OF WORK AND TERMINATION.

SC-15.01. Owner May Suspend Work. Amend paragraph 15.01.A by striking out the words "and Engineer".

SC-15.02. Owner May Terminate for Cause. Amend paragraph 15.02.B by deleting the fourth sentence of the paragraph, in its entirety, which begins: "Such Claims, costs, losses, and damages incurred…".

SC-15.04. Contractor May Stop Work or Terminate. Delete paragraph 15.04.A and 15.04.B in their entirety and insert the following new paragraph in its place:

A. If, through no act or fault of Contractor, the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or Owner fails to act on any Application for Payment within 30 days after it is submitted, or Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner, and provided Owner does not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner, stop the Work until payment is made of all such amounts dues Contractor, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude Contractor from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

SC-16. DISPUTE RESOLUTION.

Delete Article 16 in its entirety and insert the following new article in its place:

ARTICLE 16 - DISPUTES.

Arbitration will not be acceptable as a means for settling claims, disputes, and other matters.

SC-17. MISCELLANEOUS.

SC-17.04. Survival of Obligations. Add the following new paragraph immediately after paragraph 17.04.A:

B. Contractor shall obtain from all Suppliers and manufacturers any and all warranties and guarantees of such Suppliers and manufacturers, whether or not specifically required by the Specifications, and shall assign such warranties and guarantees to Owner. With respect thereto, Contractor shall render reasonable assistance to Owner

when requested, in order to enable Owner to enforce such warranties and guarantees. The assignment of any warranties or guarantees shall not affect the Correction Period or any other provisions of these Contract Documents.

End of Section

DIVISION 01

GENERAL REQUIREMENTS

SECTION 011100 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK PERFORMED UNDER THIS CONTRACT

This project consists of construction of a new 500,000 gallon multi-column or pedesphere style elevated water tank, with all associated site piping, valves, site work, utility building (for Bid Option No. 1), instrumentation and electrical work as shown on the drawings and specifications.

1.2 ENUMERATION OF DRAWINGS & SPECIFICATIONS

Following are the Drawings and Specifications which form the Contract Documents as set forth in Section 1.1 of the General Conditions:

Drawings Sheet Number

See Sheet G-00-001 Sheet Index

Specifications

See Table of Contents

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011100

SECTION 011400 – GENERAL PROVISIONS

PART 1 - GENERAL

1.1 DESIGNATION OF PARTIES

A. All references in the Specifications, Contract Documents and Drawings to "Owner" shall mean Northern Kentucky Water District; all references to "Engineer" shall mean GRW Engineers, Inc., 801 Corporate Drive, Lexington, Kentucky 40503.

1.2 EXPERIENCE CLAUSE

A. Wherever experience is required of equipment manufacturers in manufacturing or in records of satisfactory operation for a specified period of time, in lieu of the experience, the manufacturer may furnish a 100 percent (100%) performance guarantee bond or a cash deposit. The bond or cash deposit provided by the manufacturer shall guarantee replacement of the equipment process in the event of failure or unsatisfactory service. The period of time for which the bond or cash deposit is required shall be the same as the experience period of time specified.

1.3 ACCESS TO INSPECTION OF WORK

A. Representatives of the State Department of Health, the State Department for Natural Resources and Environmental Protection, local public health agencies, Owner, and Engineer shall at all times have full access to the project site for inspection of the work accomplished under this Contract and for inspection of all materials intended for use under the Contract. The Contractor shall provide proper facilities for such access and inspection.

1.4 EQUIPMENT LUBRICATION

A. The Contractor shall make suitable provision for the proper lubrication of all equipment furnished under this Contract. Accessible grease fittings shall be provided where required. A supply of oil, grease and other lubricants of proper quality, as recommended by the manufacturer of the equipment, shall be furnished. Lubricants shall be furnished in their original, unopened containers, in sufficient quantity for initial fillings and for at least one (1) year of operation.

1.5 PRE-CONSTRUCTION CONFERENCE

A. The Contractor, Engineer and Owner, or their duly appointed representative, shall meet in a preconstruction conference prior to the initiation of construction to organize, schedule and determine responsibilities for the work as it pertains to each party of the Contract.

1.6 CONSTRUCTION SCHEDULE CHART

A. Prior to start of any construction, the Contractor shall furnish a construction schedule or progress chart. The schedule or chart shall be subject to the approval of the Engineer, and be of sufficient detail to show the chronological relationship of all activities of the project, the order in which the Contractor proposes to carry on the work, estimated starting and completion dates of major features, procurement of materials, and scheduling of equipment. The schedule shall be in a form suitable for appropriately indicating the percentage of work scheduled for completion at any time. The schedule shall be kept current and shall reflect completion of all work under the Contract within the specified time and in accordance with these Specifications.

1.7 CONSTRUCTION PROGRESS MEETINGS

A. Monthly construction progress meetings shall be held at the project site or at a designated location established by the Owner. The Contractor, appropriate Sub-Contractors, the Engineer and the Owner shall meet to review construction progress, equipment or material submittals, construction schedules, etc.

1.8 PRECONSTRUCTION PHOTOGRAPHS

A. Prior to construction and mobilization of equipment, Contractor shall take record photographs of all areas of the project site.

B. In lieu of photographs, a videographic record may be made of the project site.

1.9 SPARE PARTS

A. Spare parts for routine maintenance and minor repairs shall be provided for specified equipment items in the respective technical sections of these Specifications. Required spare parts to be provided are listed in the particular equipment Specifications.

B. Parts shall be coated to protect them from a moist atmosphere. All spare parts shall be plainly tagged, marked for identification and reordering, and shall be delivered properly boxed. Required identification includes (but is not limited to):

1. Name of the manufacturer or supplier of equipment.
2. Name of the unit for which the part is intended.
3. Name of the spare part.
4. Name of the supplier of the spare part.
5. Manufacturer's catalogue part number.
6. Precautionary information.
7. Any other identifying information deemed appropriate.

C. All spare parts for a single equipment item shall be crated together in containers suitable for handling with hoisting equipment and designed for prolonged storage and stenciled to identify contents.

D. Where oil or grease lubricated equipment is concerned, sufficient oil or grease of types recommended by the equipment manufacturer shall be supplied for one year's operation.

E. The Contractor shall furnish and deliver the spare parts to the Owner at such time as he (Owner) may direct but prior to Contract expiration date. Furnish to the Engineer for record purposes a list of spare parts delivered to the Owner.

1.10 CLEANING

A. The Contractor shall at all times keep the construction site and the surrounding area presentable to the public, and clean of rubbish caused by the Contractor's operation. At completion of the work, the Contractor shall remove all the rubbish, all tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the site clean and ready for use.

B. After completion of all work and before final acceptance of the work, the Contractor shall thoroughly clean all equipment and materials and shall remove all foreign matter such as grease, dirt, plaster, labels, stickers, etc., from the exterior of the piping, equipment and all associated fabrication.

C. All waste and excess materials shall be disposed of off the project site and at no additional expense to the Owner. In no case shall waste materials (any removed concrete, piping, equipment, etc.) be buried on the site. Burning is not permitted.

D. Upon completion of the project, the Contractor is responsible for leaving the project site in as good as or better condition than the original. This includes site grading, landscaping, replacement of sidewalks, driveways, curbs, mailboxes, clotheslines, fences, etc. and removal of all construction debris.

1.11 TAXES

A. Proposals shall be made to include any applicable taxes on payrolls, materials, equipment, vehicles, utilities, etc., including State sales taxes and shall include compensation for such taxes on all work under this Contract.

1.12 LINES AND GRADES

A. The Engineer will set a benchmark or marks near the site and furnish the Contractor with the elevation of same. The Engineer will assist the Contractor in laying out the axes of the structures. The Contractor shall be responsible for all other lines and grades required for the construction of structures. The Contractor shall set line and grade stakes for all gravity sewers, offset from the centerline of the trench or the axes of the pipelines.

B. The Contractor shall use a laser beam instrument to set the grades on gravity sewer lines. In using such an instrument, the Contractor shall be responsible for maintaining grades and elevations as called for on the drawing profiles, and any variances found shall be corrected by the Contractor at his expense. The Contractor shall verify invert elevation at each manhole for a check. A blower shall be used with the laser beam instrument during warm or hot weather to assure accurate line and grade for the laser beam.

C. When water lines, process piping and other such buried pressure pipelines are involved, the Engineer will assist the Contractor in the location of these lines; however, any detailed layout requiring surveying, or excavation including that required for establishing the grade of the pipeline, shall be accomplished by the Contractor.

D. The Contractor shall furnish all materials, stakes and grade boards that are required for layout by the Contractor's forces. In addition, the Contractor shall furnish any necessary survey personnel to mark the location of the various facilities on the ground, establishing bench levels and determining as-built conditions after work is completed. The Contractor's personnel engaged in the layout work described herein and the aides furnished to the Engineer shall be fully capable of performing the duties set out herein and shall be fully qualified as required. Contractor shall be responsible for verifying all profiles and elevations prior to construction.

1.13 BLASTING

A. All blasting operations shall be conducted in strict accordance with the Rules and Regulations of the State Department of Mine and Minerals, Division of Explosives and Blasting, which shall be deemed to be included in these Specifications the same as though herein written in full. The Contractor shall also comply with applicable municipal ordinances, Federal Safety Regulations and Section 9 of the Manual of Accident Prevention in Construction, published by the Associated General Contractor's of America, Inc. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. No blasting shall be done within five feet of any water mains, or ten feet of any gas mains except with light charges of explosives. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him. All blast events shall be designed in accordance with state laws. These guidelines are established to limit peak particle velocities occurring as a result of blasting to protect structures from damage due to ground motions from blast events. The peak particle velocity is the maximum velocity of particle excitation measured along any of the three orthogonal axes (longitudinal, vertical or transverse). In addition the following guidelines shall be applicable to new concrete.

Age of Concrete, Days*	Maximum Permissible Particle Velocity, IPS**
0 to 1	0.25
2	0.50
3-or more	1.00

* Concrete is defined as properly designed and placed, well-consolidated Portland Cement concrete achieving a normal increase in strength with age.

** Measured at location of concrete, by probe fixed in or on soil surface.

As an option, a scaled distance (distance from blast to concrete/-square root of charge weight) of 130 or more can be used conservatively to design blast events.

B. Unless otherwise required by ordinance or law, each excavation crew shall be provided with two metal boxes equipped with suitable locks. One of these boxes shall be for storing explosives and one for caps. The boxes shall always be locked except when in actual use. They shall be

painted a bright color and stenciled with appropriate warning signs. At night, explosives and caps shall be stored in separate magazines.

C. If any possibility exists of rock or any other debris leaving the site during a blast event, the shot shall be covered with rope, heavy timber or rubber mats, to prevent the aforementioned.

D. The Contractor shall keep a blasting log and, for each blast, shall record the date, time of blast, number of holes, type of explosive, number of delays, amount of charge per delay; stemming type, and number of caps; and all other items as required by State laws and regulations.

E. All blasting shall be supervised and performed by qualified personnel and shall be monitored to ensure compliance with the particle velocity requirements. The Contractor shall submit a monitoring plan to the Engineer prior to beginning blasting activities.

F. A pre-blast survey shall be performed by the Contractor. The pre-blast survey shall be accurate and up to date at the time of the blast event. The survey shall be a compilation of the condition, type, and general appearance of all nearby structures. It shall also include a listing of any vibration-sensitive equipment or conditions which exist at adjacent facilities. The owners and occupants of these facilities shall be notified of the intent to blast and the blasting schedule. The survey shall be conducted by a competent engineering firm or other qualified firm and sufficiently documented by photographs, video, measurements, and diagrams. The survey shall include all structures within 200' of the project or any such structure the Contractor feels may be reasonably affected by ground and/or air vibrations from blasting. Pre-blast survey results shall be submitted to the Owner upon request.

G. Shot rock which is excavated shall be disposed of offsite by the Contractor. No rock larger than one-half cubic foot will be permitted in the backfill.

1.14 COMPLIANCE WITH SAFETY REGULATIONS

A. The equipment items furnished shall comply with all governing federal and state laws regarding safety, including all current requirements of the Occupational Safety and Health Act (OSHA). Contractor shall be solely responsible for job safety in accordance with all laws, regulations, methods, etc. of OSHA and the state.

1.15 MAINTENANCE AND OPERATIONS MANUAL

A. Every piece of equipment furnished and installed shall be provided with complete maintenance and operations manuals. These shall be detailed in instructions to the Owner's personnel. They shall be attractively bound for the Owner's records. See 01 33 23 and Section 01 78 23 for requirements. The manuals shall be submitted to the Engineer for review as to adequacy and completeness. Provide four copies each, unless otherwise noted.

1.16 OBSTRUCTIONS

A. In cases where storm sewers, sanitary sewers, gas lines, water lines, telephone lines, electric lines or other underground structures are encountered, they shall not be displaced or molested

unless necessary, in which case they shall be replaced in as good a condition as found and as quickly as possible.

B. The Contractor is responsible for notifying the appropriate utility companies, and coordinating the protection of the utility. 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.

1.17 STORAGE FACILITIES

A. The Contractor shall be responsible for proper and adequate storage of all materials and equipment used on the site. Any additional off-site space required for construction purposes shall be the Contractor’s responsibility to obtain.

B. Upon completion of the work, the Contractor shall remove all storage facilities, surplus materials and equipment and restore the site to its original condition, or to the finished condition as required by the Contract.

1.18 STANDARDS OF WORKMANSHIP

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. 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.

1.19 PERFORMANCE AND PAYMENT BONDS

A. Performance and payment bonds, as specified in of the General Conditions, shall run for a period of one (1) year after final acceptance of the work by the Owner. These bonds shall be executed on the forms provided as a part of the Contract Documents.

1.20 INITIAL START-UP AND OPERATION

A. The initial operation period provided for herein is to check and provide the satisfactory mechanical operation of the facilities. These requirements for start-up and operation in no way relieve the Contractor of his responsibility with respect to guaranty of work as specified in the "General Conditions." The manufacturer's representatives shall be present during this period to instruct the operators in the care, operation and maintenance of the equipment. When the shakedown period is completed, the Owner will assume responsibility for maintenance and operation, provided that all major items of the Work are operating satisfactorily.

B. If any or all of the facilities are not operating satisfactorily at the end of the shakedown period, the Contractor shall continue to maintain those facilities that are incomplete or not operating satisfactorily until they are complete and acceptable to the Owner. Maintenance by the Contractor shall include all mechanical facilities such as pumps and like equipment. Prior to

start-up, the Contractor will be required to prepare an operating schedule detailing the proposed start-up and his plans for manpower and auxiliary facilities to be provided.

1.21 GUARANTY

A. Except as otherwise specified herein, the Contractor shall guarantee all work from latent defects in materials, equipment and workmanship for one (1) year from the date of substantial completion of the Contract as defined in Section 01 77 00 of the technical Specifications.

B. The Contractor agrees that he will obtain from the manufacturers of equipment and materials furnished under this Contract, guarantees against defective materials and workmanship, and if those guarantees furnished by the manufacturer do not extend for the term of one (1) year from and after the date upon which the final estimate is formally approved by the Owner or other established date as set forth hereinbefore, he shall make the necessary arrangements and assume all cost for extending this guarantee for the required period.

C. The Contractor shall promptly make such repairs or replacement as may be required under the above specified guarantee, and, when the repairs or replacements involve one or more items of installed equipment, shall provide the services of qualified factory-trained servicemen in the employ of the equipment manufacturers to perform or supervise the repairs or replacements.

D. When the Engineer or the Owner deems it necessary, and so orders, such replacements or repairs under this section shall be undertaken by the Contractor within twenty-four (24) hours after service of notice. If the Contractor unnecessarily delays or fails to make the ordered replacements or repairs within the time specified, or if any replacements or repairs are of such nature as not to admit of the delay incident to the service of a notice, then the Owner shall have the right to make such replacements or repairs, and the expense thereof shall be paid by the Contractor or deducted from any moneys due the Contractor.

E. The Performance Bond shall remain in full force and effect throughout the Guaranty period.

F. All warranties and guarantees remaining in effect at and beyond the Guaranty expiration date shall be relinquished and transferred to the Owner. Copies of such warranty/guaranty shall be submitted to the Engineer prior to date of the start of the guaranty period.

1.22 TRAFFIC CONTROL AND MAINTENANCE

A. Traffic shall be maintained on all highways and streets at all times during construction of pipe lines across or along side said highways and streets. Access to all existing subdivisions and private residences shall also be kept open. Work shall be performed in accordance with applicable City, County, and state Department of Transportation guidelines. Traffic control shall include proper signing and flagging per these guidelines.

B. Traffic shall be maintained in accordance with the Manual on Uniform Traffic Control Devices. Work shall include all labor and materials necessary for construction and maintenance of traffic control devices and markings.

C. Traffic control shall also include all flag persons and traffic control devices such as, but not limited to, flashers, signs, barricades and vertical panels, plastic drums (steel drums will not be

permitted) and cones necessary for the control and protection of vehicular and pedestrian traffic as specified by the Manual on Uniform Traffic Control Devices.

D. Any temporary traffic control items, devices, materials, and incidentals shall remain the property of the Contractor when no longer needed.

E. The Contractor shall maintain a two-lane traveled way with a minimum lane width of 10 feet; however, during working hours, one-way traffic may be allowed at the discretion of the Engineer, provided adequate signing and flagpersons are at the location.

F. The Contractor shall fully cover with plywood any signs, either existing, permanent or temporary, which do not properly apply to the current traffic phasing, and shall maintain the covering until the signs are applicable or are removed.

G. In general, all traffic control devices shall be placed starting and proceeding in the direction of the flow of traffic and removed starting and proceeding in the direction opposite to the flow of traffic.

H. The Engineer and Contractor shall review the signing before traffic is allowed to use lane closures, crossovers, or detours, and all signing shall be approved by the Engineer before work can be started by the Contractor.

I. If traffic should be stopped due to construction operations and an emergency vehicle on an official emergency run arrives on the scene, the Contractor shall make provisions for the passage of that vehicle immediately.

1.23 FLOOD INSURANCE

A. Contractor is required to carry flood insurance for projects which are located in designated flood hazard areas unless Federal Flood Insurance is not available.

1.24 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:

1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.
2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed

in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials.

B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters means those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
4 For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.
7 Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.

9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.
12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.
13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:

    a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
    b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
    c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
    d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
    e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
    f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
    g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.

h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.

i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.25 PROTECTION OF VEGETATION

A. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

1.26 PIPE AND MANHOLE REPLACEMENT

A. Where indicated in the Contract Documents, pipe and manholes to be replaced shall be removed from the site and disposed of by the Contractor. Material shall not be placed back in the trench or buried on the site.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011400

SECTION 011410 – SPECIAL PROVISIONS

PART 1 - GENERAL

1.1 SUBSURFACE DATA

All soundings, boring logs, or other data pertaining to the subsurface conditions as referred to in the Drawings and Specifications is believed to be reasonably correct. However, the Engineer does not guarantee the accuracy or adequacy of such information.

Copies of reports entitled "Geotechnical Exploration NKWD Taylor Mill Tank" will be provided as Appendix "A" of these specifications and are also available for inspection at the offices of GRW Engineers, Inc., Lexington, KY 40503.

NOTE WELL:

Bidders and prospective bidders are hereby warned and put on notice that the borings and soundings referred to above were made for design purposes only. They were not made for the purpose of informing bidders and prospective bidders as to subsurface conditions in the area of the work covered by these contracts and are not, in the opinion of the Engineer, sufficient or extensive enough to provide any accurate or reliable indication of subsurface conditions in the area covered by the work to be performed under these contracts other than at the location of the borings referred to. In bidding on this Contract, each bidder acknowledges that he has made whatever investigation of subsurface conditions he has deemed necessary for the purposes of bidding. The Contractor is urged to make such investigations as he deems necessary to ascertain the subsurface conditions to be encountered in the work.

1.2 CONNECTION TO EXISTING SYSTEM

Contractor shall schedule and coordinate with NKWD for connection of new water line to existing water line along KY-16 so that water service downtime is minimized. Contractor shall provide NKWD ample notice on timeframe/schedule to make connection.

1.3 START-UP AND OWNER TRAINING

After each piece of equipment is successfully started-up, the Contractor shall "Video" the Owner's training administered by the particular piece of equipment's factory Representative. The video shall be given to the Owner for future reference.

1.4 SITE LIMITS

In no instance shall any work, materials, equipment, etc. be placed outside of the KY 16 road right-of-way on the west side of KY 16 onto private property.

1.5 PERMITS

See Appendix B for permits already obtained for this project. Contractor shall follow all permit conditions and requirements indicated in the permits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011410

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes administrative and procedural requirements governing allowances. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.

C. The following allowances shall be included in the Contractors bid:

1. None.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Engineer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Engineer's request, obtain proposals for each allowance for use in making final selections and include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by the Engineer from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 LUMP-SUM & UNIT-COST ALLOWANCES

A. Allowances shall include cost to Contractor to make structural repairs to either of the package wastewater treatment plants that are not specifically detailed. Payment will be made on a time and material basis.

1.7 UNUSED MATERIALS

A. Contractor shall be responsible for returning unused materials purchased under an allowance to the manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

B. When it is not economically practical to return material for credit, Contractor shall be responsible for preparing and delivering unused material to Owner's designated storage location. Otherwise, disposal of unused material shall be Contractor's responsibility.

C. Any amount of the allowance not used will be removed from total contract price during the final adjusting change order.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

END OF SECTION 012100

SECTION 012213 – BASIS OF MEASUREMENT AND PAYMENT - LUMP SUM

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, service 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 price as indicated by the Bidder in the Bid.

B. The Bidder declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the place where the Work is to be done; that he has examined the Plans, Specification and Contract Documents for the Work, and has read all special provisions furnished prior to the opening of bids; and that he has further satisfied himself relative to the Work to be performed.

C. All excavation required of the work shall be done as part of the total price for the complete project. All excavation shall be unclassified.

D. Owner shall make payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer, on a monthly schedule during construction. All progress payments will be on the basis of the progress of the Work measured by the Schedule of Values established in Paragraph 2.05 of the General Conditions or, in the event there is no schedule of values, as provided in the General Requirements.

E. The Progress Payments shall include the cost of Stored Materials, LESS an amount of retainage equal to 10% of their total cost. Stored materials are defined as materials and equipment not incorporated in the Work but delivered, suitably stored and accompanied by documentation satisfactory to Owner as provided in Paragraph 15.01 of the General Conditions.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012213

SECTION 012500 – PRODUCTS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. General: Substitution of materials and/or equipment is defined in Paragraph 6.7.1 of the General Conditions and more fully hereinafter.

B. Definitions: Definitions used in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents including such terms as "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction" and similar terms. Such terms are self-explanatory and have recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the project or taken from the Contractor's previously purchased stock. The term "product" as used herein includes the terms "material", "equipment", "system" and other terms of similar intent.
2. "Named Products" are products identified by use of the manufacturer's name for a product, including such items as a make or model designation, as recorded in published product literature, of the latest issue as of the date of the Contract Documents.
3. "Materials" are products that must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form units of work.
4. "Equipment" is defined as a product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.

C. Substitutions: The Contractor's requests for changes in the products, materials, equipment and methods of construction required by the Contract Documents are considered requests for "substitutions", and are subject to the requirements specified herein. The following are not considered as substitutions:

1. Revisions to the Contract Documents, where requested by the Owner, Engineer are considered as "changes" not substitutions.
2. Substitutions requested during the bidding period, which have been accepted prior to the Contract Date, are included in the Contract Documents and are not subject to the requirements for substitutions as herein specified.
3. Specified Contractor options on products and construction methods included in the Contract Documents are choices available to the Contractor and are not subject to the requirements for substitutions as herein specified.
4. Except as otherwise provided in the Contract Documents, the Contractor's determination of and compliance with governing regulations and orders as issued by governing authorities do not constitute "substitutions" and do not constitute a basis for change orders.

D. Standards: Refer to Division-01 section "Definitions and Standards" for applicability of industry standards to the products specified for the project, and for acronyms used in the text of the specification sections.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to Work of this Section.

1.3 SUBMITTALS

The information required to be furnished for evaluation of product substitution will be as follows:

A. Performance capabilities and materials and construction details will be evaluated based upon conformance with the Specifications. Products that do not conform with the Specification shall not be accepted.

B. Manufacturer's production and service capabilities, and evidence of proven reliability will be acceptable if the following is furnished.

1. Written evidence that the manufacturer has not less than (3) years experience in the design and manufacture of the substitute product.
2. Written evidence of at least one application of a type and size similar to the proposed substitute product, in successful operation in a wastewater treatment plant for a period of at least one year.
3. In lieu of furnishing evidence of a manufacturer's Experience and successful operation of an application of the product to be substituted, the Contractor has the option of furnishing a cash deposit or bond which will guarantee replacement if the product the furnished does not satisfy the other requirements specified in this section. The amount of each deposit or bond will be subject to approval.

C. Specific reference to characteristics either superior or inferior to specified requirements will be evaluated based on their net effect on the project. Products with any characteristics inferior to those specified will not be acceptable unless offset by characteristics that, in the opinion of the Engineer, will cause the overall effect of the product on the project to be at least equal to that of those specified.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.

B. Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor.

C. The detailed estimate of operating and maintenance costs will be evaluated based on comparison with similar data on the specified products. Proposed substitute products which have an operating and maintenance cost that, in the opinion of the Engineer, exceeds that of the specified products will not be considered equal and will not be acceptable.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control delivery schedules to minimize long-term storage at the site and to prevent overcrowding of construction spaces. In particular coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily dam aged, or sensitive to deterioration, theft and other sources of loss.

A. Deliver products to the site in the manufacturer's sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.

B. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

C. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT COMPLIANCE

A. General: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a Contract Requirement. These requirements may be specified in any one of several different specifying methods, or in any combination of these methods. These methods include the following:

1. Proprietary.
2. Descriptive.
3. Performance.
4. Compliance with Reference Standards.

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the Contract Documents also have a bearing on the selection process.

B. Procedures for Selecting Products: Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects.

2.2 SUBSTITUTIONS

A. Conditions: Contractor's request for substitution will be received and considered when extensive revisions to the Contract Documents are not required, when the proposed changes are in keeping with the general intent of the Contract Documents, when the request are timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.

1. The Engineer will consider a request for substitution where the request is directly related to an "or equal" clause or similar language in the Contract Documents.
2. The Engineer will consider a request for substitution where the specified product or method cannot be provided within the Contract Time. However, the request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.
3. The Engineer will consider a request for substitution where the specified product or method cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
4. The Engineer will consider a request for a substitution where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Engineer for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
5. The Engineer will consider a request for substitution when the specified product or method cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
6. The Engineer will consider a request for substitution when the specified product or method cannot be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.
7. The Engineer will consider a request for substitution when the specified product or method cannot receive a warranty as required by the Contract Documents and where the Contractor certifies that the proposed substitution receive the required warranty.
8. The Contractor shall reimburse the Owner any costs for review by the Engineer of proposed product substitutions which require major design changes, as determined by the Owner, to related of adjacent work made necessary by the proposed substitutions.

B. Work-Related Submittals: Contractor's submittal of and the Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of the Contract Documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

2.3 GENERAL PRODUCT REQUIREMENTS

A. General: Provide products that comply with the requirements of the Contract Documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

1. Standard Products: Where they are available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
2. Continued Availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.

B. Nameplates: Except as otherwise indicated for required labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on the exterior of the completed project.

1. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.
2. Equipment Nameplates: Provide permanent nameplate on each item of service-connected or power operated equipment. Locate the nameplate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data.

a. Name of manufacturer
b. Name of product
c. Model number
d. Serial number
e. Capacity
f. Speed
g. Ratings

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. General: Except as otherwise indicated in individual sections of these Specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at Time of Acceptance.

END OF SECTION 012500

SECTION 013113 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

Minimum administrative and supervisory requirements necessary for coordination of work on the project include but are not necessarily limited to the following:

A. Coordination and meetings.

B. Limitations for use of site.

C. Coordination of crafts, trades and subcontractors.

D. General installation provisions.

E. Cleaning and protection.

F. Conservation and salvage.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.3 COORDINATION AND MEETINGS

A. Monthly general project coordination meetings will be held at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Representation at each meeting by every party currently involved in coordination or planning for the work of the entire project is requested. Meetings shall be conducted in a manner which will resolve coordination problems. Results of the meeting shall be recorded and copies distributed to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.4 LIMITATIONS ON USE OF THE SITE

A. Limitations on site usage as well as specific requirements that impact site utilization are indicated on the drawings and by other contract documents. In addition to these limitations and requirements, allocation of available space shall be administered equitably among entities needing both access and space so as to produce the best overall efficiency in performance of the total work of the project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.

1.5 COORDINATION OF CRAFTS, TRADES AND SUBCONTRACTORS

A. The Contractor shall coordinate the work of all the crafts, trades and subcontractors engaged on the work, and he shall have final responsibility as regards the schedule, workmanship and completeness of each and all parts of the work.

B. 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 the execution of subcontractor agreements and the assignment of the parts of the work. Each craft, trade and subcontractor shall be made responsible to the Owner, for furnishing embedded items and giving directions, for doing all cutting and fitting and making all provisions for accommodating the work, and for protecting, patching, repairing and cleaning as required to satisfactorily perform the work.

C. The Contractor shall be responsible for all cutting, digging and other action 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.

D. 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 including Architectural and Structural Drawings, to the end that complete coordination between trades will be affected. Consult with the Engineer if conflicts exist on the Drawings.

E. Special attention shall be given to points where ducts or piping must cross other ducts or piping, where lighting fixtures must be recessed in ceilings and where ducts, piping and conduits must fit into walls and columns. It shall be the responsibility of such subcontractor to leave the necessary room for other trades.

F. No extra compensation will be allowed to cover the cost of removing piping, conduit, ducts, etc., or equipment found encroaching on space required by others.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013113

SECTION 013213 – CONTRACTOR'S SEQUENCE OF CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 CONTRACTOR'S CONSTRUCTION SEQUENCE, SCHEDULE & PROVISIONS

The Contractor shall be responsible for all planning, coordination and execution of the work. The sequence of work shall provide assurances that reliable water service will be maintained, and such sequences shall be approved by the Owner and the Engineer. No cost or schedule adjustments shall be given for changes to the construction sequence not approved by the Owner and Engineer.

The Contractor shall coordinate with the Owner for connection of the new water line to the existing water line and shall provide Owner with ample notice of proposed connection schedule.

The contractor shall be responsible for all damages brought about by the disruption of the operation if such disruptions are a direct cause of Contractor negligence and/or a failure of the Contractor to coordinate his work effort to minimize and/or eliminate disruptions in service.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013213

SECTION 013216 - PROGRESS SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Scheduling Responsibilities:

1. In order to provide a definitive basis for determining job progress, a construction schedule of a type approved by the Owner will be used to monitor the project.
2. The Contractor shall be responsible for preparing the schedule and updating on a monthly basis. It shall at all times remain the Contractor's responsibility to schedule and direct his forces in a manner that will allow for the completion of the work within the contractual period.

B. Construction Hours:

1. No work shall be done between 6:00 p.m. and 7:00 a.m. nor on Saturdays, Sundays or legal holidays without the prior written permission of the Owner. However, emergency work may be done without prior written permission.
2. If the Contractor, for his convenience and at his own expense, should desire to carry on his work at night or outside the regular hours, he shall submit a written request to the Engineer and shall allow nine (9) days for satisfactory arrangements to be made for inspecting the work in progress. If permission is granted, the Contractor shall light the different parts of the project as required to comply with all applicable federal, state, and local regulations. The Contractor shall also revise his schedule as appropriate at the next monthly schedule update meeting to reflect the changes in working hours.

C. Progress of the Work:

1. The work shall be started within thirty (30) days following the Notice to Proceed and shall be executed with such progress as may be required to prevent delay to other Contractors or to the general completion of the project. The work shall be executed at such times and in or on such parts of the project, and with such forces, material and equipment, to assure completion of the work in the time established by the Contract.
2. The Contractor agrees that whenever it becomes apparent from the current monthly schedule update that delays have resulted and, hence, that the Contract completion date will not be met or when so directed by the Owner, he will take some or all of the following actions at no additional cost to the Owner:

    a. Increase construction manpower in such quantities and crafts as will substantially eliminate the backlog of work.
    b. Increase the number of working hours per shift, shifts per working day or days per week, the amount of construction equipment, or any combination of the foregoing to substantially eliminate the backlog of work.
    c. Reschedule activities to achieve maximum practical concurrency of accomplishment of activities, and comply with the revised schedule.
    d. The Contractor shall submit to the Owner or the Owner's representative for review a written statement of the steps he intends to take to remove or arrest the delay to

the critical path in the accepted schedule. If the Contractor should fail to submit a written statement of the steps he intends to take or should fail to take such steps as required by the Contract, the Owner may direct the level of effort in manpower (trades), equipment, and work schedule (overtime, weekend and holiday work, etc.), to be employed by the Contractor in order to remove or arrest the delay to the critical path in the accepted schedule, and Contractor shall promptly provide such level of effort at no additional cost to the Owner.

1.2 CONSTRUCTION SCHEDULE

A. Within ten (10) calendar days of the Notice to Proceed, the Contractor shall submit to the Engineer five (5) copies of his proposed schedule. The schedule will be the subject of a schedule review meeting with the Contractor, the Engineer and the Owner or the Owner's representative within one (1) week of its submission. The Contractor will revise and resubmit the schedule until it is acceptable and accepted by the Owner or the Owner's representative.

1.3 SUBMITTAL SCHEDULE

A. In addition to the above scheduling requirements, the Contractor will be required to submit a complete and detailed listing of anticipated submittals during the course of the Contract. The Contractor will coordinate his submittals with those of his Subcontractors and Suppliers and will identify each submittal by Contract drawing number and specification number. The anticipated submission date for each submittal must be indicated along with the date on which its return is anticipated. For planning purposes, the Engineer will usually return shop drawings thirty (30) days after receipt. However, longer durations for review will not be considered a basis for a claim.

B. The Submittal Schedule must be submitted within twenty (20) working days of the Notice to Proceed and will be the subject of a special meeting with the Engineer and the Owner or the Owner's representative within one (1) week of the schedule's submission. At that meeting, the Submittal Schedule will be reviewed for comprehensiveness and feasibility. The Engineer will adjust the projected return dates based on the need for more or less time for each submittal's review. The Submittal Schedule will then be accepted or revised as required.

1.4 SCHEDULE UPDATES

A. Monthly Meetings:

1. A monthly Schedule Update Meeting will be held in conjunction with the applicable progress meeting at the construction site to review and update the Schedule. The Schedule Update Meetings will be chaired by the Owner or the Owner's representative and attended by the Contractor and the Engineer. Actual progress of the previous month will be recorded and future activities will be reviewed. The duration of activities and their logical connections may be revised as needed. Decisions made at these meetings and agreed to by all parties are binding with the exception that no contractual completion dates will be modified without formal written requests and acceptance as specified herein.

B. Revisions to Schedule:

1. The Schedule shall be formally revised if any of the following conditions are encountered:

a. When a delay in completion of any work item or sequence of work items results in an indicated extension of the project completion.
b. When delays in submittals or deliveries or work stoppages are encountered which make replanning or rescheduling of the work necessary.
c. When the schedule does not represent the actual prosecution and progress of the project.

1.5 CONTRACT COMPLETION TIME

A. Causes for Extensions:

1. The Contract completion time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any Contract completion date, he shall furnish such justification and supporting evidence as the Owner or the Owner's representative may deem necessary for a determination as to whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Owner, with the assistance of the Engineer, will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof.

B. Requests for Time Extension:

1. Each request for change in any Contract completion date shall be initially submitted to the Owner within the time frame stated in the General Conditions. All information known to the Contractor at that time concerning the nature and extent of the delay shall be transmitted to the Owner at that time. Within the time frame stated in the General Conditions but before the date of final payment under this Contract, all information as required above concerning the delay must be submitted to the Owner. No time extension will be granted for requests which are not submitted within the foregoing time limits.

1.6 WEATHER DELAYS

A. This provision specifies the procedures for the determination of time extensions for unusually severe weather in accordance with Article 6 - Contractor's Responsibilities and Article 12 - Change of Contract Price; Change of Contract Times of the EJCDC General Conditions, specification section 007200. In order for the Owner to award a time extension under this clause, the following conditions must be satisfied:

1. The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the average inclement weather anticipated for the project location during the given month.
2. The unusually severe weather must actually cause a delay to a project activity that is vital to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

3. The Contractor must demonstrate that the weather caused a delay long enough to affect the project's scheduled critical path.
4. The following schedule of monthly anticipated inclement weather delay is based on historical data from the National Oceanic and Atmospheric Administration (NOAA) and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these potential weather days in all weather dependent activities. The rainfall reading will be recorded from a location that is mutually agreeable to both the Owner and Contractor.
5. The baseline is defined as the normal number of calendar days for each month during which construction activity exposed to weather conditions is expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Baseline is included in the Work and is not eligible for extension of Contract Time.
6. Standard Baseline

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
17	11	9	8	8	7	7	6	5	5	8	9

7. Adverse weather is defined as the occurrence of one or more of the following conditions within a 24-hour day that prevents construction activity exposed to weather conditions or access to the site:
    a. Precipitation (rain, snow, or ice) in excess of 0.10-inches liquid measure.

8. Adverse weather may include, if appropriate determined by Owner, "dry-out" or "mud" days
    a. Resulting from precipitation days that occur beyond the standard baseline
    b. Only if there is a hindrance to site access or site work and Contractor has taken reasonable accommodations to avoid such hindrance.
    c. At a rate no greater than one (1) "dry-out" or "mud" day for each day or consecutive days of precipitation beyond the standard baseline that total 1.0-inch or more, liquid measure, unless specifically recommended otherwise by Engineer.
    d. Contractor should allow for an appropriate number of "dry-out" or "mud" days that are included in the standard baseline days in which such applicable construction activities are expected to be prevented and suspended.

9. Calculation
    a. A weather delay day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the Contractor's scheduled work day and critical path construction activities were included in the day's schedule.
    b. Make-up days
        i. Requests to work weekends, extended days, or Holiday due to previous week's weather delay, when authorized and approved by Owner, should be considered in the overall monthly calculation. Worked weekends, extended hour days and Holidays will count as Work Days in the calculation.
        ii. Weather delays on 'make-up days' should not be included as delay days. The original weather delay day that caused the make-up day may be included as a delay day.
    c. The number of actual adverse weather delay days shall be calculated chronologically from the first to the last day in each month.

d. Delay days will be awarded on a 1 for 1 basis.
e. For projects that span longer than a single month, the calculation will be based on the duration of the project.
f. Delay Days = (weather delay days) - (the cumulative baseline weather days for all months worked) - (make-up days).
    i. Example for Project under construction April through August:
    ii. (41 construction delay days) - (8+8+7+7+6; April-Aug baseline days) = 5 Delay Days

10. Upon acknowledgement of the Notice to Proceed and continuing throughout the Contract, the Contractor will maintain daily records in which the occurrence of adverse weather and resultant impact to normally scheduled work are identified. If the number of actual adverse weather days exceeds the number of days anticipated listed above, the Owner may consider granting a time extension.
11. The Contractor shall notify the Owner, Engineer, and Engineer's RPR at the time of any occurrence of any adverse weather resulting in a delay to the project's critical path.
12. The number of adverse weather days observed each month shall be documented and discussed at each progress meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013216

SECTION 013233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.
4. Preconstruction video recordings.
5. Periodic construction video recordings.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.3 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph or video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within 10 days of taking photographs.

1. Submit photos on thumb drive or by uploading to web-based project software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Project Manager.
d. Name of Contractor.
e. Date photograph was taken.
f. Description of location, vantage point, and direction.
g. Unique sequential identifier keyed to accompanying key plan.

C. Video Recordings: Submit video recordings within 10 days of recording.

1. Submit video recordings on thumb drive or by uploading to web-based project software site. Include copy of key plan indicating each video's location and direction.

2. Identification: With each submittal, provide the following information:

    a. Name of Project.
    b. Name and address of photographer.
    c. Name of Project Manager
    d. Name of Contractor.
    e. Date video recording was recorded.
    f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by an up-to-date digital camera. Use flash in low light levels or backlit conditions.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by an up-to-date digital camera capable of recording in full high-definition mode. Provide supplemental lighting in low light levels or backlit conditions.

C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Metadata: Record accurate date and time from camera.

E. File Names: Name media files with date, project name, address/location, and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

    1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by the Engineer.

    1. Flag construction limits before taking construction photographs.
    2. Take photographs to show existing conditions adjacent to property before starting the Work.

3. Take photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Engineer will inform photographer of desired vantage points.

1.7 CONSTRUCTION VIDEO RECORDINGS

A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.

B. Narration: Describe scenes on video recording. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.

D. Preconstruction Video Recording: Before starting construction, record video recording of Project site and surrounding properties from different vantage points, as directed by the Engineer.

1. Flag construction limits before recording construction video recordings.
2. Show existing conditions adjacent to Project site before starting the Work.
3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of construction.
4. Show protection efforts by Contractor.

E. Periodic Construction Video Recordings: Record video recording monthly. Select vantage points to show status of construction and progress since last video recordings were recorded.

PART 2 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013323 – SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND RFI'S

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. General: This section specifies procedural requirements for non- administrative submittals including shop drawings, product data, samples (when samples are specifically requested) and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Refer to other Division-01 sections and other Contract Documents for Specifications on administrative, non-work-related submittals. Such submittals include, but are not limited to the following items:

1. Permits.
2. Payment applications.
3. Performance and payment bonds.
4. Insurance certificates.
5. Inspection and test reports.
6. Schedule of values.
7. Progress reports.
8. Listing of subcontractors.
9. Operating and Maintenance Manuals

C. Engineer prefers initial submittals be in electronic media along with one paper copy for review. Engineer utilizes Newforma software and will provide Contractor with the necessary links and instructions for submittal purposes. Upon completion of the review process, Contractor shall print two (2) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

If Contractor does not have capability to submit electronic submittals, then Contractor shall submit a request to Engineer for waiver. In the event a waiver is granted, paper submittals shall be provided as directed by the Engineer.

D. Submittals shall be checked and reviewed by the Contractor and stamped with Contractor's review stamp before submission to the Engineer. The review of the submittals 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 submittals 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.

E. All Requests for Information (RFI) to Engineer shall be submitted electronically via Engineer's Newforma software.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to work of this section.

B. Section 017823 - Operating and Maintenance Manuals.

1.3 DEFINITIONS

A. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shopwork manufacturing instructions.
4. Templates.
5. Patterns.
6. Coordination drawings (for use on site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

B. Product data includes standard printed information on manufactured products that has not been specially-prepared for this project, including but not limited to the following items:

1. Manufacturer's product specifications and installation instructions.
2. Standard color charts.
3. Catalog cuts.
4. Roughing-in diagram and templates.
5. Standard wiring diagrams.
6. Printed performance curves.
7. Operational range diagrams.
8. Mill reports.
9. Standard product operating and maintenance manuals.

C. Samples, where specifically required, are physical examples of work, including but not limited to the following items:

1. Partial sections of manufactured or fabricated work.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture and pattern.
5. Color range sets.
6. Units of work to be used for independent inspection and testing.

D. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

1. Specially prepared and standard printed warranties.
2. Maintenance agreements.
3. Workmanship bonds.
4. Survey data and reports.
5. Testing and certification reports.
6. Record drawings.
7. Field measurement data.

1.4 SUBMITTAL PROCEDURES

A. General: Refer to the General Conditions and Paragraph 1.1 hereinbefore for basic requirements for submittal handling.

B. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

1. It is the Contractor's responsibility to make such field measurements as are needed to base submittals on actual field conditions to assure proper connection, fit, function and performance of all work and equipment in the execution of the contract work.
2. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

D. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

1. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
2. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

E. Submittal Preparation: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.

1. Project name.
2. Date.
3. Name and address of Architect/Engineer.
4. Name and address of Contractor.
5. Name and address of subcontractor.

6. Name and address of supplier.
7. Name of manufacturer.
8. Number and title of appropriate specification section.
9. Drawing number and detail references, as appropriate.
10. Similar definitive information as necessary.

F. 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). Include only one item in a submittal.

G. The Contractor shall review and check submittals, and shall indicate his review by initials and date. Any submittal received without this evidence of review shall be returned to the Contractor without review.

H. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer in writing of the deviation and the reasons therefore.

I. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".

J. Electronic Submittals: If the electronic method of submittals is agreed to by Contractor, Engineer, and Owner, the format and procedures will be determined and implemented prior to any submittals. Submittals will be processed through "Newforma" software. Each item of the submittal documents shall be in .pdf format and shall be oriented so that they are read from upper left corner to lower right corner, with no rotation of said document being required after receiving it. The .pdf file shall be named so that it describes the item being submitted. All other requirements herein are part of the electronic submittal process with the exception of the duplicate copies. Contractor stamp indicating review and any comments or notes must be on the .pdf submittal.

1.5 SPECIFIC SUBMITTAL REQUIREMENTS

A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. 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 four (4) which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8-1/2" x 11" and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.

B. Project data shall include manufacturer's standard schematic drawings modified to delete information 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. 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.

E. 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.

F. Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.

G. 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.

H. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.

I. Where manufacturers 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.

J. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.

K. All bulletins, brochures, instructions, parts lists, and warranties package with and accompanying materials and products delivered to and installed in the project shall be saved and transmitted to the Owner through the Engineer.

1.6 REVIEW STATUS

A. Submittals will be returned, stamped with the following classifications: "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected", or "Submit Specified Item".

B. In some instances, corrections to dimensions or clarification notations will be required, in which case the drawings will be marked "Furnish as Corrected." These shop drawings will not be required to be resubmitted for further approval. If the supplier makes additional modifications after receiving a "Furnish as Corrected" disposition, the drawings must then be resubmitted for review.

C. If the shop drawing is returned with the notation "Revise and Resubmit", the Contractor shall promptly make the revisions indicated and repeat the submittal approval procedure.

D. If the shop drawing is returned with the notation "Submit Specified Item", this indicates that the submittal does not meet the specification, will not be reviewed, and is unacceptable. Upon return of a drawing so marked, the Contractor shall repeat the initial approval procedure, submitting acceptable materials or equipment.

E. The "Rejected" notation is used to indicate materials or equipment that are not acceptable and are not included in the project.

1.7 REMINDER OF CONTRACTOR RESPONSIBILITIES

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

B. Coordinate each submittal with requirements of work and of 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 requires submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

E. Upon review and close-out of a submittal, Contractor shall print two (2) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

F. It is emphasized that the review of shop drawings by the Engineer is for general conformance to the Contract Drawings and Specifications, but subject to the detailed requirements of the Contract Drawings and Specifications. Although the Engineer may check submitted data in more or less detail, such checking is an effort to discover errors and omissions in the Contractor's drawings and to assist the Contractor in coordinating and expediting his work, but shall in no way relieve the Contractor of his obligation and responsibility to properly coordinate the work, and to Engineer the details of the work in such a manner, that the purpose and intent of the Contract will be achieved nor shall any such detailed checking by the Engineer be construed as placing on him or on the Owner, any responsibility for the accuracy, proper fit, functioning or performance of any phase of the work included in this Contract. The Contractor is responsible for confirmation and correlation of dimensions at the job site; for information that pertains solely to the fabrication processes or to the techniques of construction; for the coordination of the work of all trades; and for performance of his work in a safe and satisfactory manner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013323

SECTION 014216 – DEFINITIONS AND STANDARDS - SHORT FORM

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. This section specifies procedural and administrative requirements for compliance with governing regulations and codes and standards imposed upon the Work. These requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.

B. The term, "Regulations", is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the Work regardless of whether they are lawfully imposed by governing authority or not.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification Sections, apply to Work of this Section.

1.3 DEFINITIONS

A substantial amount of specification language consists of definitions of terms found in other Contract Documents, including Drawings. (Drawings are recognized as being diagrammatic in nature and not completely descriptive of the requirements indicated thereon). Certain terms used in Contract Documents are defined in this article. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the Work to the extent that they are not stated more explicitly in another element of the Contract Documents.

The provisions or requirements of other Division-01 sections apply to entire Work of the Contract and, where so indicated, to other elements which are included in the Project.

A. Indicated: The term, "indicated", is a cross-reference to graphic representations, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for the purpose of helping the reader locate the cross-reference, and no limitation of location is intended except as specifically noted.

B. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Architect/ Engineer", "requested by the Architect/ Engineer", and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's/Engineer's responsibility into the Contractor's area of construction supervision.

C. Approve: Where used in conjunction with the Architect's/Engineer's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to limitations of the Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will the Architect/Engineer's approval be interpreted as a release of the Contractor from responsibilities to fulfill requirements of Contract Documents.

D. Project Site: The term, "project site", is defined as the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.

E. Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations" as applicable in each instance.

F. Install: Except as otherwise defined in greater detail, the term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing protecting, cleaning and similar operations", as applicable in each instance.

G. Provide: Except as otherwise defined in greater detail, the term "provide" means "to furnish and install, complete and ready for intended use", as applicable in each instance.

H. Installer: The term "installer" is defined as "the entity" (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a requirement that installers are experienced in the operations they are engaged to perform.

I. Testing Laboratories: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the Work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where more explicit or more stringent requirements are written into the Contract Documents, applicable construction industry standards have the same force and effect as if bound into or copied directly into the Contract Documents. Such industry standards are made a part of the Contract Documents by reference. Individual specification sections indicate which codes and standards the Contractor must keep available at the project site for reference.

1. Referenced standards (standards referenced directly in the Contract Documents) take precedence over non-referenced standards that are recognized in the industry for applicability to the Work.
2. Non-referenced standards are defined as not being applicable to the Work, except as a general requirement of whether the Work complies with recognized construction industry standards.

B. Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of date of Contract Documents.

C. Conflicting Requirements: Where compliance with two (2) or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents specifically indicate a less stringent requirement. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/Engineer for a decision before proceeding.

1. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified is intended to be the minimum for the work to be provided or performed. Unless otherwise indicated, the actual work may either comply exactly, within specified tolerances, with the minimum quantity or quality specified, or may exceed that minimum within reasonable limits. In complying with these requirements, the indicated numeric values are either minimum or maximum values, as notes, or as appropriate for the context of the requirements. Refer instances of uncertainty to the Architect/Engineer for decision before proceeding.

D. Copies of Standards: The Contract Documents require that each entity performing work be experienced in that part of the Work being performed. Each entity is also required to be familiar with industry standards applicable to that part of the work. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed for proper performance of the Work, the Contractor is required to obtain such copies directly from the publication source.
2. Although certain copies of standards needed for enforcement of the requirements may be required submittals, the Architect/ Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.

1.5 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 014216

SECTION 014500 – QUALITY CONTROL SERVICES - LINE PROJECT

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Required inspection and testing services are intended to assist in the determination of probable compliance of the Work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the Contract Documents.

B. Tests, inspections and certifications of materials, equipment, subcontractors or completed Work, as required by the various sections of the Specifications shall be obtained by the Contractor and all costs shall be included in the Contract Price.

C. The Contractor shall submit to the Engineer the name of any testing laboratory to be used.

D. Contractor shall deliver written notice to the Engineer at least 24 hours in advance of any inspections or tests to be made at the project site. All inspections or tests to be conducted at the field shall be done in the presence of the Engineer or his representative.

E. Certifications by independent testing laboratories may be by copy of the attest and shall give scientific procedures and results of tests. Certifications by persons having interest in the matter shall be by original attest properly sworn to and notarized.

F. Inspections, tests and related actions specified in this section and elsewhere in the Contract Documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to Work of this Section.

1.3 SUBMITTALS

A. General: Refer to Section 013323 for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer.

B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.

6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on retesting, if applicable.

1.4 RESPONSIBILITIES

A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

B. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related Work with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original Work.

C. Responsibility for Associated Services: The Contractor is required to cooperate with the independent performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of Samples to test laboratories.
4. Delivery and protection of samples and test equipment at the project site.

D. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the Work. In addition, the Contractor and each independent testing agency shall coordinate their Work so as to avoid the necessity of removing and replacing Work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services performed on the Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect Work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014500

SECTION 014531 – STRUCTURAL TESTS AND INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Provision of Structural Tests and Inspections is included as part of the quality assurance plan for this project. The agency performing the Structural Tests and Inspections are to verify the performance and fully document the results of all required tests and inspections for elements and systems identified as requiring inspection and testing.

B. The Contractor will engage one or more qualified inspectors and / or testing agencies to conduct structural tests and inspections specified in this section and related sections and as may be specified in other divisions of these specifications and as indicated elsewhere in the contract documents.

C. Structural testing and inspection agencies are required to verify compliance with requirements specified or indicated.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.

D. Structural Tests and Inspections are required for the following items:

1. As indicated on the Drawings.

1.3 DEFINITIONS

A. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

B. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

C. Inspector: A qualified person who demonstrates competence, to the satisfaction of Registered Design Professional in responsible charge, for inspection of the particular type of construction or operation requiring inspection.

1. The inspector shall be a licensed professional engineer, engineering intern, or a qualified representative from the testing agency.

D. Inspection, Continuous: The full-time observation of work requiring inspection by an approved inspector who is present in the area where the work is being performed.

E. Inspection, Periodic: The part-time or intermittent observation of work requiring inspection by an approved inspector who is present in the area where the work has been or is being performed and at the completion of the work.

F. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the Registered Design Professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verifyconfirmation with construction documents.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.

a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329, unless more stringent certification requirements are indicated in the Construction Documents.
b. Certification by organizations other than those listed must be submitted to the Designated Inspecting Design Professional for consideration before proceeding with work.

2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. The inspector's reports and testing agencies results shall have precedence over reports and test results provided by the contractor.

C. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

D. Where a conflict exists between individual specification sections and this specification, provide testing and inspection to satisfy the more stringent requirements.

1.6 SUBMITTALS BY CONTRACTOR (CONTRACTOR-ENGAGED INSPECTION)

A. When the Contractor is required to engage the Inspection Agency, the Contractor shall submit to the Designated Inspecting Design Professional for review a minimum of 14 days prior to commencement of construction of elements requiring inspection, the following:

1. Name(s), address(es), telephone number(s), email address(es) and statement(s) of qualifications of all Inspection Coordinators and Inspectors to be engaged on the project.
2. A listing of all items to receive inspection, designating the name of the individual that will be performing inspection for each item.

1.7 SUBMITTALS BY STRUCTURAL TESTS AND INSPECTION AGENCIES

A. A minimum of 14 days prior to construction, for all materials and systems specified and/or referenced in this Section, the Testing and Inspection Agency shall prepare and submit to the Registered Design Professional in responsible charge and Contractor for review a complete and detailed schedule of required tests and inspections.

B. The Test Agency/Inspection Agency shall review, keep and distribute records of required tests and inspections. The Test Agency/Inspection Agency shall furnish interim reports to the Registered Design Professional in responsible charge and Contractor. Interim reports shall indicate whether work inspected was done in compliance with approved construction documents. Bring all noncompliant items to the immediate attention of the contractor for correction. If the noncompliant items are not corrected, the noncompliant items shall be brought to the attention of the Registered Design Professional in responsible charge prior to the completion of that element of the work.

1. Interim Reports and test results shall include, but not be limited to, the following:

a. Date of inspection and/or test.
b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
c. Results of inspections or tests performed including data, descriptions, photographs, etc., as evidence of compliance or noncompliance.
d. Statement noting that the work, material, and / or product complies or does not comply with the construction document requirements.

1) Name and signature of contractor's representative who was notified of work, material, and/or products that do not meet the construction document requirements.

2. Interim reports shall be submitted within one week of inspection or test.

C. Final Report of Inspections. Submitted by the Inspection Coordinator at completion of construction for each element requiring inspection confirming that all work has been completed in compliance with approved construction documents. Final Report shall document all noncompliant items (if any) that remain uncorrected at completion ofconstruction.

1. Final report shall be submitted at a point in time agreed upon by the Registered Design Professional in responsible charge and Contractor prior to the start of work, but not later than 14 days after completion of construction of all elements requiring inspection and/or testing.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 DESIGN PROFESSIONAL'S RESPONSIBILITY

A. The Registered Design Professional in Responsible Charge shall respond to valid requests for clarification of structural testing and inspection requirements and as necessary to resolve reported noncompliant items.

3.2 CONTRACTOR'S RESPONSIBILITY

A. The contractor shall provide sufficient notice to the Inspection Coordinator to allow proper scheduling of all personnel and the contractor shall provide safe access for performing inspection and on site testing. The Registered Design Professional in responsible charge shall review reports provided by the Testing/Inspection agencies and coordinate resolution of reported noncompliant items with the Contractor and Testing/Inspection agencies.

B. The contractor shall submit schedules to the Registered Design Professional and Testing/Inspection agencies. Schedules will note milestones and durations of time for materials requiring structural tests and inspections.

C. The contractor shall repair and/or replace work that does not meet the requirements of the construction documents.

1. If directed by the Registered Design Professional, contractor shall engage a qualified design professional to prepare repair and / or replacement procedures.
2. Contractor's design professional shall be registered in the State of the project location. The contractor's design professional shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
3. Procedures shall be submitted for review and acceptance by the Registered Design Professional before proceeding with corrective action.

D. The contractor shall be responsible for costs of:

1. Re-testing and re-inspection of materials, work, and products that do not meet the requirements of the construction documents and shop drawings / submittal data.
2. Review of proposed repair and / or replacement procedures by the Registered Design Professional in responsible charge and the Testing Inspection agencies.
3. Repair or replacement of work that does not meet the requirements of the construction documents.

3.3 TESTING/INSPECTION AGENCY RESPONSIBILITIES

A. The Testing/Inspection Agent for each element requiring testing and inspection is responsible for confirming that all specified tests and inspections are performed and documented.

B. The Testing/Inspection Agent for each element requiring testing and inspection may engage and coordinate additional approved qualified Inspector(s) as required to perform the required tests and inspections.

C. Prior to commencement of construction of an element requiring inspection, the Testing/Inspection Agent shall review the testing and inspection requirements and the construction documents to determine the necessary tests and inspections and shall coordinate these requirements with the Contractor.

D. As the construction progresses, the Testing/Inspection Agent shall coordinate with the Contractor to ensure performance of the required inspections and shall confirm that all required testing and inspection is satisfactorily completed.

E. The Testing/Inspection Agent shall alert the Contractor immediately of any observed noncompliant items so that the Contractor may make corrections to the work. The Testing/Inspection Agent shall document all noncompliant items and related corrective work.

F. The Testing/Inspection Agent shall keep and maintain detailed records of all tests and inspections performed and shall include copies of test and inspection reports with interim reports.

G. The Testing/Inspection Agent shall submit interim and final reports in accordance with the provisions of this specification.

H. Perform tests and inspections as directed by the Testing/Inspection Agent.

3.4 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with the provisions of this specification and as outlined elsewhere in the Construction Documents.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 4 - SCHEDULES AND FORMS (ATTACHED)

4.1 SCHEDULE OF STRUCTURAL TESTS AND INSPECTIONS

A. To be submitted by the Testing/Inspection Agency prior to commencement of construction in accordance with the provisions of this specification along with Inspector and Testing Agent qualifications. Indicate the specific individual(s) responsible for testing/inspecting each material/system.

4.2 SCHEDULE OF TESTS

A. The scope of testing shall be in accordance with this section. Where other testing requirements are indicated elsewhere in the contract documents they shall be in addition to the requirements in this section. Where conflicting provisions occur, the more stringent requirements shall apply.

1. SOILS AND EARTHWORK

a. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Structural Engineer.

b. Test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1) Prior to backfill placement perform proof rolling test of exposed subgrades.
2) Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of building slab, but in no case fewer than three tests.
3) Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.

c. Controlled Structural Fill:

1) Perform sieve tests (ASTM D422 & D1140), Atterberg limits (D4318) and standard Proctor tests (ASTM D698 of each source of fill material.
2) Verify proposed fill material meets project specification.
3) Test density of each lift of fill by nuclear methods (ASTM D2922) for conformance to compaction requirements.

2. CAST-IN-PLACE CONCRETE

a. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1) Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. m), but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2) Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3) Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4) Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5) Compression Test Specimens: ASTM C 31/C 31M.

    a) Cast and laboratory cure one set of six standard cylinder specimens for each composite sample.

6) Compressive-Strength Tests: ASTM C 39/C 39M.

    a) Test one laboratory-cured specimen at 7 days and one standard sample set at 28 days. Reserve additional specimen as spares for testing at the discretion of the Structural Engineer as needed.
    b) A compressive-strength test shall be the average compressive strength of one standard sample set obtained from same composite sample and tested at age indicated.

7) Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

8) Test results shall be reported in writing to Structural Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

3. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Structural Engineer but will not be used as sole basis for approval or rejection of concrete.
4. Additional Tests: Testing agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Structural Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Structural Engineer.
5. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
6. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

7. CONCRETE MASONRY

a. Prior to start of construction, perform the following tests:

1) Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
2) Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
3) Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content.
4) Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
5) Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

b. During the course of construction perform the following tests at a frequency of one set of tests per 5,000 square feet of constructed area:

1) Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
2) Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
3) Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content.
4) Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
5) Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

8. POST-INSTALLED ANCHORS AND DOWELS

a. Proof test mechanical anchors as follows:

1) Anchor type: As shown on the drawings, or as required during construction for repair items.
2) Anchor location(s): See drawings.
3) Percentage of anchors to be tested: 10 percent plus an additional 10 percent for every failed test.
4) Proof test tension load: 100% of allowable tension load capacity.

b. Proof test adhesive anchors as follows:

1) Anchor type: As shown on the drawings, or as required during construction for repair items.
2) Anchor location(s): See drawings.
3) Percentage of anchors to be tested: 10 percent plus an additional 10 percent for every failed test.
4) Proof test tension load: 100 percent of allowable tension load capacity.

4.3 SCHEDULE OF INSPECTIONS

A. The scope of inspections shall be in accordance with this section.

1. SOILS AND EARTHWORK

a. Inspect soils below foundations and slabs for adequate compaction and bearing capacity prior to placement of concrete.
b. Verify performance of required quality control testing.
c. Inspect all earthwork operations affecting the building foundations, slabs, envelope and related structural items.
d. Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill. Document extents of necessary removal.
e. Controlled Structural Fill:

1) Inspect placement, lift thickness and compaction of controlled fill.
2) Verify extent and slope of fill placement.

2. FOUNDATIONS

a. The inspector must be present full time during the entire placement of the first 2 foundation concrete pours and then must be present at the start of 100% of other concrete pours.
b. Verify approval of the footing subgrade prior to placement of foundation concrete.
c. Verify that forms are plumb and straight, braced against movement, and lubricated for removal.
d. For earth-formed foundations, verify that earth forms are sufficiently uniform to allow for proper dimensions and required concrete cover over reinforcement.
e. Verify foundation dimensions.
f. Verify anchor rods and/or dowels are installed with the embedment and projected lengths and in accordance with the contract documents.
g. Verify foundation reinforcement prior to placement of concrete.
h. Verify concrete placement as outlined in this inspection plan.

3. FOUNDATION WALLS AND PITS

a. The inspector must be present full time during the entire placement of the first 2 concrete pours and then must be present at the start of 100% of other concrete pours.
b. Verify that forms are plumb and straight, braced against movement, and lubricated for removal.
c. Verify wall/pit dimensions.
d. Verify anchor rods and/or dowels are installed with the embedment and projected lengths and in accordance with the contract documents.
e. Verify pit/wall reinforcement prior to placement of concrete.
f. Verify water stops are properly installed and anchored into position prior to placement of concrete.
g. Verify that foundation and pit walls with uneven backfill conditions are not backfilled until floor construction at top of wall is complete or temporary bracing is provided in accordance with the contract documents.
h. Verify concrete placement as outlined in this inspection plan.

4. SLABS-ON-GRADE

a. The inspector must be present full time during the entire placement of the first 2 slab-on- grade concrete pours and then must be present at the start of 100% of all other concrete pours.
b. Observe subgrade preparation including backfilling, compaction, and performance of compaction tests by the testing laboratory prior to concrete placement.
c. Note any alteration and subsequent replacement of subgrade materials required by other trades.
d. Verify that required moisture retarder or vapor barrier is lapped properly, and is not torn or punctured.
e. Observe that formwork at turndowns and slab edges is plumb and straight, braced against movement and lubricated for removal.
f. Observe placement of screeds to obtain proper level and thickness of slabs. Observe location of slab depressions and steps in slab while maintaining required slab thickness.
g. Verify the pour area is free of standing water and other debris.
h. Verify placement of reinforcement and observe concreting operations as outlined in this inspection plan.
i. Check that the location and type of slab control joints and construction joints conform to the contract documents.
j. Verify that sawcut control joints on slab-on-grades are cut within 12 hours of placement.

5. REINFORCING STEEL

a. This section applies to all elements of construction identified in this inspection plan that contain reinforcing steel.
b. Verify that reinforcement surfaces are free of excess rust or other coatings that may adversely affect bonding capacity. If oiling of forms is required, verify that it is applied before reinforcing is placed.
c. Verify all reinforcing bars for compliance with contract documents and approved shop drawings as follows:

1) Material Grade,
2) Reinforcement size,
3) Quantity, spacing, and layering,
4) Proper hook type and location.
5) Splice locations and required length of lap.
6) Proper clearance and cover requirements from concrete surfaces.
7) Sufficient spacing between reinforcement for concrete placement.
8) Verify that unscheduled/additional reinforcing bars shown on plan, in details, or specified in notes are provided and are in compliance with contract documents and approved shop drawings.
9) Mechanical splices:

a) Provide visual inspection of 100% of the mechanical splices (tension and/or compression) on the project.
b) Verify compliance with specifications and conformance with the manufacturer's recommendations for installation.

c) Verify that the manufacturer is present for the first installation of each type of splice on the project.

10) Verify that welded wire reinforcement is composed of flat sheets, has proper wire gage and spacing, is properly supported, and is properly lapped.
11) Inspect headed stud shear reinforcement to ensure that it conforms to the project requirements:

a) Review type and spacing.
b) Verify that reinforcing is adequately supported to resist displacement or shifting during concrete placement.
c) Verify welding of reinforcement is performed according to AWS requirements and that it is inspected by the testing laboratory.

6. CONCRETE PLACEMENT

a. This section applies to all cast-in-place concrete elements identified in this inspection plan.
b. Verify that debris and foreign materials have been removed before concrete is placed.
c. Verify that quality control testing is provided in accordance with the project requirements.
d. Verify the following with regard to the testing laboratory:

1) Verify contractor is coordinating with testing agency to allow testing technician to be available to make tests as required.
2) Verify slump is measured at the point of discharge.
3) Verify concrete test cylinders are taken in accordance with the contract documents.

e. Periodically inspect concrete upon arrival to verify the following:

1) Proper concrete mix number, type of concrete, and concrete strength for the placement location.
2) Verify that the concrete is not over 90 minutes old at the time of placement.

f. Verify that hot-weather or cold-weather techniques are being applied as required.
g. Verify that concrete being deposited is uniform, that the vertical drop does not exceed six feet, and that concrete is not permitted to drop freely over reinforcement causing segregation.
h. Verify that the concrete is properly vibrated.
i. Verify that embedded items and reinforcing steel are not adversely altered during placement. Note if anything was displaced or otherwise altered during placement.
j. Verify that there are no cold joints within the area of the pour.
k. Verify that the curing process is as specified in the contract documents and that any curing compound used is applied in accordance with manufacturer's printed application instructions.

7. CONSTRUCTION JOINTS

a. Verify the location of vertical and horizontal construction joints for compliance with the construction joint location plan submitted by the contractor to engineer of record.
b. Verify that reinforcement, dowels, keys, and bulkheads at construction joints are in conformance with the contract documents.
c. Embedded items:

1) Verify that conduits placed in the concrete are reasonably spaced to ensure structural integrity and comply with the requirements of the contract documents. Verify conduit placement allows for proper concrete cover of the reinforcement.
2) Review load carrying embedded items as placed for compliance with the contract documents. Relocation of embedded items in conflict with reinforcing shall not be permitted without the prior approval of the engineer of record.

8. CONCRETE MASONRY

a. The inspector must be present at the site continuously while concrete masonry construction is in progress.
b. Verify that materials are stored properly before placement in the structure.
c. Verify wall locations and thicknesses.
d. Verify the proper installation of horizontal joint reinforcement.
e. Verify the proper installation of control joints, type and location.
f. Verify the proper installation of lintels, sills, and door or window jams.
g. Verify that the masonry is properly connected to the supporting structure(s).
h. Mortar and grout:

1) Verify that mortar and grout materials comply with the contract documents and approved submittals.
2) Site-mixed mortar: Verify the mortar is mixed in accordance with specified proportions.
3) Bag-mix mortar: Verify the mortar is mixed according to the manufacturer's instructions.
4) Verify proper mortar placement.
5) Grout bag mix: Verify that the grout is mixed according to the manufacturer's instructions.
6) Ready-mix grout: Verify the mix number and grout strength.
7) Prior to any grouting procedure, inspect the grout space to verify that it is clean and that cleanouts, if required, are in place and conform to requirements of the contract documents.
8) Verify the proper grout placement and consolidation.
9) Verify that grout testing is performed in accordance with the contract documents.

i. Reinforcing steel:

1) Verify that the size, spacing, location, hooks, and lap splice lengths of vertical and horizontal reinforcement are installed in accordance with the contract documents.
2) Notify the engineer of record when placement of conduit, piping or other items interferes with cell grouting and/or vertical reinforcing steel.

9. WOOD CONSTRUCTION

a. Visually inspect elements as follows:

1) 10% of stick-framed bearing wall construction and assemblies
2) 100% of all shear walls, hold-down anchors and related connections
3) 100% of all wood truss anchorage connections

b. Inspect sill anchorages for wall construction. Inspect connections and connection hardware for proper size, type, configuration and quantity of fasteners.
c. Verify materials are in accordance with specification requirements including: type, grade, moisture content, material properties, etc.
d. Inspect framing sizes and configurations.
e. Verify treated lumber is used where required.
f. Inspect size, configuration, blocking and fastening of shear walls and diaphragms. Verify sheathing panel grade and thickness. Inspect hold-down anchors and fasteners into chord members.
g. Prefabricated Wood Trusses;

1) Inspect shop fabrication and quality control procedures for wood truss plant.
2) Inspect the installation of wood trusses for proper location and fastening to supports.
3) Verify bracing is installed in accordance with project plans and/or erection drawings.

10. STRUCTURAL METAL FRAMING

a. Aluminum grating:

1) Visually inspect the grating for damage during shipping.
2) Verify that the grating depth, type or properties, and finish comply with the contract documents and/or approved shop drawings.
3) Verify all grating attachment to the supporting concrete, steel, and/or masonry as specified in the contract documents and/or approved shop

11. POST-INSTALLED ANCHORS AND DOWELS

a. Inspect post-installed anchor installation at the following frequencies:

1) Mechanical Anchors:

a) Inspect installation of first 10 post-installed mechanical anchors for each individual installer with each individual anchor product.
b) Inspect 10% of remaining anchor installations after the initial verification.

2) Adhesive Anchors and Reinforcing Dowels:

a) Inspect installation of first 10 post-installed adhesive anchors for each individual installer with each individual anchor product.

b) Inspect 10% of remaining anchor installations after the initial verification.

3) Verify that each inspected anchor and dowel is installed in accordance with manufacturer's printed installation instructions as well as the following requirements:

a) Anchor/product type, manufacturer and material grade
b) Anchor diameter, length and installed embedment depth
c) Hole diameter and depth
d) Hole preparation (cleaning procedure and cleanliness)
e) Edge distances and spacing
f) Inspect expansion bolt installations for proper torque.

4) The following additional requirements apply to adhesive anchors and reinforcing dowels:

a) Verify the proper adhesive product is used for each application.
b) Verify the adhesive product being installed has not exceeded its expiration date.
c) Verify proper mixing and installation of the adhesive

12. EXPANSION JOINTS

a. Check the joint manufacturer, type, and width for compliance with the contract documents and approved shop drawings.

END OF SECTION 014531

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

This section specifies administrative and procedural requirements for temporary services and facilities, including such items as temporary utility services, temporary construction and support facilities, and project security and protection.

A. Use Charges: No cost or usage charges for temporary services or facilities are chargeable to the Owner or Engineer. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change-order extra.

B. Temporary utility services required for use at the project site include but are not limited to the following:

1. Water service and distribution.
2. Temporary electric power and light.
3. Telephone service.
4. Storm and sanitary sewer.
5. Provide adequate utility capacity at each stage of construction. Prior to availability of temporary utilities at the site, provide trucked-in services for start-up of construction operations.
6. Obtain and pay for temporary easements required to bring temporary utilities to the project site, where the Owner's permanent easement cannot be utilized for that purpose.
7. High speed internet service.

C. Temporary construction and support facilities required for the project include but are not limited to the following:

1. Temporary heat.
2. Field offices and storage sheds.
3. Temporary roads and paving.
4. Sanitary facilities, including drinking water.
5. Dewatering facilities and drains.
6. Temporary enclosures.
7. Project identification, bulletin boards and signs.
8. Waste disposal services.
9. Construction aids and miscellaneous general services and facilities.
10. Alternate temporary services and facilities, equivalent to those specified, may be used, subject to acceptance by the Engineer.

D. Security and protection facilities and services required for the project include but are not limited to the following:

1. Environmental protection.
2. Alternate security and protection methods or facilities, equivalent to those specified, may be used, subject to acceptance by the Engineer.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to the Work of this Section.

1.3 PROPERTY PROTECTION

A. Care is to be exercised by the Contractor in all phases of construction, to prevent damage and/or injury to the Owner's and/or other property. Payments for the repair and restoration are limited as set forth in the "Conflict With or Damage to Existing Utilities Facilities" of the Supplementary General Conditions.

B. All exposed existing piping must be immediately supported to prevent damage. Prior to completion of each day's work, such piping must be adequately covered by the Contractor and approved by the Owner's representative.

C. The Contractor shall avoid unnecessary injury to trees and shall remove only those authorized to be removed by written consent of the Owner. Fences, gates, and terrain damaged or disarranged by the Contractor's forces shall be immediately restored in their original condition or better.

1.4 CONSTRUCTION WARNING SIGNS

A. The Contractor shall provide construction warning signs for each location where he is working in the state highway right-of-way or in City or County streets. He will further provide flagmen as required and shall abide by all Department of Highways safety rules, including size, type and placement of construction signs. All signs shall be of professional quality.

1.5 ACCESS ROADWAYS

A. The Contractor shall construct all access roadways needed during construction, and the planned access roadways for the completed project. The Contractor shall maintain access roadways continuously during the construction period.

B. The Contractor shall maintain all existing roadways within the project site which are used for any purpose by his construction operations. The degree and frequency of maintenance shall be adequate to keep existing roadways in a condition at least equal to their condition prior to construction. Road maintenance shall include daily dust control and grading as necessary on all roads and sweeping of paved roads every other day.

1.6 RESPONSIBILITY FOR TRENCH SETTLEMENT

A. The Contractor shall be responsible for any settlement caused by the construction that occurs within one (1) year after the final acceptance of this Contract by the Owner. Repair of any damage caused by settlement shall meet the approval of the Owner.

1.7 WASTE DISPOSAL

A. The Contractor shall dispose of waste, including hazardous waste, off-site in accordance with all applicable laws and regulations.

1.8 CONTRACTOR'S TRAILERS AND MATERIAL STORAGE

A. The location of the Contractor's and Subcontractor's office and work trailers and parking areas on the project site shall be subject to the Owner's approval.

B. The location of the Contractor's and Subcontractor's material storage yards on the project site shall be subject to the Owner's approval.

1.9 QUALITY ASSURANCE

A. Regulations: Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities, including but not limited to the following:

1. Obtain all permits as required by governing authorities.
2. Obtain and pay for temporary easements required across property other than that of Owner.
3. Comply with applicable codes.

    a. In addition, comply with "Environmental Impact" commitments the Owner or previous Owners of the site may have made to secure approval to proceed with construction of the project.

B. Inspections: Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.

1.10 JOB CONDITIONS

A. General: Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in performance of the Work. Maintain, expand as required, and modify temporary services and facilities as needed throughout the progress of the Work. Do not remove until services or facilities are no longer needed, or are replaced by the authorized use of completed permanent facilities.

With the establishment of the job progress schedule, establish a schedule for the implementation and termination of service for each temporary utility. At the earliest feasible time, and when acceptable to the Owner and Engineer, change over from the use of temporary utility service to the use of the permanent service, to enable removal of the temporary utility and to eliminate possible interference with completion of the Work.

B. Conditions of Use: Operate temporary services and facilities in a safe and efficient manner. Do not overload temporary services or facilities, and do not permit them to interfere with the

progress of the Work. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

1. Temporary Utilities: Do not permit the freezing of pipes, flooding or the contamination of water sources.
2. Temporary Construction and Support Facilities: Maintain temporary facilities in such a manner as to prevent discomfort to users. Take necessary fire prevention measures. Maintain temporary support facilities in a sanitary manner so as to avoid health problems and other deleterious effects.
3. Security and Protection: Maintain site security and protection facilities in a safe, lawful and publicly acceptable manner. Take necessary measures to prevent erosion of the site.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND SERVICES

A. General: Provide new materials and equipment for temporary services and facilities; used materials and equipment that are undamaged and in serviceable condition may be used, if acceptable to the Engineer. Provide only materials and equipment that are recognized as being suitable for the intended use, by compliance with appropriate standards.

B. Temporary Electricity:

1. Provide temporary electrical service for construction needs, power to all construction trailers, and for lighting and heating facilities, throughout construction period.
2. Service shall be adequate for construction use by all trades during construction period.
3. Contractor shall make all necessary arrangements with the power company to obtain this service. He shall furnish, erect, and maintain the service pole, wires, main switch, panelboards, outlets, lights and metering facilities as required by the power company and as necessary to provide electrical service throughout the construction site.
4. Contractor shall be responsible for payment of all monthly billing charges for temporary electric power. Contractor shall pay costs of equipment, materials, furnishing, installing, maintenance and removal of temporary electric service facilities.
5. Contractor shall pay costs of equipment, furnishing, installing, maintenance and removal of temporary service facilities.
6. Maintenance of temporary electric service shall be the sole responsibility of the General Contractor.

C. Temporary Lighting:

1. Furnish and install temporary lighting required for :

    a. Construction needs.
    b. Safe and adequate working conditions.
    c. Public Safety.
    d. Security lighting.
    e. Temporary office and storage area lighting.

2. As each building is enclosed, temporary lighting shall be furnished to provide not less than 10 foot-candles in all areas.
3. Service Periods:

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

4. Costs of installation and operation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.
5. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the General Contractor.

D. Temporary Heating and Ventilating

1. Furnish and install temporary heat and ventilation in enclosed areas throughout construction period required to:

    a. Facilitate progress of work.
    b. Protect work and products against dampness and cold.
    c. Prevent moisture condensation on surfaces.
    d. Provide suitable ambient temperatures and humidity levels for installation and curing of materials.
    e. Provide adequate ventilation to meet health regulations for safe working environment.
    f. Heat and ventilate temporary field offices for Contractor and for Engineer, and other storage and construction buildings.
    g. Allow beneficial occupancy of project, or portion of project, prior to final completion, including air conditioning.

2. Temperatures required in buildings:

    a. Generally, 24 hours a day: Minimum 40 degrees F. (4.5 degrees C.).
    b. 24 hours a day during placing, setting and curing of cementitious materials: As required by specification section for each product.
    c. 24 hours a day, seven (7) days prior to, and during, placing of interior finishes; woodwork, flooring, painting and finishing: As required by specification section for each product.
    d. 24 hours a day after application of finishes, and until Substantial Completion: Minimum 70 degrees F. (21 degrees C.).
    e. Storage areas: As required by the Specification Section for each product.

3. Ventilation Required:

    a. General: Prevent hazardous accumulations of dusts, fumes, mists, vapors or gases in areas occupied during construction.
    b. Provide local exhaust ventilation to prevent harmful dispersal of hazardous substances into the atmosphere of occupied areas.

c. Dispose of exhaust materials in a manner that will not result in harmful exposure to persons.
d. Ventilate storage spaces containing hazardous or volatile materials.
e. Provide adequate ventilation for:

1) Curing installed materials.
2) Dispersal of humidity.
3) Ventilation of temporary sanitary facilities.

f. Duration of operation:

1) At all times personnel occupies an area subject to hazardous accumulations of harmful elements.
2) Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.
3) For curing installed materials: As required by specification section for respective materials.
4) For humidity dispersal: As needed to provide suitable ambient conditions for work.

4. Contractor shall pay costs of installation, operation, maintenance and removal of temporary heat and ventilation.

E. Temporary Telephone and Fax Service:

1. Furnish and install temporary telephone service for construction needs throughout construction periods.
2. Pay costs for temporary telephone service including installation, maintenance, and removal.
3. Pay service costs for all local telephone service.
4. Pay costs of toll charges related to construction of the Project.
5. Do not use Owner's existing telephone system.

F. Temporary Water:

1. Contractor shall make his own arrangements at his own expense for obtaining the water supply necessary for construction purposes.
2. Contractor shall pay costs of the furnishing, maintaining and removing all temporary water service equipment, fixtures, hose, piping, etc.

G. Protection and Security:

1. Provide barricades, lanterns and other such signs and signals as may be necessary to warn of the dangers in connection with open excavation and obstructions.
2. Provide an adequate and approved system to secure the project area at all times, especially during non-construction periods; General Contractor shall be solely responsible for taking proper security measures.
3. Contractor shall pay all costs for protection and security systems.

H. Sanitary Facilities:

1. The Contractor shall furnish, install and maintain ample sanitary facilities for the workmen. As the needs arise, enclosed temporary toilets, in sufficient number, shall be placed as directed by the Engineer. Permanent toilets installed under this Contract shall not be used during construction. Drinking water shall be provided from a proven safe source so piped or transported as to be kept clean and fresh and served from single service containers of satisfactory types.

I. Temporary Protection:

1. Temporary Enclosures:

a. Furnish and install temporary enclosures at doorways, windows and other openings in exterior walls, as necessitated by weather and other conditions, and when required for the progress of the Work. Temporary doors shall be substantially built and hung, equipped with proper hinges, locks and other necessary hardware and shall be removed and reset whenever required to accommodate the work of other trades requiring their removal. All enclosures shall be maintained in good repair and removed when no longer needed. Door and window frames and sills shall be protected as necessary to prevent damage to items during construction.

2. Temporary Covering:

a. Provide substantial temporary wood covering over all floor openings for ducts, shafts, equipment, etc., using rough planking at least two (2) inches thick, cleated together and made sufficiently strong and put in place wherever required.

3. Temporary Railing:

a. Temporary railing shall be provided on stairs and around wells, pits and other locations where needed, to prevent accidents or injury to persons.

J. Project Sign:

1. The Contractor shall provide sign(s), as detailed hereinafter, near the site of the work. The sign(s) shall set forth the description of the work and the names of the Owner, Engineer, and Contractor, and other information as required.
2. The sign shall be constructed of 3/4-inch thick APA A-B Exterior grade or marine plywood. Posts shall be 4" x 4" of fencing type material. Prime all wood with white primer.
3. The sign shall be maintained in good condition until completion of the project.

K. Contractor's Field Office:

1. Each Contractor shall establish and maintain a field office on his project and have available at the office a responsible representative who can officially receive instructions from the Engineer. The Contractor's Field Office shall be provided in accordance with Section 01 52 13.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use qualified tradesmen for installation of temporary services and facilities. Locate temporary services and facilities where they will serve the entire project adequately and result in minimum interference with the performance of the Work.

B. Relocate, modify and extend services and facilities as required during the course of work so as to accommodate the entire work of the Project.

3.2 REMOVAL

A. Completely remove temporary materials, equipment, and offices upon completion of construction.

B. Repair damage caused by installation, and restore to specified or original condition.

END OF SECTION 015000

SECTION 015213 – FIELD OFFICES

PART 1 - GENERAL

1.1 CONTRACTOR'S FIELD OFFICE

A. The Contractor shall establish and maintain a field office on this project and have available at the office a responsible representative who can officially receive communications from the Owner and the Engineer. The Contractor shall have one complete, up-to-date set of Drawings, Specifications and Contract Documents (including all Addenda and Change Orders) in this office at all times, available for reference at any time. The office shall be provided with telephone service, toilet facilities, light, air conditioning and heat; the cost of which shall be borne by the Contractor. Notices, instructions, orders, directions or other communications from the Engineer, left at this office, shall be considered as received by the Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 015213

SECTION 017329 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other Work and subsequent fitting and patching required to restore surfaces to their original condition.

B. Cutting and patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes upon written instructions of the Engineer.

C. Cutting and patching is performed during the manufacture of products, or during the initial fabrication. Erection or installation processes are not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".

D. "Cutting and Patching" includes removal and replacement of Work not conforming to requirements of the Contract Documents, removal and replacement of defective Work, and uncovering Work to provide for installation of ill-timed Work.

E. No Work shall be endangered by cutting or altering Work or any part of it.

1.2 RELATED DOCUMENTS

A. Drawing and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to Work of this Section.

1.3 SUBMITTALS

A. Prior to cutting which affects structural safety of Project, submit written notice to the Engineer, requesting consent to proceed with cutting, including:

1. Identification of Project.
2. Description of affected work.
3. Necessity for cutting.
4. Effect on structural integrity of Project.
5. Description of proposed work. Designate:

    a. Scope of cutting and patching.
    b. Trades to execute work.
    c. Products proposed to be used.
    d. Extent of refinishing.

6. Alternatives to cutting and patching.

B. Should conditions of work, or schedule, indicate change of materials or methods, submit written recommendation to the Engineer, including:

1. Conditions indicating change.
2. Recommendations for alternative materials or methods.
3. Submittals as required for Substitutions.

C. Submit written notice to the Engineer, designating time Work will be uncovered, to provide for observation.

1.4 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural Work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio.

B. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life or decreased energy.

PART 2 - PRODUCTS

2.1 MATERIALS

A. For replacement of work removed, comply with Specifications for type of work to be done.

PART 3 - EXECUTION

3.1 INSPECTION

A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the Work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the Work.

3.2 PREPARATION

A. Temporary Support: To prevent failure, provide temporary support of Work to be cut. Provide shoring, bracing and support as required to maintain structural integrity of project.

B. Protection: Protect other Work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching Work. Except as otherwise indicated or as approved by the Engineer, proceed with cutting and patching at the earliest feasible time and complete Work without delay.

B. Cutting: Cut the Work using methods that are least likely to damage work to be retained or adjoining Work. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
2. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.
3. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in wall or partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

C. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the Work.

1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
2. Restore exposed finishes of patched areas and where necessary, extend finish restoration into retained adjoining Work in a manner which will eliminate evidence of patching and refinishing.
3. Execute fittings and adjustment of products to provide finished installations to comply with specified tolerances.
4. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of Contract Documents.
5. Refinish entire surfaces as necessary to provide an even finish.

    a. Continuous Surfaces: To nearest intersection.
    b. Assembly: Entire refinishing.

3.4 CLEANING

A. Thoroughly clean areas and spaces where Work is performed or used as access to work. Remove completely point, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION 017329

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Maintain premises free from accumulations of waste, debris, and rubbish.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Leave project clean and ready for occupancy.

1.2 RELATED DOCUMENTS

A.	Cutting and Patching:	Section 017329.
B.	Project Closeout:	Section 017700.
C.	Cleaning for Specific Products of Work:	Specification Section for that work.

1.3 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 violative 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.
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

2.1 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

3.1 DURING CONSTRUCTION

A. Execute cleaning to ensure that building, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

C. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris and rubbish.

D. Provide on-site containers for collection of waste materials, debris and rubbish.

E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner's property.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

A. Employ experienced workmen, or professional cleaners, for final cleaning.

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior or exterior finished surfaces; polish surfaces so designated to shine finish.

D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

E. Broom clean paved surfaces; rake clean other surfaces of grounds.

F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION 017400

SECTION 017700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Liquidated Damages: Supplemental General Conditions

B. Cleaning: Section 017400.

C. Project Record Documents: Section 017839.

1.2 SUBSTANTIAL COMPLETION

A. In order to initiate project closeout procedures, the Contractor shall submit the following:

1. Written certification to Engineer that project is Substantially Complete.
2. List of major items to be completed or corrected.

B. Engineer will make an inspection within seven (7) days after receipt of certification, together with Owner's Representative.

C. Should Engineer consider that work is Substantially Complete:

1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
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. Owner occupancy of Project or Designated Portion of Project:

   a. Contractor shall:

      1) Obtain certificate of occupancy.
      2) Perform final cleaning in accordance with Section 017400.

   b. Owner will occupy Project, under provisions stated in Certificates of Substantial Completion.

4. 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 Engineer, certifying that Project, or designated portion of Project is substantially complete.
3. Engineer will reinspect work.

E. Should Engineer consider that work is still 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 third written notice to the Engineer certifying that the work is complete.
3. Engineer and Owner will reinspect work at Contractor's expense.

1.3 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 inspection 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 reinspect work.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: To requirements of Section 017839.

B. Guarantees, Warranties and Bonds: To requirements of particular technical Specifications and Section 017834.

1.5 INSTRUCTION

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

1.6 FINAL APPLICATION FOR PAYMENT

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

1.7 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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017700

SECTION 017823 – OPERATIONS AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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. 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.

C. Related requirements specified elsewhere:

1. Shop Drawings, Product Data and Samples: 013323.
2. Project Closeout: Section 017700.
3. Project Record Documents: Section 017839.
4. Warranties and Bonds: Section 017834.

1.2 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of the described products.
2. Completely familiar with requirements of this Section.
3. Skilled as a technical writer to the extent required to communicate essential data.
4. Skilled as a draftsman competent to prepare required drawings.

1.3 SUBMITTAL SCHEDULE

A. Submit one (1) printed copy of operation and maintenance data for each item of equipment prior to 80% completion of the Contract. Binder is not required for Preliminary submittals. Digital submittal is **NOT** required for preliminary review.

B. Upon approval of **ALL** O&M submittal items, the complete manual shall be assembled as described in the following sections.

C. The complete, assembled Operation and Maintenance Manual shall be submitted ten (10) days prior to final inspection or acceptance to the Owner. Provide a total of two (2) hard copies and one (1) digital copy of the complete manual. Do not submit individual equipment items as final O&M manuals. The final submittal shall be the COMPLETE assembled manual, with a master table of contents included.

1.4 FORM OF SUBMITTALS

A. Format: Preliminary submittals may be made of each individual item of equipment. The final O & M Manual shall be assembled by combining the individual equipment submittals in one or more 3-ring binder(s). Large equipment operating and maintenance instructions may be contained in their individual binder(s). Smaller O&M instructions shall be assembled in a binder, with the sections separated by a tabbed divider page, and a table of contents.

1. Size: 8-1/2 in. x 11 in.
2. Paper: 20 pound minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Photo copies must be clear and legible.
5. Drawings:

    a. Provide reinforced punched binder tab, bind in with text.
    b. Fold large drawings to the size of the text pages where feasible.
    c. For flow or piping diagrams that cannot be detailed on the standard size drawings, a larger, appropriate size drawing may be submitted and supplied in a properly marked map packet.

6. 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.

7. 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-ring binders, with oil and moisture resistant hard covers.
3. Imprinted on the front cover and side of each binder shall be the name of the treatment plant or project, the Contract Number and the title of equipment.
4. Binders shall be new and not recycled from a prior data manual.

1.5 CONTENTS OF MANUAL

A. Table of Contents: Each item shall be placed in a logical sequential order, according to the operating process of the facility as shown on the Hydraulic Profile in the Contract Drawings.

B. Content, for each unit of equipment and system, as appropriate:

1. Process Description: Detailed description of the process and operation functions as applicable.

2. Component Instructions: Instructions for all components of the equipment whether manufactured by the supplier or not, including valves, controllers and other miscellaneous components.

3. Component Data: Description of unit and component parts.

    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of all replaceable parts.
    d. Exploded and/or sectional drawing views.
    e. Piping diagrams numbered to correspond to the installation.
    f. Equipment model number and serial number.

4. Control and Wiring Diagrams:

    a. Internal and external wiring diagrams numbered to correspond to the installation.
    b. Control circuit diagrams
    c. One line diagrams
    d. P&ID drawings
    e. As-installed control diagrams by controls supplier.

5. Operating procedures:

    a. Start-up, break-in, routine and normal operating instructions.
    b. Regulation, control, stopping, shutdown and emergency instructions.
    c. Summer and winter operating instructions.
    d. Special operating instructions.
    e. Description of sequence of operation by control supplier.

6. Maintenance Procedures:

    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Alignment, adjusting and checking.
    e. Equipment parts list.
    f. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

        1) Predicted life of parts subject to wear.

    g. Local service center.

7. Lubrication and Service schedule.

    a. Preventative maintenance schedule.
    b. Component lubrication and servicing interval schedule.
    c. List of lubricants and/or filters required.
    d. Lubrication and servicing procedures.

8. Recommended spare parts list and quantities.

9. Guide to "trouble-shooting".
10. Plant specific instructions:

    a. Each Contractor's coordination drawings.
    b. As-installed color coded piping diagrams.
    c. Detailed specific “Sequence of Operation” for the constructed plant or project.
    d. Charts of valve tag numbers, if appropriate, with the location and function of each valve.

11. Plant specific start-up and shut-down procedures.
12. Detailed instructions for emergency operation
13. Other data as required under pertinent sections of Specifications.

C. Content, for each electrical system, as appropriate:

1. Description of system and component parts.

    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of replacement parts.

2. Circuit directories of panel boards.

    a. Electrical service.
    b. Controls.
    c. Communications.

3. As-installed color-coded wiring diagrams.
4. Operating procedures:

    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.

5. Maintenance procedures:

    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's recommended spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: The respective section of Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017823

Manufacturer Submittals/
Operation and Maintenance Manual Review Guide

Project Name

Project Number

Spec Section	Equipment Items	Initial Submittal Date	Format/Binder/TOC	Manufacturer Data	Process Description	Component Instructions	Operating Procedures	Maintenance Procedures	Lubrication Schedule	Plant Specific Instructions	Parts List	Spare Parts List	Troubleshooting Guide	Start-up/Shut-Down	Emergency Operation	Control Diagrams	Model/Serial Number	Notes

SECTION 017834 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to Engineer for review and transmittal to Owner. **Comply with provisions of Section 013323.**

1.2 RELATED DOCUMENTS

A. Bid Bond: Instructions to Bidders.

B. Performance and Payment Bonds: General Conditions and Supplemental General Conditions.

C. Guaranty: General Conditions and Supplemental General Conditions.

D. General Warranty of Construction: General Conditions.

E. Project Closeout: Section 017700.

F. Warranties and Bonds required for specific products: As listed in technical specifications in these Contract Documents herein.

G. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.

1.3 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.

1.4 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8-1/2 in. x 11 in., punch sheets for 3-ring binder.

    a. 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.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during progress of construction:

1. Submit documents within 10 days after inspection and acceptance.

B. Otherwise make submittals within 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.

1.6 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017834

SECTION 017839 – PROJECT RECORD DOCUMENTS - WATER

PART 1 - GENERAL

1.1 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.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Shop Drawings, Product Data, and Samples: Section 013323.

1.3 MARKING DEVICES

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

1.4 RECORDING

A. Label each document "PROJECT RECORD" 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. Coordinate and confirm with Engineer that electronic versions of all shop drawings have been provided to Engineer.

1.5 SUBMITTALS

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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017839

DIVISION 02

EXISTING CONDITIONS

SECTION 024100 – DEMOLITION & SALVAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for demolition as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 PROCEDURE

A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

B. It is the responsibility of the Contractor to visit the site to familiarize himself with the amount of Work that is included under this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DUST CONTROL

A. The amount of dust resulting from the demolition shall be controlled to prevent the spread of dust to occupied portions of the plant and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

3.2 DISCONNECTION OF UTILITY SERVICES

A. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.

3.3 BURNING

A. The use of burning at the project site for the disposal of refuse and debris will not be permitted, unless authorized in writing by the Owner.

3.4 PROTECTION OF EXISTING WORK

A. Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

3.5 BACKFILL OF STRUCTURES

A. All existing structures to be abandoned shall have equipment removed and walls demolished a minimum of two feet below finish grade. The portion of the demolished structures remaining below grade shall be backfilled with concrete, masonry, etc., from the demolition or any backfill material which is acceptable to the Engineer. The top two (2) feet of the backfill shall be made up of topsoil and graded to match the existing ground. It shall be free of any of the demolition material. The entire backfill shall be compacted in such a manner as to prevent settlement.

B. All existing demolished basins shall have some method of positive drainage thru the bottom slab as approved by the Engineer.

C. It is the responsibility of the Contractor to dispose of all excess demolition material from the site as soon as practicable.

3.6 SALVAGE MATERIAL

A. All equipment, pumps, controls, valves, piping, etc., is the property of the Owner and care shall be taken in its removal so not to damage it in any way. Such salvage material shall be removed and delivered to the Owner to a site designated by him. The Owner has the right to refuse any salvage material, and in such cases, it is the responsibility of the Contractor to dispose of the unwanted material.

END OF SECTION 024100

DIVISION 03

CONCRETE

SECTION 033100 – CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.

B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer's review in accordance with Section 01 33 23.

A. Concrete mixture proportions, test results and curves plotted to establish water-cementitious materials ratio if ACI 301-05 Section 4.2.3.4.b is followed.

B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301-05 Section 4.2.3.1 is followed.

C. Mix designs shall be submitted for all mixes proposed or required to be used, including all mixes containing admixtures.

D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.

E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.

1. Construction Joints
2. Control Joints
3. Steel Reinforcement

1.4 QUALITY ASSURANCE

The Contractor shall obtain and have available in the field office at all times, the following references:

A. ACI 301 Specifications for Structural Concrete for Buildings ACI 301 (latest Revision).

B. SP-15 (05) Field Reference Manual: Specifications for Structural Concrete for Buildings with selected ACI references.

Available from:

The American Concrete Institute
Publications Department
P.O. Box 9094
Farmington Hills, Michigan 48333-9094

C. Manual of Standard Practice - CRSI. (Latest Edition).

D. Placing Reinforcing Bars - CRSI (Latest Edition).

Available from:

Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, Illinois 60173-4758

E. ACI 318-08 Building Code Requirements for Structural Concrete and Commentary.

F. ACI 347 Guide to Form Work for Concrete.

PART 2 - PRODUCTS

2.1 CLASSES OF CONCRETE AND USAGE

A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:

1. Selection of Proportions for Class A Concrete:

   a. 4,500 psi compressive for strength at 28 days.
   b. Type II cement plus supplementary cementitious materials.
   c. Maximum. water-cementitious materials ratio = 0.45.
   d. Minimum. cement content = 584 pounds.
   e. Nominal maximum. size coarse aggregate = No. 67 (3/4-inch max.) or No. 57 (1-inch max.). Walls with architectural treatment shall use No. 67 (3/4-inch max.).
   f. Air content = 6% plus or minus 1% by volume.
   g. Slump = 3 inches to 4 inches when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

2. Selection of Proportions for Class B Concrete:

   a. 3,000 psi compressive strength at 28 days.
   b. Type I cement plus supplementary cementitious materials.
   c. Maximum water-cementitious materials ratio = 0.45.
   d. Minimum cement content = 470 pounds. (5.0 bags)/cubic yard concrete.

e. Nominal maximum size coarse aggregate = No. 67 (3/4-inch max.) or No. 57 (1-inch max). Walls with architectural treatment shall use No. 67 (3/4-inch max.).
f. Air content = 6% plus or minus 1% by volume.
g. Slump = 3 inches to 4 inches when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

B. Concrete shall be used as follows:

1. Class A concrete for all concrete work except as noted below.
2. Class B concrete for fill concrete, thrust blocks and topping over hollow-core slabs, and where indicated on the Drawings.

C. Type II cement conforming to ASTM C 150 shall be used in all structural concrete. Cement for exposed to view concrete shall have a uniform color classification.

D. Coarse aggregate for concrete shall be size No. 57, as specified in ASTM C 33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C 33.

E. Manufactured sand shall not be used as fine aggregate in concrete.

2.2 ADMIXTURES

A. An air entraining admixture shall be used on all concrete exposed to freezing and thawing cycles. Product shall be MB-AE 90, MB-VR or Micro Air by BASF Construction Chemicals or approved equal. Certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished, if requested.

B. Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type A. Product shall be "Pozzolith" Series or "PolyHeed" Series by BASF Construction Chemicals or approved equal.

C. High-Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type F. Product shall be Rheobuild 1000, "Glenium" Series or PS 1466 by BASF Construction Chemicals or approved equal.

D. Accelerating Admixture shall conform to ASTM C 494/C 494M Type C or E. Products shall be Pozzolith NC 534 or Pozzutec 20+ by BASF Construction Chemicals or approved equal.

E. Retarding Admixture shall conform to ASTM C 494/C 494M Type B or D. Product shall be "Pozzolith" Series or "DELVO" Series by BASF Construction Chemicals.

F. A water-reducing, set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.

G. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494, Type A, water-reducing and normal setting admixture, and when required, for

ASTM C 494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.

H. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.

I. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

J. The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.

K. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion, require the use of a set retarding admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80 degrees F. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.

L. When more than one (1) admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.

M. Calcium chloride will not be permitted as an admixture in any concrete.

2.3 REINFORCEMENT

A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615/A 615M. All bar reinforcement shall be deformed.

B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction, and securely wired or clipped with standard clips.

C. Smooth dowels shall be plain steel bars conforming to ASTM A 615/A615M, Grade 60, or steel pipe conforming to ASTM A 120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface, and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased or dowels shall be coated with high density polyethylene with a minimum thickness of 14 mils.

D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved

high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirement of Paragraph 3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork.

2.4 OTHER MATERIALS

A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.

1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
2. Inserts shall be malleable iron or steel, and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back, or shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.
3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05500 "Miscellaneous Metals". Anchors shall develop ultimate shear and pull out loads of not less than the following values in Class A concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following Specification. Contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the Specification.

1. Material:

The epoxy material shall consist of a 2-component system whose components conform to the following requirements:

a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.
b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono-functional epoxide containing compounds modified with 2, 4, 6 tri (dimethylaminomethyl) phenol.

c. The component ratio of B to A by volume shall be as specified by the manufacturer.

2. Properties of Mixed Components:

a.	Solids Content	100% by weight
b.	Pot Life	25-35 min. @ 73oF.
c.	Tack-Free Time	4-5-1/2 hrs @ (Thin Film) 73oF.
d.	Final Cure ASTM D 695	3 days at 73oF. (75% ultimate strength)
e.	Initial Viscosity (A+B)	2,000 cps. min at 73oF.
f.	Color Mixed	Straw

3. Properties of Cured Material (Neat Material):

a.	Tensile Strength ASTM D 638	3,000 psi min. @ 14 days 73oF. cure
b.	Tensile Elongation ASTM D 638	2 - 2% at 14 modified days 73oF. cure
c.	Compressive Strength ASTM D 695	12,500 psi min. at 73o F. cure
d.	Compressive Modules ASTM D 695	470,000 psi min. @ 28 days, 73oF cure
e.	Compressive Strength ASTM D 695	5,500 psi min. @ 24 days 73oF cure
f.	Water Pick-up ASTM D 570	1.5 max.

C. Flashing reglets shall be as specified in Section 075300. Reglets shall be correctly placed into forms prior to placing concrete in formwork.

D. Premolded expansion-joint filler strips shall conform to ASTM D 1752 and shall be 3/8-inch thick unless otherwise shown.

E. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable:

1. Colma by Sika Chemical Corporation
2. Hornflex by A.C. Horn, Inc.
3. Sonolastic by BASF Construction Chemicals.

F. Nonshrink grout shall be Embeco 885 grout by BASF Construction Chemicals, Euco Firmix grout by the Euclid Chemical Company, or approved equal. The approved product shall be delivered to the site of the Work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.

G. Hardeners and dustproofers shall be colorless, aqueous solution of zinc or magnesium fluosilicate. Each gallon of solution used for the first application shall contain not less than one pound of crystals. Each gallon of solution used for subsequent application shall contain not less than two pounds of crystals. Materials shall be reviewed by the Engineer. Product shall be Lapidolith by BASF Construction Chemicals or approved equal.

H. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth clay or other foreign substances.

I. Waterstops: Waterstops shall be polyvinyl chloride, flat dumbbell shape (no center bulb), of size shown on Drawings, complete with fittings as required such as unions, vertical tees, vertical ells, flat crosses, flat ells, flat tees, etc. Waterstops shall be securely wired into place to maintain proper position during placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.

J. Form Liners: Form liners for construction of fluted wall treatment shall be prefabricated plastic liners as manufactured by Greenstreak Plastic Products, Interform Company, or Symons Corporation.

1. Liners shall be fiberglass or ABS (acrylonitrile - butadiene - styrene) of such configuration as to obtain the fluted pattern shown or indicated on the Drawings.
2. For purposes of designating type and quality of material required, form liners shall be pattern 361 trapezoidal liners as manufactured by Greenstreak Plastic Products.
3. Preparation of forming materials, sealing of joints to prevent grout leakage and form release treatment (if required) shall be in strict compliance with the manufacturer's printed instructions and recommendations.

PART 3 - EXECUTION

3.1 FINISHES

A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
6. Form panels shall be provided in the maximum sized practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.

7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
8. Form ties shall remain in the walls and shall be equipped with a waterseal to prevent passage of water through the walls. Minimum set back of form ties shall be 1-1/2 inches from faces of wall. The hole left by removal of tie ends shall be sealed and grouted in accordance with the procedure described hereinafter in Par. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces; this does not apply to walls receiving decorative waterproof masonry coating.
9. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one (1) foot below the minimum liquid level that will occur during normal operations.

B. All vertical surfaces in liquid containing structures shall have a "smooth form" finish.

1. All "smooth form" concrete vertical surfaces shall be a true plane within 1/4-inch in ten (10) feet as determined by a ten (10) foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.

C. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.

D. Weirs and overflow surfaces shall be given a "troweled" finish.

E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.

F. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Parching mortar shall be mixed and placed in general accordance with ACI 301, Par. 5.3.7.5.

G. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed to provide a finished floor at the same elevation as surrounding areas.

3.2 TESTING

A. All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 1.6.4 shall be performed by a testing agency acceptable to the Engineer and Owner.

B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Contractor's expense. The Owner-approved third party testing agency shall be responsible for making

concrete test cylinders, storing and protecting concrete cylinders and delivering cylinders to the Owner-approved testing laboratory.

C. Testing services of ACI Section 1.6.4.4 shall be paid for by the Contractor. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

3.3 ADDITIONAL REQUIREMENTS

A. Unless otherwise directed by the Engineer, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.

B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 312000 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

D. Concrete Mixing

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

    a. When air temperature is between 85 and 90 degrees F (30 and 32 degrees C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F (32 degrees C), reduce mixing and deliver time to 60 minutes.

2. Project site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

    a. For mixer capacity of 1 cu. yd. (0.76 cubic meters) or smaller, continue mixing at lease 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
    b. For mixer capacity larger than 1 cubic yard (0.76 cubic meters), increase mixing time by 15 seconds for each additional 1 cubic yard.
    c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.

F. All concrete surfaces shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.

G. The unit of operation shall not exceed 30 feet for tank walls and walls exposed to weather, and 45 feet for other work in any horizontal direction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the Engineer. Provision shall be made for jointing successive units as indicated or required to be made at spacing of approximately 25 feet. Additional construction joints required to satisfy the 25 foot spacing shall be located by the Contractor subject to the review of the Engineer. The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

H. Formwork for beam soffits and slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

I. Concrete Walks and Curbs:

1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 x 6-W1.4xW1.4 welded wire reinforcement.
3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10

feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4 inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

J. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.

K. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.

L. Watertightness:

1. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water and no wet spots shall show.
2. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.
3. After repairs, if any are required, the structures shall be tested again and further repaired if necessary until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
4. Waterstops shall be placed in other locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
5. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to "MasterSeal 590" as made by BASF Construction Chemicals mixed and applied in accordance with the manufacturer's instructions.

M. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The bases shall be

constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 2 inches below the metal base. The equipment shall then be properly shimmied to grade and the 2-inch void filled with nonshrink grout.

N. Concrete which, in the opinion of the Architect-Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.

O. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A 615, Grade 60, #4 deformed steel reinforcing bar, be 9" deep, 14" wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1" diameter holes, minimum 3-3/4 inches deep into the wall, and then driving steps into hole to the penetration stop, resulting in a press fit condition.

P. Tank pressure relief valves shall be 6 inches diameter Neenah Foundry Company R-5001-1, American Valve & Hydrant B315.1, or equal, floor type, with outside hooks or inside self-contained lock; quantity and spacing as shown on structural drawings. No part of pressure relief valves shall project above the neat line of the tank floor to prevent fouling of scraper mechanisms where used.

Q. All existing contact surfaces with new patch shall be coated with moisture insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Concresive LPL Liquid by BASF Construction Chemicals, or approved equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Masterflow 713, Sonogrout by BASF Construction Chemicals, or approved equal, mixed and placed in accordance with manufacturer's instructions, to the thicknesses shown on Drawings. Coat base pour with epoxy bonding adhesive prior to placing grout course.

END OF SECTION 033100

SECTION 034000 – PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all precast concrete structures and accessories appurtenances as shown on the Drawings and specified herein.

B. Delegated Design: Design precast concrete structures, including comprehensive engineering analysis by a qualified professional engineer, licensed in the state in which the project using performance requirements and design criteria indicated.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-in-Place Concrete: Section 033100

1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer's review in accordance with Section 013323.

A. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data, calculations, and erection drawings signed and sealed by the qualified professional engineer responsible for their preparation.

B. Product Data: For each type of product indicated included but not limited to standard precast units, proprietary precast units, embedded items, and accessories.

C. Design Data: Submit calculations prepared under the direct supervision of a professional engineer supporting the structural design, including resistance to buoyancy with groundwater table to the top of the structure, resistance to uplift and resistance to wheel loads in accordance with requirements and references indicated. The calculations shall be sealed by a professional engineer licensed in the state in which the project is located.

D. Test Reports: Submit test reports for the following:

1. Material certifications and/or laboratory test reports, including mill tests and all other test data, for Portland cement, blended cement, pozzolans, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this Project.
2. Test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Such tests may include compressive strength, flexural strength, plastic or hardened air content, freeze thaw durability, abrasion and absorption. Clearly detail in the specifications special tests for precast concrete or cast-in items.

3. Sufficient documentation, when the use of self-consolidating concrete (SCC) is proposed, showing a minimum of 30-days production track records demonstrating that SCC is appropriate for casting of the product.
4. In-plant QA/QC inspection reports, upon the request of the Project Representative.

E. Shop Drawings: Submit shop drawings for standard precast units and custom-made precast units prepared under direct supervision of a professional engineer licensed in the state in which the project is located. Shop drawings shall include:

1. The criteria and loads used in the design of the precast components.
2. All materials used, their specifications and their design strengths.
3. Layout, piecemark, dimensions, reinforcing, and connection details of each precast member, including openings.
4. Details and instructions for lifting, rigging, erection, and installation of each precast component.
5. Lists and descriptions of all loose accessory materials supplied.
6. Instructions on secondary pours (in the field) when required.
7. Professional Engineer's seal.

F. Quality Control Procedures: Submit certificate from the NPCA QC Manual that the precast concrete structure manufacturer participates in their QA/QC program.

G. Manufacturer's Instructions.

1.4 QUALITY ASSURANCE

A. Manufacturer of precast concrete structures shall be quality certified by NCPA. Inspect manufacture of structures in accordance with ASTM C1037.

B. Installer of precast concrete structures shall have a record of at least three (3) years of successful installation of similar products on similar projects.

C. Inspection of earthwork, compaction and backfill shall be in accordance with the earthwork specifications in Division 31.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast units to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite, all precast concrete units will be inspected by the Project Representative for quality and final acceptance.

B. Store units off the ground or in a manner that will minimize potential damage.

C. Handle, transport, and store products in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Perform lifting with methods or devices intended for this purpose as indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

A. Circular precast vaults and structures shall conform to ASTM C478. Non-circular vaults and structures shall conform to ASTM C857. Access hatch and pipe penetrations shall be cast in the top slab and/or sides as indicated on the drawings.

B. Manhole frames and covers shall have a clear opening of 22 inches and shall be made of cast iron conforming to ASTM A48/A48M Class 30. Casting shall be smooth, clean and free from blisters, blowholes and shrinkage. Castings shall be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 144 degrees F and not more than 155 degrees F so as to form a tenacious coating.

C. Structural design of precast concrete structures is hereby delegated.

D. All precast concrete structures shall be designed to resist the lateral soil pressures and fluid pressures in accordance with ASTM C857.

E. All precast concrete structures have integral flanges at the base to engage enough soil resistance to resist the buoyant force from full submergence.

F. All precast concrete structures shall be designed to support HL-93 or HS25-44 wheel loads in accordance with the AASTHO HB-17 anywhere on the top surface of the structure.

G. Joints: Joints shall be watertight and shall be sealed with one of the following:

1. Rubber gaskets conforming to ASTM C443.
2. Pre-formed flexible butyl type joint sealant conforming to AASHTO M198.

    a. Hamilton Kent "Kent Seal No. 2"
    b. K.T. Snyder Company "Rub'r Nek"
    c. Press Seal Gasket "E Z Stik"

H. Corrosion Control: Follow recommendations outlined in ACPA 01-110 when hydrogen sulfide is indicated as a potential problem.

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate precast concrete structures in accordance with NPCA QC Manual.

3.2 INSTALLATION

A. Install precast concrete structures in accordance with ASTM C891 and the manufacturer's instructions.

B. Lift precast components at designated lifting points in accordance with the manufacturer's instructions and other applicable safety standards.

C. Precast concrete structures shall bear on a minimum 4 inch thick bedding / base / drainage course of free-draining granular material. See Division 31 for bedding / base / drainage course materials.

D. Do not bear precast concrete structures on uneven subgrade or grade with high points from rock pinnacles or boulders or rock ledges.

E. Install precast concrete structures in proper location, with the proper alignment and level.

F. Backfill around the precast concrete structures in accordance with Division 31 specifications.

3.3 JOINTS

A. Joints shall be sealed with an approved sealant as specified in Part 2, and shall be mortared or grouted.

B. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound.

C. Joints shall be watertight.

D. Pipe Connections into Precast Structures:

1. Precast Openings:

   a. Pipe shall be sealed in the precast section pipe opening with a resilient connector meeting the requirements of ASTM C923. Resilient connector shall be "Dura-Seal III" by Dura-Tech, Dayton, Ohio; "A-Lok" by A-LOK Products, Inc.; or approved equal.
   b. Resilient connector shall be cast integrally into the wall of the precast section at the time of manufacture. There shall be no mortar placed around the connector on the outside of the manhole and no mortar shall be placed around the top half of the connector on the inside of the manhole when completing the invert work.

2. Cored Openings:

   a. Pipe shall be sealed in cored precast section pipe opening with a resilient mechanical connector meeting the requirements of ASTM C923. Resilient connector shall be "NPC Kor-N-Seal I" (with stainless steel wedge) by Trelleborg Pipe Seals Milford, Inc.; "PSX: Direct Drive" by Press-Seal Gasket Corporations; interlocking link pipe seal; or approved equal. All fasteners and hardware shall be Type 304 stainless steel.
   b. There shall be no mortar placed around the connector on the outside of the structure and no mortar shall be placed around the top half of the connector on the inside of the structure when completing the invert work.

3.4 LEAKAGE TESTING

A. Leakage tests shall be made and observed by the Project Representative's representative for all precast structures. The test shall be the watertightness (exfiltration) test as described herein.

B. After each structure has been assembled in place, including wall piping, all lifting holds shall be filled with an approved non-shrink, non-metallic grout. Upon completion, each precast structure shall be tested to determine watertightness. The leakage test shall be made prior to placing any fill material and prior to application of interior/exterior wall coatings if specified. If the groundwater table has been allowed to rise above the bottom of the structure, it shall be lowered for the duration of the test. All pipes and other openings into the structures shall be suitably plugged and the plugs braced to prevent blow out.

C. The tank shall be filled with potable water to the maximum level. The test shall consist of measuring the liquid level over the next 24 hours to determine if any change has occurred. If a change is observed and exceeds the maximum allowance, the test shall be extended to a total of five days. If at the end of five days the average daily change has not exceeded the maximum allowance, the test shall be considered satisfactory.

D. The liquid volume loss for a period of 24 hours shall not exceed one-twentieth of one percent of the tank capacity, 0.0005 x tank volume. If the liquid volume loss exceeds this amount, it shall be considered excessive, and the tank shall be repaired and retested.

E. Damp spots will not be permitted at any location on the structure wall. Damp spots are defined as spots where moisture can be picked up on a dry hand. All such areas shall be repaired as necessary.

F. Damp spots or standing water on the footing may occur upon tank filling and are permissible within the allowable volume loss. Measurable flow in this area is not permissible and must be corrected.

G. It shall be the Contractor's responsibility to uncover the structure as necessary and to disassemble, reconstruct, or replace it as directed by the Project Representative. The structure shall then be retested.

H. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Project Representative that the water table is below the bottom of the structure throughout the test.

3.5 CLEAN UP

A. Upon completion of installation of the precast structures and appurtenances, the Contactor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground around and adjacent to the construction area in a uniform and neat manner to the final grade lines.

END OF SECTION 034000

SECTION 036000 – PRECISION GROUTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, material, equipment and services required for grouting of equipment, machinery, structural steel, handrails, anchor bolts and other items or work for which grouting is specified or required.

B. The object of these Specifications is to obtain grout which can be mixed to a flowable consistency (i.e., thinner than plastic consistency), placed in leakproof forms, with a minimum of strapping, without bleed water exceeding Specification requirements. The requirement of 24 hour presoak of existing concrete is of prime importance and must be adhered to. Trade name of grout shall be submitted to Engineer for review well in advance of preparation for grouting.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-in-place Concrete is included in Section 033100.

B. Review all divisions and sections for equipment, machinery, and other items to be grouted.

1.3 DESCRIPTION OF WORK

A. High strength, precision support of machine bases and soleplates, setting anchor bolts, including equipment subject to thermal movement and repetitive dynamic loading.

B. Work includes providing a non-shrink, ready-to-use, fluid precision grout material; proportioned, pre-mixed and packaged at the factory; delivered to the jobsite to place with only the addition of water; forming, placing and curing as specified in this section.

1.4 QUALITY ASSURANCE

Comply with the following codes, standards, tests and recommended practices for foundation concrete as applies to precision grouting.

A. ACI 304R-85 "Guide for Measuring, Mixing, Transporting and Placing Concrete."

B. ACI 305R-77 (Revised 1982) "Recommended Practice for Hot Weather Concreting."

C. ACI 306R-78 (Revised 1983) "Recommended Practice for Cold Weather Concreting."

D. ACI 347-78 "Recommended Practice for Concrete Formwork."

E. ASTM C 309-74 "Standard Specifications for Liquid Membrane Forming Compounds for Curing Concrete."

F. Manufacturer's Information Use of Grout: Attached to each bag of grout.

G. Corps of Engineers CRD C-79 Method of Test for Flow of Grout Mixtures (Flow-Cone method).

H. ASTM C 109-73 "Tentative Method of Test for Compressive Strength of Hydraulic Cement Mortars."

1.5 SUBMITTALS

A. Purchase Orders: Furnish copies of submittals in this Section to the Engineer prior to delivery in accordance with section 013323.

PART 2 - PRODUCTS

2.1 GROUT

A. Precision-support grout shall consist of a cementitious system, special graded and processed ferrous metallic internal reinforcing aggregate, carefully graded natural fine aggregate and additional technical components.

B. Grouts which depend upon aluminum powders, chemicals or other agents which produce gas for expansion are not acceptable.

1. Free of gas producing agents.
2. Free of oxidizing catalysts.
3. Free of inorganic accelerators, including chlorides.

C. Provide Performance Characteristics when mixed to fluid consistency, 25 to 30 seconds (Flow Cone Method CRD C-79), as follows:

1. No visible bleeding and/or settlement up to 2 hours on 1/4 to 2 gallons grout poured into gallon can, covered with glass plate to prevent evaporation. Grout shall meet the requirements of Paragraph 4.1 of Corps of Engineers CRD C 588-76.
2. Maintain firm, full contact with underside of 4 feet by 4 feet by 2 inches steel plate firmly bolted to supports at quarter points at 1, 7 and 14 days, evidenced by tapping of plate and visual observation after stripping. Grout shall be cured in accordance with manufacturer's printed instructions.
3. Provide strengths as specified in Paragraph 3.05 (2-inch by 2-inch cubes). Prepare specimens and test in accordance with ASTM C 109-73.

2.2 MEMBRANE CURING COMPOUND

A. Membrane forming curing compound shall be in accordance with ASTM C 309-74.

2.3 WATER

A. Water shall be suitable for drinking.

PART 3 - EXECUTION

3.1 PREPARATION FOR GROUTING

A. Remove laitance down to sound concrete.

B. Surface to receive grout shall be rough and reasonably level.

C. Surface shall be properly wet cured. DO NOT USE CURING COMPOUNDS. (See Section 033100).

D. Clean surface of oil, grease, dirt, and loose particles.

E. Clean bolt holes, bolts and underside of bed plate.

F. Saturate concrete including bolt holes for 24 hours prior to grouting. Blow out excess water with oil free compressed air, or siphon prior to grouting.

3.2 FORMWORK

Formwork shall be compatible with proposed method of placing grout. Design for rapid, continuous and complete filling of space to be grouted.

A. Build strong, tight forms braced so they will not leak or buckle under weight of fluid grout. On placing side, slant form at 45o angle and pour grout directly on slanted face. On other sides, place form 2 inches or more from base of bed plate and 1 inch or more higher than underside of the plate.

B. Caulk forms with grouting material being used on inside or a sand-cement mortar outside to prevent leakage and loss of "head." Use expanded polystyrene or other means to caulk between foundation and portions of the bed plate and equipment to seal off areas where grout is not desired.

3.3 PREPARATION OF GROUT

Preparation of grout shall be in paddle-type mortar mixer suitable mechanical mixer. DO NOT MIX BY HAND.

A. Mix grout adjacent to area being grouted, have sufficient manpower and equipment available for rapid and continuous mixing and placing. DO NOT ADD CEMENT, SAND OR PEA GRAVEL ADDITIVES.

B. Avoid a consistency that produces bleeding. Mix materials for a minimum of 3 minutes and place immediately. DO NOT RETEMPER. DO NOT USE MIXING WATER ABOVE 80 degrees F. (27 degrees C.).

3.4 PLACING

Placing of grout shall be at a temperature of 65-75 degrees F. (18-24 degrees C) for foundation, bed plate and grout material. Maintain for 24 hours following installation, hereafter above 40 degrees F (4 degrees C) until strength exceeds 4,000 psi (280 kg/cm2.) DO NOT USE COKE-FIRED SALAMANDERS.

A. Place grout quickly and continuously; avoid surface of overworking material and segregation. DO NOT VIBRATE GROUT. DO NOT OVERWORK GROUT.

B. Field service representative of the manufacturer shall be available during initial planning for installation to suggest recommended procedures and at start of placement for further suggestions.

1. A minimum of three (3) days notice shall be given by the Contractor to the manufacturer prior to use of the product.

3.5 FINISHING AND CURING

Follow manufacturer's printed instructions for the brand and type of grout being used.

A. The grout shall meet the following strengths:

	Plastic Mix	Flowable Mix
1-day	4,000 psi	2,000 psi
3-days	6,000 psi	3,000 psi
7-days	8,000 psi	5,000 psi
28-days	10,000 psi	7,000 psi

END OF SECTION 036000

DIVISION 05

METALS

SECTION 055000 – MISCELLANEOUS METALWORK

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The Contractor shall provide miscellaneous metalwork and appurtenances, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Federal Specifications

MIL-G-18015 A (3)	(Ships) Aluminum Planks. (6063-T6)
MIL-A-907E	Antiseize Thread Compound, High Temperature

B. Commercial Standards

AA-M32C22A41	Aluminum Assn.
AASHTO HS-20	Truck Loading
AISC	Manual of Steel Construction
AISI	Design of Light Gauge, Cold-Formed Steel Structural Members
ASTM A 36	Carbon Structural Steel
ASTM A 48	Gray Iron Castings
ASTM A 53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 193	Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service
ASTM A 194	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 307	Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 325	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 992	Steel for Structural Shapes for Use in Building Framing
ANSI/AWS D1.1	Structural Welding Code - Steel
ANSI/AWS D1.2	Structural Welding Code - Aluminum
ANSI/AWS QC1	Qualification and Certification of Welding Inspectors

1.3 CONTRACTOR SUBMITTALS

A. Shop Drawings: Shop Drawings of all miscellaneous metalwork shall be submitted in accordance with Section 013323 - Shop Drawings, Product Data and Samples.

1.4 QUALITY ASSURANCE

A. All weld procedures and welder qualifications shall be available in the Contractor's field office for review.

B. All welding shall be inspected by a Contractor-furnished inspector qualified in accordance with AWS requirements and approved by the Engineer.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Steel

Wide Flange Shapes	ASTM A 992
Shapes, Plates, Bars	ASTM A 36
Pipe, Pipe Columns, Bollards	ASTM A 53, Type E or S, Grade B standard weight unless noted otherwise
HSS	ASTM A 500 Grade B

B. Corrosion Protection: Unless otherwise indicated, fabricated steel metalwork which will be used in a corrosive environment and/or will be submerged in water/wastewater shall be coated in accordance with Section 099600 - High Performance Paint and Coating and shall not be galvanized prior to coating. All other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication.

C. Stainless Steel: Unless otherwise indicated, stainless steel metalwork and bolts shall be of Type 316 stainless steel. Where anaerobic conditions are noted, Type 304 stainless steel shall be used.

D. Aluminum: Unless otherwise indicated, aluminum metalwork shall be of Alloy 6061-T6. Aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with Section 099600.

E. Cast Iron: Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B or better.

2.2 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete masonry. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Prime shelf angles located in exterior walls with zinc-rich primer.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to concrete masonry unit walls.

2.3 METAL STAIRS

A. Metal Stairs: Metal stairs shall be composed of steel or aluminum stringers and supports, be fabricated in accordance with standard practice of the National Association of Ornamental Metal Manufacturers, and be as indicated. Steel stair members shall be hot-dip galvanized after fabrication.

2.4 SAFETY STAIR NOSINGS

A. Safety stair nosing shall be provided on all concrete stairs and other locations as indicated. The nosing shall be 3-inch wide, extruded aluminum with cast-in abrasive strips and integral extruded anchors. The color of the cast abrasive shall be as selected by the Engineer from the manufacturer's standard colors. The nosing shall be American Abrasive Metals Company, Style "231-A"; American Mason Safety Tread Company, Figure "31A" or equal.

2.5 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application): Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be steel as indicated herein. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing. Except as otherwise indicated, steel for bolt material, anchor bolts and cap screws shall be in accordance with the following:

1. Structural connections: ASTM A 307, Grade A or B, hot-dip galvanized.
   Anchor Bolts: ASTM A 307, Grade A or B, or ASTM A 36, hot-dip galvanized.
2. High strength bolts where indicated: ASTM A 325.
3. Pipe and equipment flange bolts: ASTM A 193, Grade B-7.

B. Corrosive Service: All bolts, nuts, and washers in the locations listed below shall be stainless steel as indicated below.

1. All buried locations.
2. All submerged locations.
3. All locations subject to seasonal or occasional flooding.
4. Inside hydraulic structures below the top of the structure.
5. Inside buried vaults, manholes, and structures which do not drain through a gravity sewer or to a sump with a pump.
6. All chemical handling areas.
7. Inside trenches, containment walls, and curbed areas.
8. Locations indicated by the Contract Documents or designated by the Engineer to be provided with stainless steel bolts.

C. Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be Type 316 stainless steel, Class 2, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts. All threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for

submerged stainless steel bolts, to meet government specification MIL-A-907E. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.

1. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.
2. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.

D. Bolt Requirements

1. The bolt and nut material shall be free-cutting steel.
2. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
3. Bolts and nuts shall be installed with washers fabricated of material matching the base material of bolts, except that hardened washers for high strength bolts shall conform to the requirements of the AISC Specification. Lock washers fabricated of material matching the bolts shall be installed where indicated.
4. The length of each bolt shall be such that after the joint is made up, the bolt extends through the entire nut, but in no case more than 1/2-inch beyond the nut.

E. Adhesive Anchors: Unless otherwise indicated, all drilled, concrete or masonry anchors shall be adhesive anchors. No substitutions will be considered unless accompanied with ICBO report verifying strength and material equivalency.

1. Epoxy adhesive anchors are required for drilled anchors for indoor installations, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails and reinforcing bars. Epoxy shall comply with Section 03315 - Grout. Threaded rod shall be galvanized for general purpose applications and stainless steel Type 316 for corrosive applications. Epoxy anchors shall not be permitted in areas where the concrete temperature is in excess of 100 degrees F or higher than the limiting temperature recommended by the manufacturer, whichever is lower. Epoxy anchors shall not be used when anchors are subject to vibration or fire. Embedment depth shall be as the manufacturer recommends for the load to be supported.
2. Unless otherwise indicated, glass capsule, polyester resin adhesive anchors will be permitted in locations not included above and shall be Hilti HVA or Cobra Anchors. Threaded rod shall be galvanized steel.

F. Expanding-Type Anchors: Expanding-type anchors if indicated or permitted, shall be galvanized steel expansion type ITW Ramset/Redhead "Trubolt" anchors; McCullock Industries "Kwick-Bolt;" or equal. Lead caulking anchors will not be permitted. Size shall be as indicated. Embedment depth shall be as the manufacturer recommends for the load to be supported. Expansion type anchors which are to be embedded in grout may be steel. Non-embedded buried or submerged anchors shall be stainless steel.

G. Non-Shrink Grouted Anchors: Anchors, if indicated or permitted, shall be grouted with a non-shrink cementitious grout in accordance with the manufacturer's recommendation. Embedment depth shall be as the manufacturer recommends for the load to be supported. Non-shrink grout material shall be Class B or C in accordance with Section 036000 – Precision Grouting.

2.6 POWDER-DRIVEN PINS

A. Materials: Powder-driven pins for installation in concrete or steel shall be heat-treated steel alloy. If the pins are not inherently sufficiently corrosion-resistant for the conditions to which they are to be exposed, they shall be protected in an acceptable manner. Pins shall have capped or threaded heads capable of transmitting the loads the shanks are required to support. Pins that are connected to steel shall have longitudinal serrations around the circumference of the shank.

2.7 IMPACT ANCHOR

A. Impact anchors shall be an expansion type anchor in which a nail type pin is driven to produce the expansive force. The pin shall have a zinc sleeve with a mushroom style head and stainless steel nail pin. Anchors shall be Metal Hit Anchors, manufactured by Hilti, Inc., Rawl Zamac Nailin, manufactured by the Rawlplug Company; or equal.

PART 3 - EXECUTION

3.1 FABRICATION AND INSTALLATION REQUIREMENTS

A. Fabrication and Erection: Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

B. Aluminum Railings: Aluminum railing fabrication and installation shall be performed by craftsmen experienced in the fabrication of architectural metalwork. Exposed surfaces shall be free from defects or other surface blemishes. Dimensions and conditions shall be verified in the field. All joints, junctions, miters and butting sections shall be precision fitted with no gaps occurring between sections, and with all surfaces flush and aligned. Electrolysis protection of materials shall be provided.

C. Powder-Driven Pins: Powder-driven pins shall be installed by a craftsperson certified by the manufacturer as being qualified to install the manufacturer's pins. Pins shall be driven in one initial movement by an instantaneous force that has been carefully selected to attain the required penetration. Driven pins shall conform to the following requirements where "D" = pin's shank diameter:

Material Penetrated by Pin	Material Minimum Thickness	Pin Shank Penetration in Supporting Material	Minimum Space From Pin's CL to Edge of Penetrated Material	Minimum Pin Spacing
Concrete	16D	6D minimum	14D	20D
Steel	1/4-inch	Steel thickness	4D	7D

3.2 WELDING

A. Method: Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.

B. Quality: In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as indicated by the AWS Code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Ground all sharp corners of material which is to be painted or coated to a minimum of 1/32-inch on the flat.

3.3 GALVANIZING

A. Structural steel plates shapes, bars, and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.

B. Field repairs to damaged galvanizing shall be made by preparing the surface and applying a coating.

1. Surface preparation shall consist of removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC SP1) followed by brush off blast cleaning (SSPC SP7), over an area extending at least 4-inches in all directions into the undamaged area.
2. Coating shall be applied to at least 3 mils dry film thickness. Use Galvax by Alvin Products, or ZRC by ZRC Worldwide or approved equal.

3.4 DRILLED ANCHORS

A. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions. Holes shall be roughened with a brush on a power drill, cleaned and dry. Drilled anchors shall not be installed until the concrete has reached the required 28-day compressive strength. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

END OF SECTION 055000

SECTION 055133 – ALUMINUM LADDERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fixed aluminum wall ladders.

B. Fasteners and installation accessories.

1.2 RELATED SECTIONS

A. Division 03

1.3 REFERENCES

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.

B. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2002.

C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.

D. ASTM B 308 - Standard Specification for Aluminum - Alloy T6061-T6 Standard Structural; 2002

E. OSHA 29 CFR Standard 1910.27 - Fixed ladders; Occupational Safety and Health Standards; current edition

1.4 SUBMITTALS

A. Submit under provisions of Section 013323.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Detailed drawings showing complete dimensions, all materials, mounting attachments, and fabrication details.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than twenty years of experience.

1.6 WARRANTY

A. See Section 017700 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Alaco Ladder Co.
2. ACL Industries, Inc.
3. Jomy Products, Inc.
4. O'Keeffe's, Inc.

B. Requests for substitutions will be considered in accordance with provisions of Section 012500.

2.2 MATERIALS

A. Extruded Aluminum Profiles: ASTM B 221, ASTM B 210, ASTM B 308, Alloy 6061-T6; standard mill finish.

B. Aluminum Sheet and Plate: ASTM B 209, Alloy 6061-T6; standard mill finish.

C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs shear strength.

D. Cast fittings, connectors and rung ends: Cast Aluminum alloy 356

2.3 LADDERS

A. Ladders - General: Comply with ANSI A14.3 and OSHA regulations.

B. Fixed Wall Ladders: Extruded aluminum; serrated rungs 1-1/8 inches (29 mm) in diameter, connected to 2-7/8 inch (73 mm) side rail channels with cast aluminum rung connectors, each secured to rails by means of four solid aircraft rivets.

1. Capacity: 500 pounds (225 kg).

2. 24 inches Wide.

2.4 FINISHES

A. Provide all aluminum in standard mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 055133

SECTION 055314 – ALUMINUM BAR GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes metal bar gratings and metal frames and supports for gratings.

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for structural-steel framing system components.
2. Section 055116 "Aluminum Ships Stair" for grating treads and landings of ships stair.
3. Section 055219 "Fixed Aluminum Stairs" for grating treads and lands of fixed stairs.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Clips and anchorage devices for gratings.
2. Paint products.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

C. Manufacturers published load tables for each size of grating on job.

1.5 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Alabama Metal Industries Company; a Gibraltar Industries company.
2. All American Grating.
3. BarnettBates Corporation.
4. Borden Metal Products (Canada) Limited.
5. Fisher & Ludlow; a NUCOR Company.
6. Grating Pacific, Inc.
7. Grupo Metelmex, S.A. de C.V.
8. Harsco Industrial IKG, a division of Harsco Corporation.
9. McNicholos Co.
10. MLP Steel Company; Laurel Steel Products Division.
11. Neenah Foundry Company.
12. Ohio Gratings, Inc.
13. Ross Technology Company.
14. Seidelhuber Metal Products; Brodhead Steel.

2.2 METAL BAR GRATINGS

A. Pressure-Locked, Rectangular-Bar Aluminum Grating MBG-531-17: Fabricated by swaging crossbars between bearing bars.

1. Bearing Bar Spacing: 1-3/16 inches o.c.
2. Bearing Bar Depth: 2-1/4 inches.
3. Bearing Bar Thickness: 3/16 inch.
4. Crossbar Spacing: 4 inches o.c.
5. Traffic Surface: Serrated.
6. Aluminum Finish: Class I, clear, anodized finish.

2.3 ALUMINUM

A. General: Provide alloy and temper recommended by aluminum producer for type of use indicated, with not less than the strength and durability properties of alloy, and temper designated below for each aluminum form required.

B. Extruded Bars and Shapes: ASTM B221, alloys as follows:

1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
2. 6061-T1, for grating crossbars.

C. Aluminum Sheet: ASTM B209, Alloy 5052-H32.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners.

1. Provide stainless-steel fasteners for fastening aluminum.

B. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 2.

2.5 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
2. Toeplate Height: 4 inches unless otherwise indicated.

G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
2. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.
3. Provide no fewer than four weld lugs for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced less than 15/16 inch o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.
4. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.
5. Furnish self-drilling fasteners with washers for securing grating to supports.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Kee Safety, Inc.
2) Lindapter International.
3) LNA Solutions, a Kee Safety company.

H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

I. Do not notch bearing bars at supports to maintain elevation.

2.6 GRATING FRAMES AND SUPPORTS

A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

1. Unless otherwise indicated, fabricate from same basic metal as gratings.
2. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Attach toeplates to gratings by welding at locations indicated.

F. Field Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055314

DIVISION 06

WOODS, PLASTICS & COMPOSITES

SECTION 061000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Rooftop equipment bases and support curbs.
3. Wood blocking
4. Plywood backing panels.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Application: Treat all rough carpentry unless otherwise indicated.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664 and design value adjustment factors shall be calculated according to ASTM D6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry unless otherwise indicated.

1. Framing for raised platforms.
2. Concealed blocking.
3. Framing for non-load-bearing partitions.
4. Framing for non-load-bearing exterior walls.
5. Roof construction.
6. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:

a. Hem-fir (north); NLGA.
b. Southern pine or mixed southern pine; SPIB.
c. Spruce-pine-fir; NLGA.
d. Hem-fir; WCLIB, or WWPA.
e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
f. Northern species; NLGA.
g. Eastern softwoods; NeLMA.
h. Western woods; WCLIB or WWPA.

B. Ceiling Joists: Construction or No. 2 grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Douglas fir-larch (north); NLGA.
e. Southern pine or mixed southern pine; SPIB.
f. Spruce-pine-fir; NLGA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-south; WWPA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
j. Northern species; NLGA.
k. Eastern softwoods; NeLMA.
l. Western woods; WCLIB or WWPA.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

C. Concealed Boards: 15 percent maximum moisture content and the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.7 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.8 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring [**Sleepers**] to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

C. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Do not splice structural members between supports unless otherwise indicated.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

I. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

J. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

K. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WALL AND PARTITION FRAMING

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal (38-mm actual) thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal- (38-by-140-mm actual-) size wood studs spaced 16 inches (406 mm) o.c. unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-6-inch nominal- (38-by-140-mm actual-) or 2-by-4-inch nominal- (38-by-89-mm actual-) size wood studs spaced 16 inches (406 mm) o.c. unless otherwise indicated.
3. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches (2438 mm) high, using members of 2-inch nominal (38-mm actual) thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal (89-mm actual) depth for openings 48 inches (1200 mm) and less in width, 6-inch nominal (140-mm actual) depth for openings 48 to 72 inches (1200 to 1800 mm) in width, 8-inch nominal (184-mm actual) depth for openings 72 to 120 inches (1800 to 3000 mm) in width, and not less than 10-inch nominal (235-mm actual) depth for openings 10 to 12 feet (3 to 3.6 m) in width.

3.4 INSTALLATION OF CEILING JOIST

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- (19-by-184-mm actual-) size or 2-by-4-inch nominal- (38-by-89-mm actual-) size stringers spaced 48 inches (1200 mm) o.c. crosswise over main ceiling joists.

B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.5 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 – SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
2. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
3. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings, and the following:

1. Roof sheathing in Structure #14 only.
2. Wall sheathing in Structure #14 only at wall between new and existing.

2.4 WALL SHEATHING

A. Plywood Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 5/8 inch.

2.5 ROOF SHEATHING

A. Plywood Sheathing: Exterior, Structural I sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 3/4 inch.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Special Inspections per Specification Section 014000 "Quality Requirements". See General Notes, Sheet S-00-002.

C. Testing Agency: Per Specification Section 014000 "Quality Requirements" or Specification Section 014533 "Quality Control and Special Inspections - Plant Project". See General Notes, Sheet S-00-002.

END OF SECTION 061600

SECTION 061753 – SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood roof trusses.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For fire-retardant-treated lumber, metal-plate connectors, metal truss accessories, and fasteners.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification from treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For metal connector-plate manufacturer and fabricator.

B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

D. Evaluation Reports: For the following, from ICC-ES:

1. Fire-retardant-treated wood.
2. Metal-plate connectors.
3. Metal truss accessories.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.

B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection under Design Loads:

    a. Roof Trusses: Vertical deflection of 1/360 of span for live load and l/240 for total load.

C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S.
3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 FIRE-RETARDANT-TREATED WOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products according to test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, with no evidence of significant progressive

combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841. For enclosed roof framing and framing in attic spaces, and where high-temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

E. Application: Treat items indicated on Drawings, and the following:

1. Roof trusses in Structure #14 Administration Building only.

2.4 METAL CONNECTOR PLATES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Alpine Engineered Products, Inc.; a division of ITW Building Components Group, Inc or equal.

B. Fabricate connector plates to comply with TPI 1.

C. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.5 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

2.6 METAL FRAMING ANCHORS AND ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Simpson Strong-Tie Co., Inc.; or equal.

B. Allowable design loads, as published by manufacturer, shall comply with or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches wide by 1 inch deep by 0.040 inch thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.

F. Drag Strut Connectors: Angle clip with one leg extended for fastening to the side of girder truss.

1. Angle clip is 3 by 3 by 0.179 by 8 inches with extended leg 8 inches long. Connector has galvanized finish.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

2.8 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.9 SOURCE QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.

B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

H. Securely connect each truss ply required for forming built-up girder trusses.

1. Anchor trusses to girder trusses as indicated.

I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 061000 "Rough Carpentry."

2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

J. Install wood trusses within installation tolerances in TPI 1.

K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

L. Replace wood trusses that are damaged or do not comply with requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

3.2 REPAIRS AND PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Repair damaged galvanized coatings on exposed surfaces according to ASTM A780/A780M and manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION 061753

DIVISION 09

FINISHES

SECTION 099600 – HIGH PERFORMANCE PAINTS AND COATINGS - WATER

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment and services for furnishing and installing the finishes as indicated on drawings and schedules, and as herein specified.

B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated. In addition, the Contractor shall provide for the use of deep tone colors to be applied in selected areas as wall graphics, stripes and visual accents. The areas and colors shall be selected by the Architect-Engineer and shall not exceed 15% of the total wall surface area to be painted.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect-Engineer will select these from standard colors or finishes available.

F. Following categories of work are not included as part of field- applied finish work.

1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and finish mechanical and electrical equipment, including light fixtures, switchgear, and distribution cabinets.
2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces, and duct shafts.
3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.

G. Following categories of work are included under other sections of these specifications.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these Specifications.

H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

I. PVC plastic process piping shall not be painted, but shall be stenciled and labeled or tagged for identification surfaces. Each type of process piping using PVC pipe shall be installed using the same color pipe.

J. Repainting of existing structures, tanks, piping, and all other existing items shall not be part of this Contract unless otherwise noted. Areas that have been directly altered or damaged by construction shall be repainted to match existing conditions using the appropriate painting system.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to Work of this Section.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples: Prior to beginning work, submit color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect-Engineer's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

C. Submit manufacturer's data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.

D. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.

E. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

F. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Coatings		X		X			X		X	X		

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

B. Coordination of Work: Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings systems for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.5 DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

1. Name or title of material.
2. Fed. Spec. number, if applicable.
3. Manufacturer's stock number, batch number, and date of manufacturer.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.6 JOB CONDITIONS

A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless

otherwise permitted or restricted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted or restricted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

D. Paint only when the surface temperature is at least 5 degrees F above the dew point, unless otherwise permitted by paint manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Tnemec Company, Inc. (Tnemec)
2. Induron
3. Or approved equal

2.2 MATERIALS

A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

1. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

D. Potable Water: Where required all potable water linings will comply with the requirements detailed in ANSI/NSF 61 (2023). Potable water linings shall be applied in a manner consistent with the product's NSF 61 rating.

PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

1. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect-Architect-Engineer in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning per SSPC SP-1. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
4. Abrasives for blasting shall be sharp, washed, salt free, angular, and free from feldspar or other constituents that tend to breakdown and remain on the surface.
5. Concrete floors shall be dry as indicated by testing in accordance with ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

B. Cementitious Materials: Per ASTM D4261, Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating, prepare cementitious surfaces of concrete block to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze. Per ASTM D4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces, determine alkalinity of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Test the surface for moisture and do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of

white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.
2. When transparent finish is required, use spar varnish for backpriming.

D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, and other foreign substances by solvent cleaning per SSPC SP-1. Mechanical cleaning shall be in accordance with SSPC-SP6 Commercial Blast Cleaning specifications for non-immersion surfaces and SSPC-SP10 Near White Metal Blast Cleaning for immersion in potable or non-potable water.

E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent. For immersion service, clean in accordance with SSPC-SP16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

F. Shop Primed Surfaces: Prepare shop-applied prime coats wherever damaged or bare as required by other sections of these Specifications. Clean and touch-up with same type shop primer.

G. Welds: All welds on substrate in immersion service should be ground smooth and to a 1/4-inch radius with all weld spatter removed in accordance with the most up-to-date version of NACE RP-0178. Grade D welds shall be the minimum grade weld that may be coated.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Painting requirements, surface treatments, and finishes, are indicated in "schedules" of the contract documents and as noted in Paragraph 3.11 hereinafter.
2. Provide finish coats which are compatible with prime paints used.
3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently- fixed equipment or furniture with prime coat only before final installation of equipment.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
7. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
8. Sand lightly between each succeeding enamel or varnish coat.
9. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
10. All edges, welds, penetrations, nozzles or other areas of irregular substrate geometry that will be in liquid immersion service shall be stripe-coated with the manufacturer's recommended material prior to application of the complete lining system.

B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.

1. Mechanical items to be painted include, but are not limited to, the following:

    a. Piping, pipe hangers, supplementary steel and supports except galvanized surfaces.
    b. Heat exchangers.
    c. Tanks.
    d. Ductwork, insulation.
    e. Motor, mechanical equipment, and supports.
    f. Accessory items.

2. Electrical items to be painted include, but are not limited to, the following:

    a. Conduits and fittings except galvanized surfaces.
    b. Switchgear (touch up only).
    c. Hanger and support except galvanized surfaces.

E. Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of

uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable. Holiday test coated steel in immersion areas in accordance with NACE International SP0188-2007 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

G. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.

H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 FIELD QUALITY CONTROL

A. The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:

1. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
2. Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.

B. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.6 CLEAN-UP AND PROTECTION

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect-Architect-Engineer. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.7 PAINTING SYSTEMS

A. Ferrous Metals, Structural, Tanks, Pipe and Equipment

1. Exterior, Non-Immersion

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	91-H_20 or 94-H_20 Hydro-Zinc	2.5 - 3.5	Indurazinc MC67	2.5 - 3.5
2nd Coat	N69 High-Build Epoxoline	4.0 - 6.0	Permaclean II Epoxy	4.0 - 6.0
3rd Coat	1094 Endura -Shield	2.0 - 3.0	Indurethane 6600	2.0 - 3.0

2. Interior, Non-Immersion

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	91-H_20 or 94-H_20 Hydro-Zinc	2.5 - 3.5	Indurazinc MC67	2.5 - 3.5
2nd Coat	N69 High-Build Epoxoline	4.0 - 6.0	Permaclean II Epoxy	4.0 - 6.0
3rd Coat	N69 High-Build Epoxoline	2.0 - 3.0	Permaclean II Epoxy	2.0 - 3.0

3. Immersion, Potable or Non-Potable Water

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP10 Near-White Blast Cleaning		SSPC-SP10 Commercial Blast Cleaning	
1st Coat	91-H_20 or 94-H_20 Hydro-Zinc	2.5 -3.5	PE-70 or RC-70	4.0 - 6.0
2nd Coat	Series 21 Epoxoline	10. - 18.0	PE-70 or RC-70	4.0 - 6.0
			PE-70 or RC-70	4.0 - 6.0

4. Factory Primed Interior (Refer to Piping Specifications)

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean / Dry. Thoroughly and uniformly mechanically abraded to provide tooth and anchor. Clean failed and damaged areas as per SSPC-SP11. Verify compatibility with a test patch.		Surface Shall be Clean/Dry	
Touch up	N69 High-Build Epoxoline		PermaClean II Epoxy	
1st Coat	N69 High-Build Epoxoline	4.0 - 6.0	PermaClean II Epoxy	4.0 - 6.0
2nd Coat	N69 High-Build Epoxoline	4.0 - 6.0	PermaClean II Epoxy	4.0 - 6.0

5. Factory Primed, Exterior (Refer to Piping Specifications)

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/ Dry	
Touch up	N69 Hi-Build Epoxoline		PermaClean II Epoxy	
1st Coat	N69 Hi-Build Epoxoline	4.0 - 6.0	PermaClean II Epoxy	4.0 - 6.0
2nd Coat	1094 Endura -Shield	2.0 - 3.0	Indurethane 6600	2.0 - 3.0

6. Primed Steel (Doors, Frames, etc.) - Exterior

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
Touch-up	Series 135 Chembuild		Induramastic 85	4.0 - 6.0
1st Coat	Series 135 Chembuild	4.0 - 6.0	N/A	N/A
2nd Coat	1094 Endura -Shield	2.0 - 3.0	Indurethane 6600	2.0-3.0

7. Buried

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	Hi-Build Tneme-Tar	16.0 - 20.0	Ruff Stuff 2100 Coal Tar Epoxy	16 - 20

B. Galvanized Steel - Pipe and Miscellaneous Fabrications

1. Exterior, Non-Immersion

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Visible deposits of oil, grease, or other contaminants shall be removed as required by SSPC-SP1. Sweep (Abrasive) Blasting per SSPC-SP16 to achieve a uniform anchor profile (1.0 to 2.0 mils). Galvanized surfaces must be clean, dry, and contaminant free prior to application of coatings.		SSPC-SP1 Solvent Cleaning	
1st Coat	N69 Hi-Build Epoxoline	2.0 - 3.0	Permaclean II Epoxy	4.0 - 6.0
2nd Coat	1074 Endura -Shield	2.0 - 3.0	Permastic Polyurethane	2.0 - 3.0

2. Interior, Non-Immersion (Doors, Frames, etc.)

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning	
1st Coat	N69 Hi-Build Epoxoline	2.0 - 3.0	Permaclean II Epoxy	4.0 - 6.0
2nd Coat	N69 Hi-Build Epoxoline	2.0 - 3.0	Permaclean II Epoxy	2.0 - 3.0

3. Immersion, Potable or Non-Potable Water

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Visible deposits of oil, grease, or other contaminants shall be removed as required by SSPC-SP1. Sweep (Abrasive) Blasting per SSPC-SP16 to achieve a minimum uniform anchor profile of 2.0 mils. Galvanized surfaces must be clean, dry, and contaminant free prior to application of coatings.		SSPC-SP16 Brush-Off Blast Cleaning	
1st Coat	Series 21 Epoxoline	4.0 - 6.0	PE-70 or RC-70	4.0 - 6.0
2nd Coat	Series 21 Epoxoline	4.0 - 6.0	PE-70 or RC-70	4.0 - 6.0

C. Porous Masonry - Concrete Masonry Units

1. Interior

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	130 Envirofill or Series 54 (Spray and Back Roll to Fill Porosity)	80 - 100 sf/gal.	AC 220 Block Filler	80 - 100 sf/gal
2nd Coat	113 H.B. Tneme-Tufcoat	4.0 - 6.0	AC 303 Epoxy Enamel	2.0 - 3.0
3rd Coat	113 H.B. Tneme-Tufcoat	4.0 - 6.0	AC 303 Epoxy Enamel	2.0 - 3.0

2. Exterior

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean / Dry		Surface Shall be Clean / Dry	
1st Coat	Series 180 Tneme-Crete	6.0 - 8.0*	AC 403 elastomeric	6.0 - 8.0
2nd Coat	Series 180 Tneme-Crete	6.0 - 8.0*	AC 403 elastomeric	6.0 - 8.0

*Coats must be sufficient to fill the porosity of the block face and create a pinhole-free surface.

D. Cast-In-Place Concrete

1. Concrete Walls & Precast Concrete Ceilings (Interior)

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP13 Abrasive Blast		SSPC SP-13 to meet roughness of ICRI 310.2 CSP 2 -3	
1st Coat	113 H.B. Tneme Tuf-coat	4.0 - 6.0	AC 303 Epoxy Enamel	2.0 - 3.0
2nd Coat	113 H.B. Tneme Tuf-coat	4.0 - 6.0	AC 303 Epoxy Enamel	2.0 - 3.0

2. Concrete Walls, Exterior & Non-Potable

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/ Dry	
1st Coat	Series 180 Tneme-Crete	125 sf/gal	AC 403 elastomeric	6.0 - 8.0
2nd Coat	Series 180 Tneme-Crete	200 sf/gal	AC 403 elastomeric	6.0 - 8.0

3. Concrete Floors

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	SSPC-SP13, ICRI 310.2 CSP 2-3		ICRI 310.2 CSP 2-3	
1st Coat	Tnemec 237	6.0 - 8.0	E Bond-100	1.0 - 2.0
2nd Coat	Tnemec 237	6.0 - 8.0	Perma-Tuff SL	15 - 40

4. Concrete Tanks & Basins

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Allow new cast-in-place concrete to cure a minimum of 28 days at 75°F (24°C). Verify concrete dryness in accordance with ASTM F 1869 "Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride" (moisture vapor transmission should not exceed three pounds per 1,000 square feet in a 24 hour period), F 2170 "Standard Test Method for Determining Relative Humidity in Concrete using in situ Probes" (relative humidity should not exceed 80%), or D 4263 "Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method" (no moisture present). Prepare concrete surfaces in accordance with NACE No. 6/SSPC-SP13 Joint Surface Preparation Standards and ICRI Technical		SSPC-SP13, Severe Service Abrasive Blast	

	Tnemec	Dry Mils	Induron	Dry Mils
	Guidelines. Abrasive blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers and other contaminants and to provide a minimum ICRI-CSP 5 surface profile. Large cracks, voids and other surface imperfections should be filled with a recommended filler or surfacer.			
Parge Coat	Series 218	*1/16 - 1/4"*	Mortarchem	*As needed*
2nd Coat	Series 21	6.0 - 8.0	TL-70	15.0 - 20.0
3rd Coat	Series 21	6.0 - 8.0	N/A	

E. Wood

1. Interior or Exterior

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	151-1051 Elasto-Grip FC	1.0 - 1.5	Aquanaut II Primer	1.0 - 2.0
2nd Coat	Series 1029 Enduratone	2.0--3.0	Aquanaut II Enamel	2.0 - 3.0
3rd Coat	Series 1029 Enduratone	2.0 - 3.0	Aquanaut II Enamel	2.0 - 3.0

F. Insulated Pipe

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	Series 1026 Enduratone	2.0 - 3.0	Aquanaut II Primer	2.0 - 4.0
2nd Coat	Series 1026 Enduratone	2.0 - 3.0	Aquanaut II Enamel	2.0 - 4.0

G. Gypsum Board

1. Interior Drywall - Architectural

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/ Dry	
1st Coat	151-1051 Elasto-Grip FC	1.0 - 1.5	Aquanaut II Primer	1.0 - 2.0
2nd Coat	Series 1026 Enduratone	2.0 - 3.0	Aquanaut II Enamel	2.0 - 4.0
3rd Coat	Series 1026 Enduratone	2.0 - 3.0	Aquanaut II Enamel	2.0 - 4.0

2. Interior Drywall - Severe Exposure

	Tnemec	Dry Mils	Induron	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
Prime Coat	151-1051 Elasto-Grip FC	1.0 - 1.5	Aquanaut II Primer	1.0 - 2.0
1st Coat	113 H.B. Tneme-Tufcoat	4.0 - 6.0	AC 303 Acrylic Epoxy Enamel	2.0 - 3.0
2nd Coat	113 H.B. Tneme-Tufcoat	4.0 - 6.0	AC 303 Acrylic Epoxy Enamel	2.0 - 3.0

H. PVC Piping - Do Not Paint

I. Aluminum Windows, Doors, Handrails & Grating - Do Not Paint

J. Fiberglass Reinforced Plastic Doors & Windows - Do Not Paint

3.8 PIPING COLOR CODE

A. To facilitate identification of piping in plants and pumping stations it is recommended that the following color scheme be utilized:

WATER LINES	
Raw Water	Olive Green
Settled Water	Light Blue
Filtered, Finished or Potable Water	Dark Blue

CHEMICAL LINES	
Alum or Primary Coagulant	Orange
Ammonia	White
Carbon Slurry	Black
Caustic	Yellow w/ green band
Chlorine	Yellow
Lime Slurry	Light Green
Fluoride	Light Blue w/ red band
Polymers or Coagulant Aid	Orange w/ green band
Potassium Permanganate	Violet
Soda Ash	Light Green w/orange band
Sulfur Dioxide	Light Green w/yellow band

WASTE LINES	
Backwash Waste	Light Brown
Sewer (Sanitary or Other)	Dark Gray
Sludge	Dark Brown

OTHER	
Compressed Air	Dark Green
Gas	Red
Other Lines	Light Gray

3.9 STENCILING

A. The Contractor shall supply all materials and labor necessary for stenciling of legends on pipes. The legend shall show the name of the contents. Review by the Architect-Engineer of legends will be required. Names shall be "plainly visible". Arrows showing direction of flow shall also be stenciled on pipes. The legends shall be located not more than 10 feet apart and, in general, at each valve and piece of equipment. The size and location of the legend shall be in general accordance with ANSI A13.1-1981 "Scheme for the Identification of Piping Systems". All visible piping 6" in diameter and larger shall be color-coded and stenciled. "Stick-on" labels are not acceptable.

3.10 PLASTIC IDENTIFICATION MARKERS

A. All visible piping 3/4" and greater and less than 6" which is accessible for maintenance operations shall be color-coded and identified with semi-rigid plastic identification markers equal to SETMARK Pipe Markers as manufactured by Seton Name Plate Corporation, New Haven, Conn.; T & B/Westline, Los Angeles, California; or equal. Direction of flow arrows are to be included on each marker, unless otherwise specified.

B. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A 13.1 - 1981).

C. For pipes under 3/4" O.D. (too small for color bands and legends), brass identification tags 1-1/2" in diameter with depressed 1/4" high black-filled letters above 1/3" blackfilled numbers shall be fastened securely at specified locations.

D. All electrical conduits, which are accessible for maintenance operations, shall be identified with semi-rigid identification markers similar to those specified above.

E. Each marker background is to be color-coded with a clearly printed legend to identify the conductor. Size of markers and sizes of lettering to generally conform with the "Scheme for Identification of Piping Systems" (ANSI A 13.1 - 1981)

F. Locations for pipe and electrical markers to be as follows:

1. Adjacent to each valve and fitting (except on plumbing fixtures and equipment).
2. At each branch and riser take-off.
3. At each pipe passage through wall, floor and ceiling construction.
4. At each pipe passage to underground.
5. On all horizontal pipe runs marked every 25 feet.

3.11 PAINT SCHEDULE

All items at the Project site shall be painted in accordance with these Specifications and Drawings. The following paint schedule is provided only to assist the Owner and Contractor in selection of the appropriate paint system and is not intended to be a complete list of items to be painted.

A. Paint Application Schedule

	Location and/or Description	System
1.	Tank Site Utility Building (Bid Option No. 1)	
	a. Concrete	Do not Paint
	b. Piping & Valves	A
	c. Block Walls	C.1
	d. Drywall Ceiling	G.1
2.	Tank Site Pedesphere Base Cone (Bid Option No. 2)	
	a. Concrete	Do not Paint
	b. Piping & Valves	A

END OF SECTION 099600

SECTION 099713.24 – STEEL WATER STORAGE TANK COATINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The scope of work to be accomplished under this section shall consist of the furnishing of all labor, materials, equipment, and services necessary for the painting of the elevated water storage tank as indicated on the project drawings.

B. This specification contains the detailed criteria for the selection of materials, surface preparation, and the furnishing of all coatings, labor, equipment and appliances for field painting of steel water storage facilities. The following specifications shall govern with modifications as specified herein: ANSI/AWWA D102 (latest edition) "AWWA Standard for Painting Steel Water Storage Tanks" and shall be approved by the Kentucky Division of Water and the National Sanitation Foundation, N.S.F.

C. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to Work of this Section.

1.3 PRODUCT SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples: Prior to beginning work, submit color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect-Engineer's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

C. Submit manufacturer's data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.

D. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.

E. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

F. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Coatings		X		X			X		X	X		

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

B. Coordination of Work: Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings systems for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.5 REFERENCES

A. American Water Works Association (AWWA)

1. D100 - Welded Carbon Steel Tanks for Water Storage
2. D102 - Coating Steel Water Storage Tanks
3. C652 - Disinfection of Water Storage Tanks

B. The Association for Materials Protection and Performance – Formerly (SSPC and NACE)

1. SSPC-PA 1 - Shop, Field and Maintenance Painting of Steel
2. SSPC-SP1 - Solvent Cleaning
3. SSPC-SP 6/NACE 3 - Commercial Blast Cleaning
4. SSPC-SP10/NACE 2 - Near-White Metal Blast Cleaning
5. SSPC Guide 6 - Guide for Containing Debris Generated During Paint Removal Operations

C. ANSI/NSF 60 and 61 - Drinking Water System Components - Health Effects

D. NACE SP0188 - Discontinuity (Holiday) Testing of New Protective Coatings in Conductive Substrates

E. Occupational Safety and Health Administration (OSHA)

PART 2 - PRODUCTS

2.1 GENERAL

A. Contractor shall comply with all environmental, safety and health regulations and requirements during all work performed.

B. Conform to applicable codes and ordinances for flame, fuel, smoke, and volatile organic compounds (VOC) ratings requirements for finishes at time of application.

C. The Contractor shall post appropriate SDS, safety and health hazard notices in the work area, clearly visible to those entering the site.

D. Contractor shall have a confined space program documenting all entry procedures, permits, roles, and responsibilities of workers, training, gas monitoring, potential hazardous situations, rescue procedures, documentation and competent person as defined in 29 CFR 1910.146.

E. Contractor shall provide, pay for, maintain, and remove any temporary utilities or power required to operate any equipment used on the project.

F. Contractor shall maintain a neat and clean work site. Attention to storage areas and waste, including paint cans and abrasives, shall be performed daily.

G. A qualified representative of the paint manufacturer shall make periodic visits to the project site during surface preparation and painting operations for technical assistance and to verify proper application procedures, quality and progress of work. An Interior and an Exterior Certificate of Proper Installation of the coating systems shall be provided to the Owner.

2.2 SEALANT AND CAULK

A. For all interior applications, sealant and caulks shall be ANSI/NSF/CAN Std-61 and 600 approved for contact with potable water.

B. For all exterior applications, sealant and caulks shall be clear or color matching with a minimum 30-year life expectancy.

2.3 CONTAINMENT

A. Contractor shall be responsible for protecting all surrounding property from fugitive blast media and paint particles and therefore shall provide containment system(s) as needed.

B. Containment systems shall be design by a licensed Engineer. Containment drawings shall include PE stamp by a Professional Engineer licensed in the state of Kentucky and shall be submitted to the Engineer prior to any surface preparation work.

2.4 PAINT SYSTEM

A. The Paint Systems shall be as scheduled below:

INTERIOR COATINGS - WET
High Solids Epoxy System with Zinc Rich Primer
AWWA D102 ICS No. 3

Coat	Tnemec	Dry Mils	Induron	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 93 / 94 H2O	2.5 - 3.5	Aromatic Urethane, Zinc-Rich, Indurazinc MC 67	2.5 - 3.5
Intermediate "Stripe Coat"	Polyamidoamine Epoxy, Pota-Pox Plus Series N140 or N140F	---	PE-70 Epoxy	---
Finish	Modified Polyamine Epoxy, Epoxoline Series 22	20.0 - 30.0	Perma-Clean 100 Ceramic Epoxy	25.0 - 30.0
Minimum Total DFT (excluding Stripe Coat)	---	22.5 - mils	---	27.0 mils

INTERIOR COATINGS - DRY

Coat	Tnemec	Dry Mils	Induron	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 93 / 94 H2O	2.5 - 3.5	Aromatic Urethane, Zinc-Rich, Indurazinc MC 67	2.5 - 3.5
"Stripe Coat"	Polyamidoamine Epoxy Hi-Build Epoxoline II Series N69	---	PE-70 Epoxy	---
Intermediate	Polyamidoamine Epoxy Hi-Build Epoxoline II Series N69	4.0 - 6.0	PE-70 Epoxy	4.0 - 6.0
Finish	Polyamidoamine Epoxy Hi-Build Epoxoline II Series N69	4.0 - 6.0	PE-70 Epoxy	4.0 - 6.0
Minimum Total DFT (excluding Stripe Coat)	---	10.5 mils	---	10.5 mils

EXTERIOR COATINGS
Fluoropolymer with Zinc Rich Primer
AWWA D102 OCS No. 4

Coat	Tnemec	Dry Mils	Induron	Dry Mils
Primer	Aromatic Urethane, Zinc-Rich, Hydro-Zinc Series 93 / 94 H2O	2.5 - 3.5	Aromatic Urethane, Zinc-Rich, Indurazinc MC 67	2.5 - 3.5
Intermediate	Aliphatic Acrylic Polyurethane, Endura Shield Series 1095	2.0 - 3.0	Acrylic Polyurethane, Indurethane 6600 Plus	2.0 - 3.0
Finish	Fluoropolymer, HydroFlon Series 700	2.0 - 3.0	Fluoropolymer, Perma-Gloss Flurorourethane	2.0 - 3.0
Minimum Total DFT	---	6.5 mils	---	6.5 mils
Lettering and Logo	Fluoropolymer, HydroFlon Series 700	2.0 - 3.0	Fluoropolymer, Perma-Gloss Flurorourethane	2.0 - 3.0

Notes: 1. All completed painted areas shall be holiday tested with NACE SPO 188 (latest revision) Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

2. A performance equal alternate paint system may be considered but must be submitted for Engineer approval. All materials shall be compatible with the service intended. No products shall be used that may have ingredients which might react detrimentally with adjacent fluids or gases.

B. Tank Lettering/Logo:

1. The NKWD logo, as shown below, shall be painted in two (2) locations on the exterior of the tank. Contractor shall submit a computerized rendering showing the proposed logo, size and proposed locations on the tank to Engineer for review. One coat of tank lettering/logo paint as specified above shall be applied at a dry film thickness as specified. Tank lettering/logo coating must be compatible with the exterior coating system applied. Contractor shall submit color samples for tank lettering and logo to Engineer for approval. After evaluating the bids, Owner shall select the color. All bids shall be based on common Tnemec color "14WH Veiled" and logo colors to be "25BL Fountainblue" and "11SF True Blue". Owner shall review and approve tank lettering/logo size and location/orientation after receiving a rendering and description from the Contractor.

C. Workmanship and Materials: Workmanship, procedures, and materials shall in general comply with the requirements of AWWA D102 where applicable.

D. Product Delivery, Storage and Handling:

1. The Contractor shall be responsible for the delivery, storage and handling of coating products.

2. Deliver all materials to the job site in original, new unopened packages and containers bearing manufacturer's name and label.

3. Provide labels on each container with the following information:

   a. Name or title of material;
   b. Manufacturer's stock and batch number;
   c. Manufacturer's name;
   d. Contents by Volume, for major pigment and vehicle constituents;
   e. Expiration date after which the material should not be used;
   f. Thinning instructions;
   g. Application instructions; and
   h. Safety precautions.

4. Store coating products in sealed and labeled containers. Properly store coatings to prevent degradation of the coating products. Paint materials shall be kept sealed when not in use. Store materials in a clean, dry area, and the within temperature range in accordance with the manufacturer's specifications. Do not use coating products that have been damaged during storage, which have not been applied prior to the applicable expiration date, or which do not otherwise comply with the specifications. Promptly remove damaged coating products from the job site.

5. Restrict storage to coating materials and related equipment. Store materials in an area protected in accordance with NFPA Bulletin 101.

6. Product delivery, storage and handling shall meet the requirements of safety, health and fire regulations. Remove used rags from the job site and take all necessary steps to prevent spontaneous combustion. Protect materials during handling and application to prevent damage or contamination.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

A. General Surface Preparation:

1. Contractor shall remove or otherwise protect all hardware, accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be painted prior to surface preparation and painting operations.

2. Surfaces shall be clean, dry and adequately protected from dampness. Surfaces shall be free of any material, which will adversely affect adhesion or appearance of painting and coating. Cleanliness shall be checked by wiping the prepared steel surface with a white cloth dampened with manufacturer's thinner for the particular paint system. If a dark spot

or obvious soil appears on the rag from light wiping, the Contractor shall take steps to clean the surface more thoroughly before applying paint via SSPC SP1 standards.

3. All blast materials used for surface preparation shall be new materials, not recycled, and shall be free of lead.

4. The grit or abrasive blasting equipment shall have ample capacity to furnish the required volume of compressed air to operate the blast effectively. The air shall be free of oil and or moisture. After cleaning, all surfaces shall be wiped free of any residue, dust, or other contaminants before applying prime coat. Prime coat must be applied on the same day that the surface is prepared and before any deterioration of the surface occurs.

5. Prior to the application of the prime coat, all steel surfaces shall be prepared in accordance with SSPC-SP 10/NACE 2 "Near-White Blast Cleaning." A minimum angular anchor profile of 1.5 mils is required. After blast cleaning, all surfaces shall be thoroughly and completely cleaned of all traces of residue, or other contaminants.

6. After the tank is erected and the welding completed, the weld seams, abraded areas, and all unprimed surfaces, both interior and exterior, shall be thoroughly cleaned in accordance with the procedures specified in SSPC-SP 10/NACE 2 "Near-White Blast Cleaning,". A minimum angular anchor profile of 1.5 mils is required. All shop primed surfaces shall be cleaned of all dirt, foreign matter and contaminants. All unprimed or abraded areas shall then be spot primed and retouched, wherever necessary, using the specified primer. The dry coating thickness of the primer so applied shall be same as specified for shop primer.

7. Interior floor of the tank shall be completely swept clean of all debris, dirt, and loose particles prior to field surface preparation and painting.

3.2 PAINTING

A. General:

1. All paint shall be applied only under favorable conditions and by skilled painters. All surfaces to which paint is applied shall be clean and dry to the satisfaction of the Engineer. No paint shall be applied during wet or foggy weather, or when the temperature of the air is below 50°F unless otherwise allowed or restricted by the coating manufacturer. Coatings shall not be sprayed if wind velocity is above the manufacturer's limit. Surfaces shall be prepared and coatings shall be applied and cured within the relative humidity in accordance with the manufacturer's instructions. The steel surface temperature shall be a minimum of 5°F above dew point at the time of final surface preparation, material mixing and application. All painting shall be done strictly in accordance with the paint manufacturer's instructions and performed in a manner satisfactory to the Engineer. All coatings shall be in accordance with current EPA Standards.

2. All materials shall be applied under adequate illumination.

3. Materials shall be thoroughly mixed and kept at a uniform consistency during application. Mixing can best be accomplished with mechanical agitators equipped with air or explosion proof motors. Strictly observe the pot life limitations.

4. Where multiple coats of paint are used, each coat of paint shall be a distinctly different color than the preceding coat.

5. Finished work shall be uniform and of the approved color. It shall completely cover, be smooth and free of runs, sags, holidays, drips, wrinkles, shiners, streaks, and brush marks. Any of these defects shall be removed and recoated. Make edges of paint adjoining other materials or colors sharp and clean without overlapping. Brush or roll an additional coat of primer over primed weld seams on interior wet surfaces.

6. Contractor shall submit paint color samples or color chart to Engineer for Owner's selection of color.

7. All adjacent property and structures shall be protected at all times. The Contractor shall be solely responsible and shall bare all costs for repairing any and all damage to adjacent properties from surface preparation and painting operations.

8. Coating operations shall be as continuous and uninterrupted as weather and schedules allow. Excessive start and stop operations and recoating due to Contractor error, including missing windows of opportunity, within control of the Contractor, are grounds for Owner to back-charge the Contractor for increased Owner Inspector time or durations.

B. Quality of Paint:

1. The paints and paint products of the aforementioned manufacturers are set up as standards of quality and the bid for this Contract shall be based on providing the products of the manufacturer mentioned hereinbefore. The products of other manufacturers comparable in performance and type to those specified will be acceptable if said paints are offered by the Contractor with satisfactory data on past performance on water storage tanks, composition, directions for use and other information required, and if approved by the Engineer. All materials shall be brought to the job site in the original sealed and labeled containers of the paint manufacturer and shall be subject to inspection by the Engineer's inspector on the job. All materials shall be of same manufacturer's system. In no case shall the products of more than one manufacturer be applied to the same surface. Provide secondary materials which are produced or are specifically recommended by the coating system manufacturer to ensure compatibility of the system.

2. The Contractor shall submit to the Engineer, immediately upon completion of the job, certification from the manufacturer indicating that the quantity of each coating purchased was sufficient to properly coat all surfaces. Such certification shall make reference to the square footage figures provided to the manufacturer by the Contractor.

3. All coating shall be free (less than 0.06% by weight) of lead, lead alloys and chromate.

4. All materials in contact with potable water must have been tested and approved by ANSI/NSF/CAN Standard 61/600.

C. Application of Paint:

1. The painter shall apply each coating at the rate, and in the manner, specified by the manufacturer. The application shall be completed in accordance with SSPC-PA 2. If the

material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. The interior immersion finish coating shall be completely without defects permitting moisture penetration when tested according to the low voltage wet-sponge method. Film thickness shall be applied in the range as recommended by the coating manufacturer. Deficiencies in film thickness shall be corrected by the application of an additional coat of paint. Excessive film thickness shall be removed in a manner approved by the coating manufacturer. The paint applicator shall have available on the project site both wet film and dry film thickness measuring devices.

2. Painting shall be accomplished in an orderly manner so as to facilitate inspection. Materials subject to weathering shall be prime coated as quickly as possible. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection. Remove items, if necessary, for the complete painting of the items and adjacent surfaces.

3. Contractor shall prevent the discharge of visible fugitive dust emissions beyond the property line. All dust, fumes, gases, mist, odorous matter, vapors or any combination shall not be allowed to escape from the structure or equipment in a manner and amount to cause a nuisance or to violate any administrative regulations.

4. Contractor shall prevent overspray on any concrete or surface not requiring coating. Any paint on surface shall be removed at the Contractor's expense to the satisfaction of the Owner. Contractor shall be responsible for cleaning and correcting the condition of any property that is damaged due to overspray or emissions as a result of paint application or surface preparation.

D. Coating Procedures:

1. All coating work shall meet the requirements of the coating manufacturer.

2. All surfaces to be coated shall be in the proper condition to receive the specified coatings before any coatings are applied. Do not blast clean any more surfaces than can be primed within the same working day that the sandblasting is done. Round off all sharp edges and rough welds. Remove all burrs and weld splatter. Remove oil, grease and heavy deposits of surface contaminants by solvent or detergent cleaning. All surfaces shall be clean, dry and free of any dirt, dust, grease, oils, salts, and other deleterious substances before coatings are applied.

3. Whatever metal is cleaned during a working day shall be coated with primer on the same working day. Unpainted surfaces shall not be allowed to sit overnight. Covering manways and vents overnight is not allowed.

4. Apply additional stripe coats to all interior critical locations on steel such as welds, corners, fasteners, and edges by the brush method on field prime coat and field intermediate coats. On the exterior welds, corners, fasteners and edges apply additional stripe coat by the brush method using the prime coat.

5. Examine all areas of surface prepared steel prior to coating and report areas of excessive pitting and metal loss.

6. All necessary welding shall be complete prior to coating the interior and exterior surfaces of the designated weld areas.

7. Coatings shall be applied in such a manner to produce as uniform a thickness of coating and as complete coverage as possible, free of lap marks.

8. Each coat shall be applied and allowed to cure within the required air, temperature and humidity ranges as instructed by the manufacturer by heating, ventilating, and dehumidifying, if necessary. Any defective paint shall be scraped off and repainted.

9. The dry film thickness specified shall be obtained. Additional coats shall be applied at the Contractor's expense, if required to achieve the specified dry film thickness.

10. Only good, clean brushes and equipment shall be used. Clean all brushes, rollers, buckets and spray equipment at the end of each coating period.

11. Do not start filling the coated tank with water before the interior and exterior coatings have properly dried or cured. The minimum drying or curing time allowed shall not be less than seven (7) days at 75 degrees F or higher.

12. Contractor shall perform solvent rub test, pencil hardness test, or other test recommended by the coating manufacturer to verify curing. This test shall be performed with the Owner's Inspector present and results shall be documented to the Owner.

E. Painting System:

1. All interior and exterior steel surfaces shall be given a primer coat as specified hereinafter. The primer coat shall be applied the same day as the blast cleaning is completed and prior to the formation of rust. Spray all surfaces within two inches of the edge with one coat, to a dry film thickness as specified. The cleaning and application of the primer are to be done by the fabricator.

2. The interior field intermediate and finish coats shall be as specified hereinafter. Spray all interior surfaces to achieve the dry film thickness as specified. The total dry film thickness for the coating system shall be as specified. Curtains and sags will not be acceptable.

3. The interior of the tank is to have forced ventilation and circulating air continually for the curing period supplied by an exhaust fan capable of circulating air at 25,000 CFM, or of adequate size in relation to the size of the tank. The tanks also shall be allowed to dry at least seven to ten days at atmospheric temperatures of 60º F. or higher to allow proper curing of the completed coating system and solvent removal before it is disinfected and filled with water. During this period, access and ventilation manholes in the tanks shall be left open.

4. The exterior intermediate and finish coats shall be applied to all steel surfaces to the dry coating thickness as specified.

3.3 TOUCH-UP AND REPAIR

A. At completion, all painted surfaces and coatings shall be inspected. All damaged coatings, pinholes, shiners, runs, sags, and/or holidays, whether due to defective materials or workmanship or defects of surfaces covered shall have edges feathered and be repaired in accordance with the recommendations of the coating manufacturer. Additional coats of paint and coatings required to cover all spots or discoloration of every sort shall be applied at no additional costs to the Owner.

B. All finish coats, including touch up and damage-repair coats shall be applied in a manner which will present a uniform texture and color-match appearance.

C. If an item has an improper finish, color or insufficient film thickness, the surface shall be cleaned and top coated with the specified material to obtain the specified color and coverage.

D. All visible areas of chipped, peeled or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall be primed and finished coated in accordance with the specifications.

E. The Contractor shall furnish to the Owner at least three (3) extra gallon of finish paint specified above for exterior paint for touch-up repairs due to vandalism.

3.4 WORKER PROTECTION

A. OSHA requirements for work protection as outlined in 29 CFR 1910.1025 shall be followed, with the following exceptions: (Paragraph (a) (2)). The Contractor shall supply all workers with the necessary air purifying or air supplied respirator equipment, protective clothing, and hygiene facilities and supplies required to achieve full compliance with the above referenced standard.

3.5 JOB CONDITIONS

A. The Contractor shall ascertain that job conditions are suitable for the application of coatings.

B. Do not apply coatings when the surrounding air temperature, measured in the shade is below 50°F. Do not apply coatings when the temperature of the surface to be coated is below 50°F. Do not apply coating when the relative humidity exceeds 85%, the surface temperature must be 5 degrees above the dewpoint and rising. Do not apply coatings in extreme heat. Do not apply coatings in dust or smoke-laden air.

C. Take all precautions necessary to prevent damage of adjoining properties due to coating work. The Contractor shall be solely liable for such damage.

D. Conduct all operations in a clean and sanitary manner.

E. The Contractor shall not operate valves or controls in the existing waterworks. The Owner will operate all existing valves, hydrants, blowoffs and controls.

F. The Contractor shall furnish (and use) a sling psychrometer with a wet and dry bulb to determine the dewpoint. Adequate surface thermometers shall be provided.

3.6 CLEANING

A. During the progress of work, do not allow the accumulation of empty containers or other excess items except in areas specifically reserved for that purpose.

B. Contractor shall take all precautions to prevent accidental spillage of paint materials. At a minimum, all containers shall be stored on pallets off the ground and plastic tarp ground cover shall be used to contain any accidental spills. In the event of a spillage, immediately remove all spilled materials and the waste and other equipment used to clean up the spill and wash surfaces to their original undamaged condition.

C. Contractor shall touch-up and restore finish where damaged.

D. All trash and accumulated materials of a painting nature shall be removed from the premises at the completion of work.

E. Paint spots, oil, or stains upon adjacent surfaces shall be removed. Any damage to the work of other trades or equipment caused from painting shall be repaired at no expense to the Owner.

3.7 INSPECTION

A. The Owner or an outside inspection service representing the Owner will make inspections noted in this section. Additional inspections will be made if required. It shall be the responsibility of the Contractor to request an inspection by at least the end of the second day proceeding the inspection day. Should Owner be summoned to inspect a completed phase of construction and find the work incomplete and, therefore, not ready for inspection, the Contractor shall bear the cost of inspection. It is not the intent to charge the Contractor for an inspection if discrepancies are found in the completed phase of construction as long as the discrepancies do not necessitate additional inspection trips.

B. Contractor shall provide safe access to all areas at any time for any inspector. This includes equipment and labor for all ladders, rigging, scaffolding, equipment, and safety devices as necessary.

C. Daily Paint Inspection Reports:

1. Contractor shall prepare and submit to the Owner's Inspector daily reports at the end of each working day documenting painting conditions, steel and blast conditions, thicknesses and materials. The Owner's Inspector will compile the daily reports weekly for the Owner.

2. The following information shall be recorded on each daily report:

a. Air Temperature: Air temperature readings shall be taken at multiple intervals throughout the workday and when environmental conditions change.

b. Surface Temperature: Surface temperature shall be taken in areas where work is being performed.

c. Material Temperature: Material temperature shall be taken prior to the application of the paint.

d. Relative Humidity: Relative humidity readings shall be taken at multiple intervals throughout the workday and when environmental conditions change.

e. Dew Point: Dew point readings shall be taken at multiple intervals throughout the workday and when environmental conditions change.

f. Surface Preparation and Blast Profile: Following blasting and surface preparation operations, the Contractor shall take and record the depth of the blast profile. Blast profile measurements shall be taken using Testex replica tape. Replica tape shall be included in the daily log. Include adhesion testing results of existing coatings.

g. Detail of Work Performed During the Day: Area where work was performed and the extent of the work performed shall be included in the daily report. Include any nonconforming work identified and/or remedied. Verify environmental conditions are as specified.

h. Paint Thicknesses: Verify DFT for each coat and total DFT of each coating system are as specified using wet film and dry film gauges. DFTs shall be measured in accordance with SSPC-PA 2.

D. The Owner will retain any additional inspection and testing services as appropriate. This does not relieve the Contractor from executing the tasks as required in the specifications.

E. The following inspections will be made:

1. After uncoated surfaces in the interior of a tank have been blast cleaned and before coatings are applied, the uncoated surfaces in the exterior of a tank, tower, and appurtenances shall be blasted and primed immediately; however, if the inspector removes any field primer, over blasted or shop primed areas and finds evidence of improper blasting and cleaning, the inspector may order all questionable coatings removed by blasting and the cleaned areas reprimed at no cost to the Owner.

2. After all coating work has been completed; at this time, the total required mil thickness, lack of "holidays" and aesthetic acceptability will be checked by the Engineer. The Contractor will be required to repaint or retouch any areas or surfaces found deficient in complying with these specifications.

3. Additionally, a first anniversary inspection shall be made at approximately one-years' time after the painting work has been completed to determine whether any repair work is necessary. The Owner shall establish the date for the inspection and shall notify the Contractor at least 30 days in advance. If an inspection data has not been established with 13 months after final acceptance of the painting work by the Owner, the first anniversary inspection shall be considered to be waived. The Owner shall drain the tank, and the Contractor shall provide all lighting, ventilation and other equipment necessary to complete the inspection.

   Any location where coats of paint have peeled off, bubbled or cracked and any location where rusting is evident shall be considered to be a failure of the paint system. The

Contractor shall make repairs at no cost to the Owner at all points where failures are observed by removing the deteriorated coating, cleaning the surface and recoating with the same paint system. If the areas of failures exceeds 25 percent of the area of a portion of the tank surface, then for that portion, the entire paint system shall be removed and repainted. For purposes of determining the need for complete repainting, the inside roof, shell and floor and the outside roof, shell and floor shall be considered separately.

The Contractor shall prepare and deliver to the Owner an inspection report covering the first anniversary inspection, setting forth the number and type of failure observed, the percentage of the surface area where failure has occurred, and the names of the persons making the inspection. Color photographs shall be included in the report.

F. The Contractor shall furnish the following for purposes of inspection by the Owner.

1. Pictorial surface preparation standards as provided by the AMPP (SSPC-VIS 1) or the American Society for Testing and Materials (ASTM D2200):

2. Wet film thickness measurement gauge;

3. Dry film thickness measurement gauge;

4. Certified thickness calibration standards;

5. Steel temperature gauges;

6. Wet bulb and dry bulb temperature-measuring equipment and psychometric tables;

7. Low voltage wet sponge instrument; and

8. "Tooke" gauge.

Additionally, the Contractor shall provide any necessary rigging to facilitate the inspection of all tank areas. Proper coordination with the Engineer is intended to prevent extensive re-rigging by the Contractor. Therefore, it is the responsibility of the Contractor to keep the Owner fully informed on the status of the painting operation.

END OF SECTION 099720

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 230100 – GENERAL PROVISIONS FOR MECHANICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the general arrangement of the mechanical systems and related items to complete the work as shown on the drawings and as specified herein.

B. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

C. The Contractor shall familiarize himself with the work of all other trades, general type construction and the relationship of his work to other sections. He shall examine all working drawings, specifications and conditions affecting his work. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field and advise the Engineer of any discrepancy before performing any work.

D. The work shall include complete testing of all equipment and piping at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment.

E. The Contractor shall perform all necessary temporary work during construction.

F. Work under this section shall conform to all governing codes, ordinances and regulations of the City, County and State.

G. The Contractor shall be responsible for all errors in fabrication, for the correct fitting, installation and erection of the various mechanical systems as shown on the drawings.

1.2 SCOPE

A. This branch of the work includes coordination with all utility companies; agency review fees and all inspection fees; all labor, materials, tools, excavation and backfill and all equipment necessary for the installation of all Heating, Ventilating and Air Conditioning, System as shown on the Drawings and Specifications and/or as required for complete and operating systems. The work shall include starting, balancing and the necessary and required tests to insure the proper operation of the complete system.

B. A complete and operating mechanical system shall be provided. See plans for diagrams and details.

C. All work for this project must comply and be in strict accordance with the Kentucky Building Code, Kentucky Plumbing Code, Kentucky Boiler Code, NFPA, ADA, NEC and all local codes and regulations.

D. In general (as a minimum) all materials and equipment must be installed in strict accordance with manufacturer's requirements; and provided with all required controls, internal fusing, relays, piping connections, electrical connections, ductwork connections, etc., to provide for complete and operable systems.

1.3 PERMITS, FEES, CODES AND APPROVALS

A. Permits and Fees

1. All permits, tap on fees and agency review and inspection fees necessary for the complete HVAC, system shall be obtained by the Contractor from the authorities governing such work. The cost of all permits shall be borne by the Contractor.

B. Codes

1. The minimum standard for all mechanical work shall be the current requirements of the Kentucky State Plumbing Law, Regulation and Code, Kentucky Building Code, ADA, International Mechanical Code, Kentucky Boiler Code, NFPA and local ordinances.

C. Approvals

1. All work must be approved by the Architect/Engineer, Owner and all related Code Agencies before final payment will be made.
2. As a minimum, the following approval Certificates of Inspection and Approval shall be required:

    a. HVAC Inspection
    b. Local and State Building Inspections.

3. Final payment will be contingent upon all Approval Certificates.

1.4 DRAWINGS AND SPECIFICATIONS

A. Contract drawings for work under this section are in part diagrammatic, intended to convey the scope of work and indicate the general arrangement of equipment, piping and the approximate size and location of equipment and outlets. The Contractor shall follow these drawings in laying out his work and shall verify spaces in which his work will be installed, indicating to the Engineer where any conflicts or overlapping of systems occur. Any item of work not clearly included, specified and/or shown, errors or conflict between Plans (Mechanical, Architectural, Structural or Electrical), Specifications, codes and field conditions, shall be clarified by a written request to the Architect by the Bidder before bidding; otherwise, the bidder shall, at his own expense, supply the proper labor and materials to include these items of work and to make good any damages or defects in his work caused by such error, omission or conflict. Under no circumstances shall a Contractor scale the Drawings for the location of equipment and work.

B. Where job conditions require reasonable changes in indicated locations and arrangement, proposed departures shall be submitted with detailed drawings to the Engineer for approval before any of the proposed work is commenced. All approved departures shall be made at no additional cost to the Owner.

C. The drawings and the specifications are intended to indicate complete and working systems, unless specifically indicated to the contrary. The work includes the furnishing, installing and connecting of a complete working installation in each case to the full extent set forth in the drawings and herein specified. The Contractor shall be responsible for the complete functioning system, unless specifically noted otherwise.

D. The drawings and specifications shall be considered as cooperative, work and material included in either, though not mentioned in both, shall be a part of the work to be accomplished and shall be carried out completely in as thorough manner as if covered by both.

E. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, pipe, traps, valves and accessories as may be required to make a functional installation at no additional cost to the Owner.

F. Mechanical as built "Record Drawings" shall be kept up to date each day. "Record Drawings" shall be reviewed by Architect/Engineer each month with contractor's pay request review.

G. Any deviation in work as shown on plans and specifications must be approved in writing by Architect/Engineer prior to installation.

1.5 EXAMINATION OF SITE

A. Bidders shall visit the site before submitting proposals to satisfy themselves as to the nature and scope of the work and any difficulties attending to the execution.

B. The submission of a proposal will be construed as evidence that such an examination has been made. Later claims for labor, equipment, materials, etc., required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

1.6 EQUIPMENT DESIGN AND INSTALLATION

A. The design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the applicable standard rules of the following. Where materials are not specifically referred to, but are required, they shall meet the requirements of the applicable code.

1.	NEMA	National Electrical Manufacturer's Assoc.
2.	UL	Underwriter's Laboratories, Inc.
3.	ASME	American Society of Mechanical Engineers
4.	ASTM	American Society of Testing Materials
5.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
6.	BOCA	Building Officials & Code Administrators International, Inc.
7.	NFPA	National Fire Protection Association
8.	AWWA	American Water Works Association
9.	AWS	American Welding Society
10.	AMCA	Air Moving and Conditioning Assoc.

11.	ANSI	American National Standards Institute
12.	NEC	National Electrical Code
13.	AIEE	American Institute of Electrical Eng.
14.	ARI	Air Conditioning & Refrigeration Institute
15.	SMACNA	Sheet Metal and Air Conditioning Contractors National Assoc.
16.	LSDHBC	Local and/or State Division of Housing, Building and Construction
17.	SPC	State Plumbing Code
18.	NPC	National Plumbing Code
19.	OSHA	Occupational Safety and Health Adm.
20.	EPA	Environmental Protection Agency
21.	DOE	U.S. Department of Energy
22.	IMC	International Mechanical Code
23.	IECC	International Energy Conservation Code

B. Unless otherwise specified, equipment and materials of the same type and used for the same purpose, shall be products of the same manufacturer.

1.7 CAPACITIES, SIZES AND OPERATING CONDITIONS

A. Capacities, sizes and conditions specified or shown on drawings shall be regarded as minimum allowable. If the Contractor proposes to furnish any equipment which would have to operate at other than specified conditions to produce final effects, all other directly or indirectly related components of the entire systems (as well as of the structure, finish and other systems in the building) must be properly coordinated to the satisfaction of the Engineer. That is: Operating conditions through the entire system must be such that no motor is overloaded, no equipment operates noisier, faster, or hotter than manufacturer's publication recommends and that no excess stress or demand is imposed on any component of any system or the structure; also that no quality, architectural feature, function or "end result" is affected adversely, in the opinion of the Architect.

B. The Architect/Engineer reserves the right to determine if the contractor's proposed materials and equipment of any one manufacturer is acceptable in lieu of the specified material or equipment.

C. Where materials and equipment are listed on Drawings and specifications as acceptable or equivalent, this does not relieve the contractor and/or manufacturer from providing and proving to Architect/Engineer that their materials and equipment are equivalent to items the Architect/Engineer used as a guide specification.

D. The contractor and manufacturer must confirm to the Architect/Engineer that their equipment and materials will meet the space requirements of the project and that the equipment is easily accessible for maintenance and operation.

1.8 LAYOUT

A. The Contractor's work lines and established heights shall be in strict accordance with drawings and specifications insofar as these drawings and specifications extend. The Contractor shall verify all dimensions shown and establish all elevations and detail dimensions not shown. He shall also correlate the time so that the work will proceed to the best advantage of the complete job as a unit. The Contractor shall be responsible for furnishing in ample time, any information

required to revise footing elevations, build all chases and openings in floors, walls, partitions, ceilings, and roofs to provide clearance which may be required to accommodate the work. The contractor shall set all sleeves, anchor bolts and inserts required to accommodate his equipment before masonry is constructed.

B. The Contractor shall layout his work well enough in advance to foresee any conflicts or interferences with work of other sections so that in case of interference, his layout may be altered to suit the conditions, prior to the installation of any work. This procedure will require constant coordination with all sections of the work.

1.9 DEMOLITION AND SCHEDULE

A. All existing mechanical equipment noted on drawings and listed herein that is to be removed or demolished, shall be removed on schedule and disposed of as hereinafter directed.

B. All items removed shall become the property of the contractor and shall be immediately disposed of off-site at contractor's expense except as noted on drawings unless otherwise directed by owner.

C. All demolition shall be carefully accomplished in accordance with master construction schedule so as not to remove any item required for support operation during the planned schedule. No item shall be removed until full schedule is worked out with contractors according to owner's demands and agreed to in writing by the Engineer.

D. Storage will be arranged during scheduling process. Contractors to provide own storage and security.

E. Contractor doing the demolition of equipment must conform to the Clean Air Act of 1990. Refrigerant must be recovered from any air conditioning or refrigeration equipment prior to disconnecting and disposal. The contractor must own and use recovery equipment to meet this requirement. The contractor will be responsible for disposal of refrigerant, refrigerant oil or equipment.

F. If pipe, insulation or equipment to remain is damaged in appearance or is unserviceable, remove damage or unserviceable portion and replace with new products of equal capacity and quality. All existing piping to remain shall be permanently capped, new or existing valves are not adequate.

1.10 ACCESSIBILITY

A. All equipment, valves, motors, damper operators, traps, unions and all other items which require adjustment, maintenance, repair and observation shall be installed in such a fashion that such maintenance, repair and observation can be readily achieved without undue difficulty. Where the drawings show these items in locations not conforming to the above, the Contractor shall advise the Architect/Engineer of this conflict prior to bid Date otherwise he shall, at his own expense, relocate such items as directed by the Architect/Engineer. Where such items are installed above inaccessible ceilings or in or behind walls, this contractor shall provide approved access panels unless otherwise directed in these Specifications.

1.11 ARCHITECTURAL DRAWING AND SPECIFICATIONS

A. Each Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floor and ceiling heights, for location of walls, partitions, beams etc., and shall be guided accordingly for the setting of all sleeves and equipment.

B. Under no circumstances shall a Contractor scale the Drawings for the locations of equipment and work.

1.12 COOPERATION WITH OTHER CONTRACTORS

A. Each Contractor shall demand and examine all Drawings and Specifications pertaining to the construction before installing the work described and shown under these Drawings and Specifications. Each Contractor shall cooperate with all other contractors in locating piping, openings, chases and equipment in order to avoid conflict with any other contractor's work. It is the responsibility of all trades to examine all shop drawings of other trades that would require equipment to occupy the same space and plane within the building to eliminate any potential conflicts. No extra payment will be allowed for relocation of piping, and equipment not installed in accordance with the above instructions, and which interferes with work and equipment of other contractors.

1.13 INSTALLATION OF EQUIPMENT

A. All appliances, materials and equipment shall be installed and connected in accordance with the best engineering practice and in accordance with manufacturer's instructions and recommendations. All auxiliary piping, special controls, water seals, valves, electrical connections, drains, etc., recommended by the manufacturer, required for proper operation, or required by code shall be furnished and installed complete.

B. All equipment designed and constructed for indoor use shall not be shipped to the site until such time that the equipment is ready for permanent installation in a dry building or may be stored on site provided equipment is stored in a water and moisture tight storage building or job trailer. Covering equipment outdoors with plastic or tarp is not acceptable.

1.14 PROTECTION OF EQUIPMENT AND MATERIALS

A. No piping shall be installed in any part of the building where danger of freezing may exist without adequate protection being given, whether or not insulation is specified for the particular piping. All damage resulting from leaking pipes shall be borne by the Contractor under this Division.

B. All work, equipment and materials shall be protected at all times. All pipe and ductwork openings shall be closed with caps or plugs during construction. All equipment and accessories shall be tightly covered and protected against dirt, water or other injury during the period of construction.

C. If the permanent HVAC equipment is used during construction period for temporary heating, cooling and ventilating, the equipment must be carefully protected, and filters changes at minimum of once a week. All return air and exhaust air ductwork used in temporary HVAC systems during construction period must be filtered at each opening to prevent construction dust from entering the ductwork system.

D. Before the building is turned over to the Owner all of the equipment must be carefully cleaned of debris and dust, coils cleaned and flushed out, new filters installed, and all ductwork cleaned of debris and dust.

1.15 PROTECTION FROM MOVING PARTS

A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded.

1.16 CUTTING AND PATCHING

A. All cutting and patching required in connection with the installation of this work, and work due to errors, defective work, ill-timed work or tardiness in properly designating size and location in sufficient time or by failure to notify other trades, shall be done under this section, but only in the manner directed by the Engineer so as to prevent or minimize damage to installed work. Damage as a result of cutting for installation, shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Owner.

B. No cutting of structural members will be permitted, except when prior permission of the Engineer has been obtained. This work must conform in every respect to the surrounding finish and to the quality of workmanship and materials used.

C. Piercing of any waterproofing or roofing shall be done only by the trade involved. After the part piercing the waterproofing has been set in place, the opening made for this purpose shall be filled and made absolutely watertight to the satisfaction of the Engineer.

D. See Section: 230517 - SLEEVING, CUTTING, PATCHING AND REPAIRING - MECHANICAL

1.17 FIRE AND SMOKE-STOPPING

A. Fire-stopping and smoke-stopping shall be provided around all piping and ductwork penetrations of fire rated and/or smoke-rated floors, walls, ceilings or other barriers.

B. The materials used shall be UL 263 or UL 1479 classified and meet ASTM E814 standards and be rated for assemblies where applied.

C. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion, or the required fire resistance.

D. Install penetration seal materials in accordance with manufacturer's instruction.

E. Seal holes or voids may be penetrations to ensure an effective fire and/or smoke barrier.

F. Protect materials from damage on surfaces subject to traffic.

G. Stop insulation flush with wall on insulated pipe and seal edges.

H. All exposed piping passing through floors, ceilings and walls in finished areas shall be fitted with a chrome plated escutcheon of sufficient outside diameter to amply cover the sleeved opening and ad inside diameter to closely fit the pipe around which it is installed.

I. Galvanized sheet metal collars shall be provided around all ducts, equipment, etc., exposed in finished areas. Where such openings are finished and the space around the unit is small, the collar may be omitted with the approval of the Architect.

1.18 CONCRETE WORK AND ANCHOR BOLTS

A. The Contractor under this Division shall provide all concrete bases, curbs and pads for all floor and ground mounted equipment unless otherwise indicated.

B. The Contractor under this Division shall verify the sizes and locations of all supports, bases and pads prior to pouring of same to be certain that the installed units will be compatible.

C. The Contractor under this Division shall set anchor bolts when required for the equipment prior to pouring of concrete. Sizes and exact locations of bolts shall be determined by the manufacturer's recommendations for the equipment served.

D. Concrete work must be provided in strict accordance with Section 03 Concrete Work. As a minimum provide pads using 3500 psi concrete not less than 3.5 inches high reinforced with WI.4 x WI.4 welded wire fabric. Chamfer top and edge corners with 3/4-inch preformed chamfer strips. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. Slope top to floor drain if drain is provided in pad.

1.19 ACCESS PANELS

A. The Mechanical Contractor shall furnish all other access panels needed for access to valves, open receptacles, vents, fire dampers, mechanical units, etc., in inaccessible locations installed under this Division of the work.

B. Access panels shall have a minimum size of 12 inches by 12 inches and shall be centered beneath equipment for accessibility and maintenance. Access panels must be of adequate size to service, observe, remove and maintain equipment.

C. Access panels shall be equal to the types specified under the Architectural Specifications. As a minimum the access panels shall be equivalent to Cesco Products style FB/FB SS, Besco, Inryco/Milcor, Phillips or equivalent, 14 gauge with vandal proof lock and frame as selected by Architect.

D. Ceiling Types

1. In areas with suspended acoustical tile ceilings (installed on exposed metal grid suspension system so that the tile may be readily removed), equipment, valves, etc., install above these ceilings will be considered to be accessible.
2. All plastered ceilings or ceilings having concealed spline type of suspension system will be considered as not removable for accessibility to equipment; therefore, access panels will be required.
3. See Architectural Drawings and Specifications for the types of ceilings throughout the building.

E. Access panels shall be installed by sub-contractor specialized in access panel installation.

1.20 CONNECTION TO EQUIPMENT SPECIFIED IN OTHER SECTIONS

A. Examine all Contract Documents and be thoroughly familiar with all items of equipment in other sections or by Owner, unless otherwise specified or indicated on Drawings. Rough-in for and make final connections to all equipment which requires any of the services specified in this Section and including furnishing and install all valves, P-traps, unions, vacuum breakers and all other specialties as required to make all work and equipment final and operating. It is the intent of the Contract Drawings to detail and indicate all such equipment; however, be responsible for notifying Architect/Engineer in writing of major discrepancies seven (7) days prior to Bid Date; otherwise, all such connections shall be made at no extra cost.

B. Unless specified otherwise, all conduit, wiring and connections for power to mechanical equipment will be provided by Electrical Contractor. Be responsible for correct sequences of operation of all mechanical equipment after all wiring has been completed.

1.21 OPERATING INSTRUCTIONS

A. After all tests have been completed and work accepted by the Owner, a competent representative shall, at a time determined by the Engineer, present verbal and visual instructions to the Owner's personnel in the proper operation of his respective system. For this purpose, each section of work shall be demonstrated and explained to the Owner's personnel and sufficient time allotted for instructions. See Specification Section 230600.

1.22 SAFETY

A. The contractor and his subcontractors for the project shall comply with all applicable Federal, State, and local laws governing safeguards, safety devices, and protective equipment and shall take all other needed actions which they may determine or which the Department may determine to be reasonably necessary to protect the life and health of all employees and personnel on the project, provide for the safety of the public and protect all property affected by the performance of the work covered by the contract.

B. As provided in KRS Chapter 338 in the Kentucky Occupational Safety and Health Act and in subsequent regulations and standards promulgated by the Kentucky Occupational Safety and Health Standards Board, neither the Contractor nor his subcontractors shall require any laborer or mechanic employed in performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.

C. The contractor shall not remove or disturb any suspected hazardous materials, including asbestos-containing materials, lead based paints, electrical equipment containing PCB's, or any other except as instructed in this contract. If any material not covered by the contract is encountered, notify the Engineer immediately.

1.23 TESTS - GENERAL

A. All tests required to establish the adequacy, quality, safety, completed status and suitable operation of each system and all components thereof shall be made in the presence of and to the satisfaction of the Engineer or his authorized representative and other representatives of State and local Government. All instruments, labor and expert service necessary to conduct these tests shall be supplied by the Contractor; power and fuel will be furnished by the Owner.

B. The final inspection and tests are to be made only after the Engineer is satisfied that the work described in these specifications has been completely installed in accordance with the true spirit and intent of these specifications and that complete preliminary tests were made which indicate adequacy, quality, completion and satisfactory operation. The acceptance of the work herein specified, shall not in any way prejudice the Owner's right to demand replacement of defective material and/or workmanship.

1.24 CLEANING

A. General: Clean all piping and equipment systems as required to leave the piping and equipment clean and free from scale, silt, contamination, etc., as normally required and as specified herein.

B. Utilities and Equipment: The Contractor shall provide all necessary temporary materials and equipment to clean the piping and equipment installed under this specification. No permanent equipment shall be used for storage, mixing, settling, compressing, pumping, etc., without the approval of the Architect. The Contractor shall supply a separate and independent source of clean, dry, oil-free air for the blowdown of systems requiring this method of cleaning.

C. Use of Chemicals: No chemicals, wetting or drying agents shall be used to clean systems or equipment where the materials of the system undergo any changes in their physical or structural characteristics. In case of any doubt as to the compatibility of any materials to the cleaning solution used, the Contractor shall obtain prior written approval for the use of the solution from the manufacturer of the equipment. Piping systems, equipment and sub-assemblies shall be cleaned after completion of welding, machining, threading, testing and any other operations capable of contaminating the system piping or equipment. After cleaning, the permanent strainers shall be removed, cleaned and replaced. Temporary strainers shall be periodically removed, cleaned and replaced during cleaning in lines ahead of equipment to protect against particles becoming lodged in the equipment.

D. After the Architect/Engineer has complete examination, this Contractor shall remove all stickers, tags, etc., and shall thoroughly clean all equipment, fixtures, and materials installed under his section of the work.

E. Surplus material, rubbish and equipment resulting from the work shall be removed from the building and premises by the Contractor upon completion of the work in accordance with the General Conditions.

F. All equipment shall be thoroughly cleaned to "Factory New" condition prior to turning over to owner. Touch up or completely repaint equipment as required.

G. Keep all nameplates on equipment clean and exposed for easy reading.

1.25 WARRANTY AND SERVICE

A. All equipment shall be warranted for a period of at least one (1) year from the date of acceptance, as evidenced by date of substantial completion for the entire project or for the last phase of the project, whichever occurs later, against defective materials, design, and workmanship. In addition to the equipment warranty, the Contractor shall provide all repair and adjustment service necessary for the proper operation of the entire system for a period of one (1) year after the date of acceptance, as evidenced by the date of substantial completion for the entire project or for the last phase of the project, whichever occurs later. Upon receipt of notice from the Owner's representative of failure of any part of the warranted system or equipment during the warranty period, the affected part shall be replaced promptly with a new part without cost to the Owner. Upon failure to take action within 24 hours after being notified, the work will be accomplished by the Engineer at the expense of the Contractor. See General Conditions and individual equipment specifications. Note that the warranty period of time specified in this section represents the minimum warranty period required for work performed under specification Division 23. Where the General Conditions and/or individual equipment/system specifications require a warranty period of longer duration or earlier start date than specified in this paragraph, the longer duration/earlier start date shall supersede for those portions of work covered by that specification. In the event the contractor is notified of warranty issues but does not correct or address the warranty issues prior to the end of the specified warranty period, the contractor will not be relieved of the responsibility to correct the deficient items after the warranty end date has passed.

B. Make a minimum of two (2) service calls during guarantee period, free of charge, to check with Owner and to check and repair malfunctioning equipment which was installed. Service calls shall be in middle and end of guarantee period and as required to maintain systems operation. Dates shall be listed in operating and maintenance manuals, along with contractor's name and phone number.

1.26 ELECTRIC MOTORS

A. All motors shall be designed, tested and applied in accordance with the applicable standards listed hereinbefore. Motors shall be of sufficient size for the duty to be performed and shall not exceed the full load rating when the driven equipment is operating at specified capacity. Unless otherwise specified, all motors shall be high efficiency type and shall have open frames and continuous-duty classification based on 50 degrees C. ambient temperature. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics. Motors shall meet NEMA high efficiency standards MGI - 1.41.2 for energy efficient polyphase squirrel-cage motor. Efficiency shall be in accordance with MGI - 1.2.55. When motor horse powers required differ from those indicated on the drawings, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, starters and branch-circuit protection at no additional cost to the Owner.

1. Motors shall be rated for continuous duty capable of driving the connected loads without exceeding temperature limitations of the motor insulation. Special Class A moisture-resisting insulation (designed to operate in a 122-degree F. ambient without exceeding a temperature rise rating designated by NEMA for the type of enclosure used) shall be utilized in each motor.

B. Unless otherwise indicated or specified, the electrical components required to operate mechanical equipment, such as, motors, float and pressure switches, solenoid valves, and other devices functioning to control the mechanical equipment, shall be furnished as part of the mechanical equipment, shall be complete and operable, and shall be included under this section of the specifications. All motor starters not part of a motor control center shall be included under this Section and shall be the hand off auto type with 3 over-loads on 3 phase units and 120V control transformer. Conduit and wires required for external electrical connections shall be furnished and are specified under DIVISION 26 - ELECTRICAL. Integral phase failure relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Mechanical contractor shall coordinate staggered restart times as required.

1.27 DRIVES

A. Each belt-connected motor-driven unit or fan shall be provided with a variable pitch V-belt drive.

B. Sheaves shall be of cast iron or of steel, statically and dynamically balanced, bored to fit properly on the shafts and secured with key of proper size. Sheaves having set screws alone will not be permitted. Sheaves shall be variable pitched and shall be designed to give the required rpm at approximately the mid-position of adjustment. Pitch diameters of sheaves shall be not less than 3.0 inches for "A" section belts; 5.4 inches for "B" section belts; 9.0 inches for "C" section belts; and 13.0 inches for "D" section belts.

C. Belts shall be selected for a minimum service factor of 1.5 (based on motor nameplate horsepower) and selected and matched in sets for equal tension.

D. All other drives shall be as described under the respective equipment paragraph of these Specifications, as applicable.

1.28 AS-BUILT DRAWINGS

A. The Contractor shall deliver to the Engineer at the completion of the work, one (1) print of "As-Built" drawings, showing legibly and accurately, mechanical and piping systems with equipment locations shown as actually installed. Changes in original plans shall be neatly shown in red pencil. Each print shall be signed by the sub-contractor who has done the work.

B. During construction the Contractor shall retain a set of blue line drawings on the site for recording all changes. These drawings shall be available for inspection by the Engineer.

1.29 TESTS

A. The Architect/Engineer shall be notified by the Contractor under this Division forty-eight (48) hours in advance of any tests so that the Architect/Engineer or his representative may be present when the tests are run. Leaks or imperfections found shall be corrected and a new test shall be run to the satisfaction of the Architect/Engineer. Upon successful completion of the test, pipe covering may be applied, and piping may be concealed. A successful test, even if witnessed, however, does not relieve the Contractor under this Division of the responsibility for any failure during the guarantee period.

B. After pipe fabrication has been completed, all water piping shall be subjected to a hydrostatic test of 100 psi and proven tight and free of leaks for a 24-hour period. Tests shall be applied to the piping before being attached to any equipment which would be damaged by the test pressure. Damage to equipment caused by testing shall be repaired or replaced without additional cost to the Owner.

C. Exterior water piping shall be tested in strict compliance with local water company. The minimum hydrostatic test pressure is 1-1/2 times the water pressure serving the site.

D. No insulation, paint, backfill or other prohibitive covering shall be applied to piping prior to the above tests.

E. Provide all temporary equipment, materials, valves, gauges, etc., required for the preceding tests.

F. The expense of all tests shall be borne by the Contractor under this Division.

G. In addition to the testing specified above the contractor shall perform the following HVAC systems tests and place the system(s) in operation to demonstrate that all features of the system(s) including instrumentation, controls and equipment function as specified for final acceptance.

1. At such time as the Engineer determines that the new heating, ventilating and cooling system is ready to be placed into service, the Contractor shall place the new equipment in operation and demonstrate that the safety devices are in proper working order to the satisfaction of the Engineer.
2. The Contractor shall then maintain operation and demonstrate each system's capability of producing at full load capacity. Within 24 hours after the systems have been satisfactorily tested, Owner operating personnel will relieve the Contractor of the operations and the Contractor shall continue his work on a joint occupation basis.
3. Depending on the status of the work, the Contractor may at his option conduct other required tests concurrent with, prior to, or following the system testing, providing the Engineer is satisfied the installation is in conformance with the specifications. However, all features of the system(s) shall be tested individually for proper operation at partial and full load conditions and collectively where normal operations require the several components to operate concurrently to constitute an acceptable system.
4. Final acceptance of the entire installation will be based on an acceptable demonstration that all components, local and remote, respond to safety manual and Automatic System controls. During this test the Contractor shall cause simulated perturbations for which the control system is designed to respond. All control, monitor and readout points in the system shall function properly before final acceptance is made.

1.30 CONTRACTOR FURNISHED DRAWINGS, DESCRIPTIVE DATA AND MANUALS

A. Approval of Materials and Equipment: Within 30 days of receipt of notice to proceed, and before starting installation, the Contractor shall submit to the Architect for approval, in triplicate, lists of materials, fixtures and equipment to be incorporated in the work. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore shall be submitted with drawings. Where such departures require piping or equipment to be supported otherwise than shown, the details submitted shall include loadings and type and kinds of frames, brackets, stanchions, or other supports necessary. Approved departures shall be made at no additional cost to the Owner. The lists of materials and equipment shall be supported by sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable.

B. Conformance to Agency Requirements: Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Air Moving and Conditioning Association, or the American Society of Heating, Refrigerating and Air Conditioning Engineers, or to be approved by the Underwriters' Laboratories, Inc., the Contractor shall submit proof that the items furnished under this specification conform to such requirements. A certificate or published statement by the manufacturer will be sufficient evidence that the item conforms to the specified requirements. In lieu of such stamp, certificate, or statement, the Contractor may submit written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing, of the specified agencies.

C. Shop Drawings

1. In accordance with the General Conditions, shop drawings shall be submitted on all units of prefabricated materials. Shop drawings shall show, in detail, all parts of the work, fully dimensioned and shall also indicate construction, concealed and other jointing, thickness of materials, method of anchoring and attachment to other materials. Where required for certain work, submit setting and bending diagrams and mark same to correspond with the design drawings, identifying locations of various items. Show types, sizes and locations of sleeves and inserts.
2. The Contractor shall check all shop drawings for completeness and for correctness before submitting the drawings. If major corrections are required on the drawings, the Contractor shall return the drawings to the originator and have the changes made. The Contractor shall indicate his corrections on the prints in green pencil and sign all prints and other material sent to the Engineer.
3. Detail and Erection Drawings: Detail and erection drawings for equipment, piping and other items of this nature shall be carefully prepared in accord with standard practice and shall show erection plans and member details with all individual parts identified on both the detail sheets and erection plans. All identification markings shall be carefully preserved until after the erection process is completed.
4. Material Data: The Contractor shall submit descriptive data, as required, on pipe, fittings and valves to be incorporated into the work. This data shall be in sufficient detail to allow the Engineer to determine that the pipe, fittings and valves meet the requirements of the contract drawings and specifications or that they are an acceptable equal to that

specified. All data shall be in the form of manufacturer's or supplier's literature concerning the product and shall indicate catalog number, conditions of use, application instructions, and/or other information as applicable.

5. Equipment Data: The Contractor shall submit descriptive data on all items of equipment to be furnished and installed under this contract. These submittals shall consist of manufacturer's published catalog information which completely describes component materials, configuration and rough-in data for mechanical and electrical equipment shall also include cuts, diagrams, characteristic curves and capacity information as applicable. Where more than one item of equipment is employed in the same system, the submittal of equipment data will include special diagrams showing the electrical wiring, interconnecting piping, related controls and relation and operation of the various items of equipment for the entire system.

D. Operating Instructions and Maintenance Manuals, Etc.

1. At completion of the contract, the Owner shall be provided with three (3) bound copies of operations and maintenance instructions, recommended list of spare parts required for a period of one (1) year and a list of any special tools required to maintain the equipment for the various items of the mechanical equipment. Where special tools are required, the Contractor shall furnish two (2) of each such tools to the Owner at no additional contract cost.
2. MANUAL SHALL INCLUDE ALL APPROVED SHOP DRAWINGS OF EQUIPMENT REQUIRING OPERATION AND MAINTENANCE INFORMATION.
3. MANUAL SHALL BE ORGANIZED WITH APPROVED SHOP DRAWING FOLLOWED BY ALL RELATED OPERATION AND MAINTENANCE MATERIAL.
4. EQUIPMENT SHALL BE IDENTIFIED IN ACCORDANCE WITH THE DRAWING NOMENCLATURE AND INCLUDE SUPPLIER OF SAID EQUIPMENT.
5. Instructions shall be included for routine checking of all items requiring continued maintenance.
6. Schematic drawings with actual pieces of mechanical equipment, etc., shall be included; where manufacturer’s parts numbers only are applicable, they shall be included.
7. Detailed operating instructions for mechanical equipment shall be included, as well as general maintenance procedures to be followed on such equipment. Manufacturers maintenance and operation manuals will be required where such are normally available with the equipment, but as such information is often of a general nature and applicable to various models of equipment, such information shall be supplemented by specified typed directions for the particular piece of equipment applicable to this project.

E. Materials, Equipment and Appliances

1. Materials: All materials, equipment, products and incidentals to be furnished by the Contractor shall be new, unless otherwise specified, undamaged and the first line quality product of the manufacturer and/or supplier, except when competitive grades fully meet the standards specified in the various technical sections of these specifications.
2. Standard Products: Except as otherwise approved by the Engineer, the equipment and appliances to be furnished under these specifications shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design. Where two or more units of the same type and class of equipment are required, the units shall be the product of the same manufacturer and shall be identical insofar as possible. The component parts of the products need not be products of one manufacturer.

3. Manufacturer's Directions: Where manufacturer's instructions or recommendations are applicable to the installation or application of materials, the Contractor shall adhere to strict conformance with such instructions or recommendations unless specifically noted to the contrary in these specifications. Where such directions are in conflict with the drawings and specifications, the Contractor shall inform the Engineer of such conflict and request instructions.
4. Samples: The Contractor shall furnish, for approval, samples of materials, profiles, designs, finishes, etc., which are either required by the various sections of specifications or which the Engineer may request from time to time. Samples shall be clearly identified with adequate information for the Engineer's evaluation.
5. Materials and Equipment Delivered to Jobsite: All items of materials, equipment, supplies and miscellaneous items to be incorporated into the work shall be delivered to the jobsite with labels, tags, nameplates and/or containers which clearly indicate the manufacturer's item or catalog number or conformance with the applicable standards stipulated in the technical sections of the specifications. Any item which cannot be verified in the field shall not be included in the work until its identity can be established by the Engineer.

F. Equipment and Material Substitutions

1. Should the Contractor elect to use and install materials which have been approved for use other than specified, he shall be required to make any necessary changes, perform all work and furnish any additional materials and ancillary equipment required to make such substituted materials or equipment function or perform as that specified, at no cost to the Owner. This includes structural, electrical and/or other affected trades.

1.31 DEFINITIONS

A. Mechanical Contractor: Any contractor whether bidding or working independently or under the supervision of a general contractor and/or construction manager and who installs any type of mechanical work.

B. Mechanical Sub-Contractor: Any contractor contracted to or employed by the mechanical contractor for any work required by the mechanical contractor.

C. Engineer: The consulting mechanical/electrical engineers either consulting to the owners, architects, other engineers, etc.

D. A-E: Shall construe architect and/or engineer. In all situations that involve an architect, it shall construe architect, in all others, engineer.

E. Furnish: Deliver to the site in good condition and turn over to contractor responsible for installation.

F. Provide: Furnish and install in complete working order.

G. Install: Install equipment furnished by others.

H. Indicated: Shown on the drawings or addenda thereto.

I. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on the project. Includes but not limited to: plans, specifications, instructions to bidders, general and special conditions, addenda, alternates, list of materials, list of subcontractors, unit prices, shop drawings, field orders, change orders, cost breakdown, periodical payment requests, etc.

1.32 INTENT

A. It is the intention of these specifications and all associated drawings to call for finished work, tested and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".

B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION 230100

SECTION 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers:

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.
5. Electronically commutated.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230517 – SLEEVING, CUTTING, PATCHING AND REPAIRING FOR MECHANICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements for the Mechanical Contractor related to sleeving, cutting, patching, and repairing associated with mechanical work.

1.2 WORK INCLUDED

A. Sleeves

B. Sleeve Seals

C. Grout

D. Escutcheons

E. Lintels

1.3 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the Form of Proposal insofar as they affect this portion of the work.

B. Section 230100 - GENERAL PROVISIONS FOR MECHANICAL WORK

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness, round tube closed with longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Metraflex Company (The).
3. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel, Plastic, or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

2.5 LINTELS

A. New openings under 48 inches in width: Provide one 3-1/2 inches by 3-1/2 inches by 3/8 inch steel angle for each 4 inches of masonry width. Lintel shall have 8" bearing on either side.

B. New openings 48 inches to 96 inches in width: Provide one 3-1/2 inches by 6 inches by 3/8 inch steel angle for each 4 inches of masonry width. Lintel shall have 8 inches bearing on either side.

C. New openings over 96 inches in width: Consult the project structural engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for all openings, sleeves, trenches, etc., that he may require or create by demolition in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.

B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through the walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to go throughout; however, when this is not done, the Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.

C. The Contractor shall notify other trades in due time where he will require openings or chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.

D. The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly made good to the satisfaction of the Engineer.

E. All work improperly done or not done at all as required by the Mechanical Trades in this section, will be performed by the Contractor at the direction of the trade whose work is affected.

3.2 SLEEVES

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

F. Pipes Passing Through Waterproofing Membranes: Pipes passing through floor waterproofing membrane shall be installed through a 4-pound lead-flashing sleeve, or a 0.032-inch thick aluminum sleeve, each with an integral skirt or flange. Flashing sleeve shall be suitably formed, and the skirt of flange shall extend not less than 8 inches from the pipe and shall set over the floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 1 inch above the floor. The annular space between the flashing sleeve and the metal-jacket-covered insulation shall be sealed. At the Contractor's option, pipes passing through floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and a pressure ring with brass bolts. Waterproofing membrane shall be clamped into space and sealant shall be placed in the caulking recess.

G. Pipes Passing Through Roof: Pipes passing through the roof shall be installed where shown on the drawings. Any penetration in roof shall be approved by the Roofing Manufacturer.

H. Openings for ductwork, fixtures, equipment, etc. through floors, walls, ceiling and roofs, shall be located and sized by the Contractor under this division who shall provide and set necessary lintels, sleeves and sheet metal forms for all such openings.

I. Galvanized sheet metal collars shall be provided around all ducts, equipment, etc., exposed in finished areas. Where such openings and finished and the space around the penetration is small, the collar may be omitted with the approval of the Architect/Engineer.

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 ESCUTCHEONS

A. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

3.5 CUTTING

A. All rectangular or special shaped openings in plaster, stucco or similar materials, including gypsum board, shall be framed by means of plaster frames, casing beads, wood or metal angle members as required. The intent of this requirement is to provide smooth even termination of wall, floor and ceiling finishes as well as to provide a fastening means for grilles, diffusers, lighting fixtures, etc.

B. All trades shall coordinate all openings in masonry walls with the General Contractor, and, unless otherwise indicated on the Architectural drawings, shall provide lintels for all openings required for the plumbing work (piping, wall boxes, etc.).

C. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the engineer.

D. Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.

E. Openings in metal building walls shall be made in strict accord with building suppliers recommendations.

3.6 PATCHING AND REPAIRING

A. Patching and repairing made necessary by work performed under this division shall be included as part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the engineer.

B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation or work of this Division, such items shall be repaired and/or replaced to the satisfaction of the engineer.

C. Where the installation or removal of piping, etc. requires or creates the penetration of fire or smoked rated walls, ceilings or floors, the space around such pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor or ceilings affected.

D. Piping passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe around which it is installed.

E. Where pipes pass through exterior walls, the wall openings shall be sealed air and water tight. This shall include sealing on both sides of the wall to ensure air and water does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION 230517

SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and Equipment Hangers, Supports, and Associated Anchors

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the Form of Proposal insofar as they affect this portion of the work.

B. Section 230100 - GENERAL PROVISION FOR MECHANICAL WORK

1.3 REFERENCES

A. ANSI/ASME B31.1 - Power Piping

1.4 SCOPE

A. This specification shall apply for the design and fabrication of all hangers, supports, anchors and guides. Where piping design is such that exceptions to this specification are necessary, the system shall be identified, and the exceptions approved by Engineer prior to installation. See drawings.

1.5 STRUCTURE

A. This section is intended to cover the structural requirements of the piping and equipment. It is not intended to imply that the building structure will support the loads imposed. The contractor shall review the structural drawings for where loads can be applied, what load can be supported and what structural reinforcing is required. Specific questions can be directed to the structural engineer.

1.6 DESIGN

A. All supports and parts shall conform to the latest requirements of the ANSI Code for Pressure Piping B31.1.0, and MSS Standard Practice SP-58, SP-69 and SP-89 except as supplemented or modified by the requirements of this specification.

B. Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.

C. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.

D. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

E. Where possible, steel structural attachments shall be beam clamps. Other attachments shall be as scheduled.

F. All rigid hangers shall provide a means of vertical adjustment after erection.

G. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

H. Where horizontal piping movements are greater than 1/2-inch, or where the hanger load angularity from the vertical is greater than 4 degrees from the cold to hot position of the pipe, the hanger rod to structural attachment shall be by use of Anvil Fig. 47 and Fig. 299 or the hanger rod and structural attachments shall be offset in such manner that the rod is vertical in the hot position.

I. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.

J. Hangers shall be spaced in accordance with ANSI B31.1.0

K. Where practical, riser piping shall be supported independently of the connected horizontal piping.

1. Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with ANSI B31.1 codes.

L. Supports, guides and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of support parts shall be based on a temperature gradient of 100 degrees F per inch distance from the outside surface of the pipe.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Anvil, Elcen, Mason Industries, Advanced Thermal, Fee & Mason, Piping Specialties, MIRO Industries.

2.2 SHIELDS

A. Shield for Insulated Piping 2 Inches and Smaller: galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support. See schedule for thickness.

B. Shield for Insulated Piping 2-1/2 Inches and Larger: Pipe covering protective saddles.

C. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90-degree segments, 12-inch minimum length, block thickness same as insulation thickness.

D. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.3 HANGER RODS

A. Threaded one end, threaded both ends, threaded continuously.

2.4 INSERTS

A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 PIPE HANGERS, SUPPORTS AND ANCHORS

A. BEAM CLAMPS

1. Beam clamps shall have malleable iron jaws, steel bolt or tie rod, nuts and jamb nuts.
2. C-clamps will not be permitted unless retainer is provided.

2.6 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.7 ROOF SUPPORTS

A. Roof mounted piping shall be supported by pillow block pipe stands as manufactured by MIRO Industries at 800-768-6978 or 615-849-9431.

PART 3 - EXECUTION

3.1 INSERTS

A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

B. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

3.2 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping indicated in schedule on drawings.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Provide hangers with 1-1/2-inch minimum vertical adjustment.

E. Support riser piping independently of connected horizontal piping.

F. Support horizontal piping as follows:

Nominal Pipe Size	Single Rod Diameter	Thickness of Insulation Shield	Maximum Spacing Ferrous Piping	Copper Tubing	HDPE Piping
3/4" & Under	3/8"	16 gauge	6'	5'	2.5'
1"	3/8"	16 gauge	7'	6'	3'
1-1/4"	3/8"	16 gauge	8'	8'	4'
1-1/2" & 2"	3/8"	16 gauge	9'	8'	4'
2-1/2" & 3"	½"	12 gauge	12'	8'	4'
4" & 5"	5/8"	12 gauge	14'	8'	4'
6"	3/4"	10 gauge	14'	8'	4'
8"	7/8"	8 gauge	14'	10'	5'

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Pipe Hangers	X	X						
Supports	X	X						
Inserts		X						

END OF SECTION 230529

SECTION 230548 – VIBRATION CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. This specification includes vibration isolation, equipment balancing requirements and sound level criteria for equipment spaces and exterior mounted equipment.

B. Mechanical and electrical equipment and associated piping and ductwork shall be mounted on vibration isolators as specified and/or required to minimize transmission of vibration and structure-borne noise to building structure or spaces.

C. All rotating equipment shall be balanced both statically and dynamically. The equipment when mounted and placed in operation shall not exceed a self-excited vibration velocity of 0.10 inches per second in the vertical, horizontal or axial directions when measured with a vibration meter on the bearing caps or at the equipment mounting feet if the bearings are concealed.

D. All electrical motors shall comply with the balancing requirements of NEMA Standard HG-1-4.23.

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the Form of Proposal insofar as they affect this portion of the work.

B. Section 230100 - GENERAL PROVISIONS FOR MECHANICAL WORK

1.3 SHOP DRAWINGS

A. Shop drawings shall be submitted as required in Section 230100 - GENERAL PROVISIONS FOR MECHANICAL. See Submittal Sheet.

B. Shop drawings for neoprene mounts, or pads and spring isolators with neoprene components shall contain a certification that the neoprene compound complies with the industry standards for physical properties.

C. All steel frames, steel bases and rails and vibration isolation units except those installed as part of the packaged equipment prior to shipment shall be furnished by one vibration isolation manufacturer.

D. All submittals for equipment bases and equipment and piping isolation shall be in one brochure. The isolation units including steel base for each piece of equipment and connected piping shall be grouped together. Each isolation unit in the group shall show the equipment location, weight supported, type unit specified, and type unit selected. Data for each spring isolator shall include

outside diameter, deflection, operating spring height, solid spring height and the ratio of outside diameter to the operating height. Submittal shall include detail drawings, cut sheets and catalog data showing foundations, bases and isolators for all equipment. Certifications required for isolation materials shall be placed on all submittal drawings and catalog sheets containing neoprene items. The sound power levels in Db with reference to 10 - 12 watts, in the nine frequency bands between 31 and 8000 Hertz, exterior to the equipment as it effects the equipment space sound level shall be included with the data submitted for approval of the equipment. The sound power levels of the equipment with the resultant sound pressure levels for a room acoustics factor of 0.15 shall be plotted on an octave band analysis chart containing the broad band and pure tone Db sound pressure levels specified. When the equipment sound levels exceed the specification levels in any of the frequencies, the submittal shall include the sound attenuating enclosure or other method proposed to reduce the equipment sound level to that specified, with supporting data.

E. The submittals for equipment mounted at the exterior of the building, or generating outside noise, shall include sound level calculations showing equipment sound level limitations based on the requirements hereinbefore specified and applicable sound level ordinances. The equipment sound pressure levels in all nine frequency bands between 31 and 8000 Hertz shall be included in the data. Where required to comply with the sound level limitations, the sound attenuation method proposed, with supporting data, shall be included with the equipment submittal.

1.4 EQUIPMENT SOUND ATTENUATION

A. The sound pressure levels in occupied spaces generated by any mechanical and electrical equipment as transmitted by the building structure, supply or return duct borne, duct breakout or airborne through mechanical room wall and ceiling shall not exceed the following:

Octave Band Hertz							
Mid Frequency	63	125	250	500	1000	2000	4000
Sound Pressure Level dB	57	48	41	35	31	29	28

B. The maximum allowable sound pressure levels shall be reduced by 5 Db in any octave band where field tests indicate pure tone generation.

C. When equipment sound levels exceed the specified noise criteria removable acoustical enclosures, alterations to the equipment, or other approved means shall be provided to reduce the noise level to that specified. Ventilation openings in enclosures shall be provided with sound traps, access openings, observation ports and lights shall be provided where required for normal operation, observation and servicing.

D. Equipment sound power levels may be obtained by laboratory tests measured in accordance with ASHRAE Standard No. 35-36 or by field testing. All equipment sound power tests shall be certified for compliance with the specified test procedure and accuracy by the test personnel and a responsible official of the test company.

E. Mechanical equipment installed within or outside the building shall comply with all local, city, state and OSHA sound level requirements.

F. Test instruments shall be calibrated for accuracy by an approved testing laboratory or by the manufacturer. Certificates showing degree of accuracy shall be furnished to the Engineer.

G. All labor, instruments and appliances required for the tests shall be furnished by the Contractor.

1.5 VIBRATION

A. Isolation system shall be stable during starting and stopping of equipment without excessive transverse or eccentric movement.

B. The installed vibration isolation system shall have a maximum lateral motion under start-up and shut-down conditions of 0.25 inch. Motions in excess shall be restrained by approved spring type mountings.

C. All electrical and piping connections shall be sufficiently flexible to permit proper isolation.

D. Isolation components shall be selected for the lowest operating speed of the equipment.

E. Isolators, including springs, exposed to weather shall be hot dip galvanized after fabrication.

F. Isolators shall be selected and located to produce uniform loading and deflection even when equipment weight is not evenly distributed.

G. The type of isolation, base and minimum deflection shall be as required for each specific application when supported on a solid concrete slab, 6 inches total thick minimum. Vibration isolators with a deflection greater than the minimum specified shall be submitted for approval if they are needed to meet the noise criteria.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Mason Industries, Amber/Booth Company, Vibration Elimination Co., Inc.

2.2 ELASTOMERIC ISOLATORS

A. Elastomeric isolators shall be one of the following:

1. Neoprene isolation mounts of the straight-line deflection curve type. The isolation mounts shall be manufactured with bolt holes for bolting to equipment base. Bottom steel plates for mounting to subbase shall be provided where required to prevent movement of equipment. These isolators shall be molded in black oil-resistant neoprene and color coded. All metal parts shall be embedded in neoprene.
2. Neoprene pads shall be of cross-ribbed or waffle design, 5/16-inch minimum thickness. Where concentrated load bearing is encountered, steel bearing plates shall be bonded to the neoprene pads. The neoprene pads shall be sized for a load of 50 psi.

2.3 SPRING ISOLATORS

A. Spring isolators shall be free-standing, laterally stable without any housing and complete with 1/4-inch-thick neoprene acoustical friction pads between the base plate and the support.

B. All mountings shall have leveling bolts. Coil outside diameters shall be not less than 0.8 of the operating height.

C. Spring shall have an additional travel to solid equal to 50% of the operating deflection.

D. The horizontal stiffness of spring isolators shall be not less than 0.8 of the vertical (axial) stiffness.

E. Springs shall be designed and installed so that the ends remain parallel during and after deflection to operating height.

2.4 SUSPENSION TYPE ISOLATION

A. Suspension type spring isolation for piping system or equipment hangers shall be a combination of spring and neoprene in series. The spring and elastomer combination shall be encased in a structurally stable steel bracket. Spring diameters shall be large enough to permit a 15-degree angular misalignment of the rod without rubbing on the hanger box.

B. Suspension type elastomeric isolators shall be double deflection. Isolators shall be mounted in an open steel bracket with openings for hanger rod connections. The hanger rod shall be separated from contact with the hanger bracket by a neoprene grommet. The neoprene isolator shall have a minimum deflection of 0.35 inch.

C. Where required, pipe hangers shall be equipped with a method of holding the piping at a fixed elevation during installation and a secondary adjustment to transfer the load to the spring and maintain the same elevation. Deflection shall be clearly indicated by a permanent pointer and scale.

D. Duct isolation hangers shall consist of spring and neoprene grommet or mount encased in a steel bracket with suitable means of connecting to ducts and building structure.

2.5 FOUNDATIONS FOR MACHINERY

A. Subbases of 3500 PSI concrete not less than 4 inches high shall be provided for all floor and ground mounted mechanical equipment. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. A minimum clearance of 1 percent of the maximum base dimension or 1 inch shall be provided between subbases and all steel bases and steel saddles with equipment in operation.

B. Each electric motor shall be mounted on the same foundation as the driven machine.

C. Foundations for machines shall be a minimum of 2500 psi concrete with all exposed surfaces, steel troweled smooth and corners beveled.

D. Machines shall be secured to steel bases with anchor bolts of ample size. All machines having baseplates shall be grouted under the full area of the baseplate with a non-shrinking, premixed grout.

2.6 FLEXIBLE CONNECTIONS

A. Flexible hose shall be designed for an operating temperature of 50 degrees F above the maximum system design temperature and for a working pressure of not less than 125 psig or 150 percent of the system operating pressure whichever is greater.

B. Metal flexible hose shall be Grade E phosphor bronze, Monel or stainless steel corrugated tube covered with comparable bronze or stainless braid restraining and pressure cover. Stainless steel grade shall be 304. Live lengths of flexible metal hose shall generally be not less than recommended by the manufacturer for continuous vibration application.

2.7 VIBRATION ISOLATION ROOF CURB RAILS

A. Pre-fabricated factory assembled bases with neoprene or spring isolators. Unit shall be fully enclosed and air/water tight.

PART 3 - EXECUTION

A. Provide equipment and piping vibration isolation where required by equipment manufacturer and where called for on drawings.

B. Type of vibration isolators to be provided shall be based as follows:

1. Static deflection up to 1/4 inch - single deflection neoprene mounting or pads.
2. Static deflection 5/16 inch to 3/8 inch - double deflection neoprene mountings.
3. Static deflection above 3/8 inch - spring isolators.

C. Furnish vibration isolation for all piping connected to equipment mounted on vibration isolation. Equipment that has internally isolated units (compressors, etc.) shall be considered separately as to isolation requirements.

3.2 FLEXIBLE CONNECTIONS

A. Flexible connections shall be provided for all connections indicated on drawings, manufactured of materials suitable for the operating temperatures and pressures of the fluid or gas it is conveying.

B. Flexible hose shall be installed in accordance with the manufacturer’s recommendations including placement in the pipe line without damage, misalignment or change in its normal length. Prior to filling the system, the alignment and length shall be checked by loosening the flange bolts to determine the installation conditions. The piping installation shall be corrected if necessary and the flexible hose replaced if damaged, at no cost to the Owner.

C. Equipment installed on the roof shall be mounted on pre-fabricated bases with neoprene or spring isolators. Where practical supports shall be at bearing walls or beam locations. Provide water-tight pitch pockets at roof level for all supports.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Elastomeric Isolators	X	X	X					
Suspension Type Isolators	X	X	X					
Spring Isolators	X	X	X					
Flexible Connections	X	X	X					
Vibration Isolation Curbs	X	X	X					

END OF SECTION 230548

SECTION 230593 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL SPECIFICATIONS

1.1 DESCRIPTION OF WORK

A. The total system balance shall be performed by an independent test and balance firm that specializes in testing and balancing of HVAC systems.

B. This specialty firm shall perform the following:

1. On-going job site inspections of equipment, controls and metering devices during construction to verify conformance with design specifications.
2. Air System Balance

a. Outside Air Systems
b. Supply Air Systems
c. Return Air System

3. Control Systems Verification

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the Form of Proposal insofar as they affect this portion of the work.

B. Section 230100 – GENERAL PROVISIONS FOR MECHANICAL WORK

1.3 DEFINITIONS

A. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers.

B. HVAC: Heating, Ventilating and Air Conditioning.

C. NAS: National Account Services. An enhanced program of testing and balancing offering an expanded range of services including a Quality Assurance Guaranty.

D. Testing, Adjusting and Balancing (TAB) of HVAC systems to meet design objectives and obtain optimum system performance.

E. TBE: Test and Balance Engineer is an individual certified by AABC or NEBB as having a degree in engineering and 3 years of test and balance experience, or, 5 years of background in the air conditioning field and 5 years continuous field experience in testing and balancing work.

1.4 REFERENCES

A. 2011 ASHRAE Handbook, HVAC Applications, Chapter 38, Testing, Adjusting and Balancing.

1.5 AGENCY QUALIFICATIONS

A. TAB Agency shall be a member of the AABC or NEBB.

B. A certified Test-and-Balance Engineer (TBE) shall be responsible for certification of the total work of this section.

C. All work shall be performed in accordance with AABC National Standards. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.

1.6 QUALIFICATION SUBMITTALS

A. TAB Agency shall submit a company resume listing personnel and project experience in the field of air and hydronic system balancing.

B. TAB Agency shall furnish all necessary calibrated instrumentation to adequately perform the specified products. TAB Agency shall submit an inventory and calibration data of all instruments and devices in possession of the balancing agency, to enable the Owner, or his representative, to evaluate the balancing agency's performance capability.

C. The TAB Agency shall, upon acceptance of the contract, submit to the Owner, or the Owner's representative, a "Quality Assurance Guaranty".

D. Within 30 days after acceptance of the contract, the TAB Agency shall submit to the Design Engineer a working agenda which will include procedures for testing and balancing each type of air and water flow system. The Test and Balance Report format will also be submitted indicating data to be recorded.

1.7 NOTIFICATION AND SCHEDULING

A. A pre-balance conference shall be held prior to job start as scheduled by the TAB Agency. Attendees at the meeting shall include representatives of the TAB Agency, General Contractor, Mechanical Sub Contractor, Control Sub Contractor, Owner and Mechanical Engineer.

B. The schedule for testing and balancing the HVAC system shall be established by the General Contractor, and/or Owner’s representative, in coordination with the TAB Agency on a critical path network.

C. The TAB Agency is responsible for initiating this continuing coordinating to determine schedule for final testing and balancing services.

D. It will be necessary for the TAB Agency to perform its services in close coordination with the Mechanical Contractor, with all scheduling and deficiencies reported through the General Contractor, and/or Owner’s representative.

E. Before testing and balancing commences, the TAB Agency shall receive notification in writing from the Mechanical Contractor that the system is operational, complete and ready for balancing.

F. A completed system means more than just physical installation. The Mechanical Contractor shall certify that all prime movers; fans, pumps, refrigeration machines, boilers, etc., are installed in good working order, and that full load performance has been preliminarily tested.

G. The Mechanical Contractor shall certify in writing that all equipment has been checked, started and adjusted by the manufacturer and operated for the specified period.

1.8 COORDINATION WITH OTHER TRADES

A. To bring the HVAC system into a state or readiness for testing adjusting and balancing, the Mechanical Contractor shall perform the following:

1. Air Distribution Systems

a. Ensure that all splitters, extractors, volume, smoke and fire dampers are properly located and functional. Dampers serving requirements of smoke, minimum and maximum outside, return, relief, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
b. Verify that all supply, return, exhaust, and transfer grilles, registers, diffusers, and high-pressure terminal units are installed and operational.
c. Ensure that air handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc. are blanked and/or sealed to eliminate excessive bypass or leakage of air.
d. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
e. Make any necessary changes to the sheaves, belts, and dampers, as required by the TAB Agency, at no additional cost to Owner.
f. Install clean filters prior to testing.
g. Ensure all airflows are within plus/minus 10% of scheduled values.

B. The Temperature Control Subcontractor Shall Perform the Following:

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Calibrate room thermostats after installation and before the thermostat control verification tests are performed. The Agency shall verify the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
4. The Control Contractor shall allow sufficient time in the project to provide assistance and instruction to the TAB Agency in the proper use and setting of control components such

as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

C. The General Contractor and/or Owner's representative, Mechanical Contractor, Temperature Control Subcontractor, and the suppliers of the HVAC equipment shall all cooperate with the TAB Agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

D. In coordination with the General Contractor and/or Owner's representative, the TAB Agency shall arrange for an area of ample size and convenient location for storage of tools, equipment, and other items as required.

PART 2 - PRODUCTS - (Not applicable)

PART 3 - EXECUTION

3.1 ONGOING JOB SITE INSPECTIONS

A. During construction, the balancing agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of 3 times. (Typically this is performed when 60% of the duct work is installed and again when 90% of the total system is installed and prior to insulation of the piping.)

B. The balancing agency shall submit a written report of each inspection to the Owner or owner's representative, and the contractors responsible for correcting noted deficiencies.

C. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.

D. Identify and evaluate any variations from system design.

E. Identify and report possible restrictions in systems (closed fire dampers, long runs of flexible duct, poorly designed duct fittings, etc.).

3.2 AIR SYSTEM TEST AND BALANCE PROCEDURES

A. Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.

B. Current and Voltage: Measure and record motor current and voltage.

C. Pitot Tube Traverse: Perform a Pitot tube traverse of main supply and return ducts to obtain total CFM. If a Pitot tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation of why a traverse was not made must appear on the appropriate data sheet.

D. Outside Air: Test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperature. Make allowances for heat of compression and motor heat where applicable.

E. Static Pressure: Test and record system static pressures, including suction and discharge static pressure profile of each fan.

F. Air Temperature: Take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on the entering and leaving side of each heating coil.

G. Zone Ducts (supply and return): Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.

H. Main Ducts: Adjust main ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

I. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

J. Tolerance - test and balance each diffuser, grille, and register to within 10 percent of design requirement.

K. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.

L. Description: Record the size and type of each diffuser, grille, and register on air outlet data sheets.

M. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.

N. Exhaust Fans: Measure exhaust fan static pressure, total CFM, makeup air and fan RPM. Measure motor operating voltage and amperage.

O. Measure exhaust fan static pressures, total CFM, makeup air and fan RPM.

P. Measure motor operating voltage and amperage.

Q. Record the specified against the actual supplied horsepower and electrical characteristics of all motors.

3.3 CONTROL SYSTEMS VERIFICATION

A. Verify that all control devices are properly connected.

B. Verify that all dampers, valves and other controlled devices are operated by the intended controller.

C. Verify that all dampers and valves are in the position indicated by the controller (open, closed or modulating).

D. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions. This includes dampers in multizone units.

E. Check that all valves are properly installed in the piping system in relation to direction of flow and location.

F. Check the calibration of all controllers.

G. Verify the proper application of all normally open and normally closed valves.

H. Check the location of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.

I. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Control Contractor will relocate as deemed necessary by the TAB Agency.

J. Check the sequence of operation that any control mode is in accordance with approved shop drawings. Verify that only minimum simultaneous heating and cooling occurs.

K. Verify that all controller set points meet the design intent.

L. Check all dampers for free travel.

M. Verify the operation of all interlock systems.

N. Perform all system verification to assure the safety of the system and its components.

3.4 SYSTEM PERFORMANCE VERIFICATION

A. At the time of final inspection, the TAB Agency shall recheck, in the presence of the Owner's Representative, specific and random selections of data, air quantities, and air motion recorded in the Certified Report.

B. Points and areas for recheck shall be selected by the Owner's Representative.

C. Measurement and test procedures shall be the same as approved for work forming basis of Certified Report.

D. Selections for recheck, specific plus random, will not normally exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.

E. If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Certified Report listings, by ten percent or more of the selected recheck stations, the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspection tests made, all at no additional cost to Owner.

F. Following system verification of the Certified Report by the Owner's Representative, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently

marked by the TAB Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.

G. Opposite Season Test

1. The TAB Agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The TAB Agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

3.5 RECORD AND REPORT DATA

A. The Test and Balance Report shall be complete with logs, data and records as required herein. All logs, data and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the Testing and Balancing (TAB) Agency's certified Test and Balance Engineer.

B. Copies of the Test and Balance Report are required and shall be submitted to the Owner, or the Owner's representative.

C. The report shall contain the following general data in a format selected by the TAB Agency.

1. Project number.
2. Contract number.
3. Project title.
4. Project location.
5. Project architect.
6. Project mechanical engineer.
7. Test and balance agency.
8. Test and Balance Engineer.
9. General contractor.
10. Mechanical subcontractor.
11. Date tests were performed.
12. Certification.

D. The Test and Balance Report shall be recorded on report forms conforming to the recommended forms in AABC National Standards. At a minimum, the report shall include:

1. Preface: A general discussion of the system, any abnormalities and problems encountered.
2. Instrumentation List: The list of instruments including type, model, manufacturer, serial number, and calibration dates.
3. Air Handling Equipment

    a. Manufacturer, model number, and serial number.
    b. All design and manufacturer related data.
    c. Total actual CFM by traverse if practical, if not practical, the sum of the outlets may be used, or a combination of each of these procedures. For specific systems, such as ones with diversity, see the AABC National Standards.
    d. Suction and discharge static pressure of each fan, as applicable.

e. Outside air and return air total CFM.
f. Actual operating current, voltage, and brake horsepower of each fan motor.
g. Final RPM of each fan.
h. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
i. Belt size and quantity.
j. Static pressure controls' final operating set points.

4. Coils

a. Manufacturer.
b. All design and manufacturer's related data.
c. Rated and actual water pressure drop through each coil and related GPM.
d. Rated and actual static pressure drop across each coil.
e. Entering and leaving water temperatures.
f. Wet bulb and dry bulb temperatures entering and leaving each cooling coil; dry bulb temperatures entering and leaving each heating coil.

5. Electric Heating Coil

a. Manufacturer and model number.
b. All design and manufacturer rated data.
c. Actual operating current and voltage.
d. Coil location and identification number.

END OF SECTION 230593

SECTION 238113.12 – PACKAGED TERMINAL AIR CONDITIONERS, OUTDOOR, WALL-MOUNTED UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section includes packaged, terminal, outdoor, wall-mounted air conditioners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For packaged, terminal air conditioners.

1. Include plans, elevations, sections, details for wall penetrations and attachments to other work.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For packaged, terminal air conditioners, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Field quality-control reports.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged, terminal air conditioners to include in emergency, operation, and maintenance manuals.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of packaged, terminal air conditioners that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Sealed Refrigeration System: Manufacturer's standard, but not less than five years from date of Substantial Completion, including components and labor.
2. Warranty Period for Nonsealed System Parts: Manufacturer's standard, but not less than five years from date of Substantial Completion, including only components and excluding labor.
3. Warranty Period for Heat Exchangers: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Bard Manufacturing Company.
2. Carrier.
3. McQuay/Daikin.
4. Trane.

2.2 MANUFACTURED UNITS

A. Description: Factory-assembled and -tested, self-contained, packaged, terminal air conditioner with room cabinet, electric refrigeration system, heating, and temperature controls; fully charged with refrigerant and filled with oil; with hardwired chassis and circuit breaker.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Ventilation Rate Procedures," and Section 7 - "Construction and Startup."

D. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

E. ASHRAE Thermal Comfort: Applicable requirements in ASHRAE 55.

F. ASHRAE ERV Testing: Applicable requirements in ASHRAE 84.

G. AHRI Rating: Applicable requirements in AHRI 1060.

H. UL listed and ETL performance certified.

2.3 CHASSIS

A. Cabinet: Sloped top, 0.052-inch- thick steel with removable front panel with concealed latches.

1. Mounting: On exterior wall; vertical wall mounted; horizontal discharge.
2. Discharge Grille: Extruded-aluminum discharge grille.
3. Return Grille: Extruded-aluminum grille.
4. Louvers: Extruded aluminum with enamel finish; color.
5. Finish: Epoxy coating.
6. Access Door: Hinged door in top of cabinet for access to controls.
7. Cabinet Extension: Matching cabinet in construction and finish, allowing diversion of airflow to adjoining room; with grille.
8. Insulation: Cooling and heating sections fully insulated with 1-inch-thick fiberglass insulation.
9. Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
10. Wall Sleeves: Galvanized steel with polyester finish.

B. Refrigeration System: Direct-expansion indoor coil with capillary restrictor and hermetically sealed, soft-start scroll compressor with crankcase heater, liquid line filter dryer, externally equalized expansion valve, high-pressure switch, low-pressure switch, fan cycle, variable speed control, lockout relay, common alarm, vibration isolation, and overload protection.

1. Indoor and Outdoor Coils: Seamless copper tubes mechanically expanded into aluminum fins.
2. Accumulator.
3. Constant-pressure expansion valve.
4. Charge: R-410A.

C. Indoor Fan: Forward curved, centrifugal; with single variable-speed motor(s) with twin blowers and positive-pressure ventilation damper with electric operator.

D. Filters: 2-inch, pleated, disposable MERV 8, serviceable from front of the unit.

E. Condensate Drain: Coated galvanized-steel drain pan to direct condensate to outdoor piping direct to splash block.

1. Comply with ASHRAE 62.1 for drain pan construction and connections.

F. Outdoor Fan: Propeller type with separate motor.

1. Indoor and Outdoor Fan Motors: Two speed; comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 15058 "Common Motor Requirements for HVAC Equipment."

a. Fan Motors: Electronically commutated motors (ECM).
b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
c. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

2.4 HEATING

A. Electric-Resistance Heating Coil: Nickel-chromium-wire, electric-resistance heating elements with contactor and high-temperature-limit switch.

2.5 CONTROLS

A. Control Module: Unit-mounted digital panel with touchpad temperature control and with touchpad for heating, cooling, and fan operation. Include the following features:

1. Low-Ambient Control: Permits cooling-cycle operation down to 0 degrees F outdoor air temperature.
2. Temperature-Limit Control: Prevents occupant from exceeding preset setback or setup temperature.
3. Building Automation System Interface: Allows remote on-off control with setback temperature control.
4. Reverse-Cycle Defrost: Solid-state sensor monitors frost buildup on indoor coil and reverses unit to melt frost.

B. Remote Control: Standard unit-mounted controls with remote-mounted, low-voltage, adjustable thermostat with heat anticipator; heat-off-cool-auto switch; and on-auto fan switch.

C. Outdoor Air: Motorized intake damper. Open intake when unit indoor-air fan runs.

D. Economizer Operation: Motorized intake-air damper controlled by a dry temperature sensor and a mixed-air sensor to provide natural cooling when the outdoor air temperature is favorable. Allows 100 percent outdoor air with associated relief.

E. Dual Unit Control (DUC) Lead/Lag: Hinged cover with two-stage heat/cool thermostat with individual heat/cool setpoints, adjustable interstage differentials and bimetallic elements. The control shall feature a solid-state timer with 1-2-4-8 day sequence, unit lead selector, Unit 1 and 2 power-on LEDs, Unit 1 or 2 lead unit LEDs, 48-hour program save on loss of power, industry standard connections, and 24-volt power from each unit. The DUC shall provide auto sequencing and displays on status and operating status parameters.

F. Three-Phase Power Rotation Monitor: Three-phase monitoring to protect compressor from reverse rotation and to protect the unit from phase failure. Monitor manually reset.

G. Ventilation:

1. Ventilation: Section internally mounted, allowing up to 20% outside air and exhaust air through the action of adjustable dampers.

H. Dehumidification Circuit: Supply-air stream, independent heat exchanger using a separate humidistat, hot gas three-way valve, separate desuperheating condenser circuit, and back drain orifice inserted between the reheat coil and suction line.

2.6 CAPACITIES AND CHARACTERISTICS

A. See schedule on Drawings.

2.7 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Factory test to comply with AHRI 300, "Sound Rating and Sound Transmission Loss of Packaged Terminal Equipment."

B. Unit Performance Ratings: Factory test to comply with AHRI 310/380/CSA C744, "Packaged Terminal Air-Conditioners and Heat Pumps."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.

B. Install wall sleeves in finished wall assembly; seal and weatherproof.

C. Install and anchor wall sleeves to withstand, without damage to equipment and structure, seismic forces required by building code.

3.2 CONNECTIONS

A. Install piping adjacent to machine to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Inspect for and remove shipping bolts, blocks, and tie-down straps.
2. After installing packaged, terminal air conditioners and after electrical circuitry has been energized, test for compliance with requirements.
3. Unit is level on base and is flashed in exterior wall.
4. Unit casing has no visible damage.
5. Compressor, air-cooled condenser coil, and fans have no visible damage.
6. Labels are clearly visible.
7. Controls are connected and operable.
8. Shipping bolts, blocks, and tie-down straps are removed.
9. Filters are installed and clean.
10. Drain pan and drain line are installed correctly.
11. Electrical wiring installation complies with manufacturer's submittal and installation requirements in electrical Sections.

12. Installation: Perform startup checks according to manufacturer's written instructions, including the following:

    a. Lubricate bearings on fan.
    b. Check fan-wheel rotation for correct direction without vibration and binding.

13. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
14. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. After performance test, change filters.

E. Packaged, terminal air conditioners will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged, terminal air conditioners.

END OF SECTION 238113.12

SECTION 238127 – MINI-SPLIT SYSTEM AIR CONDITIONER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Fan coil unit

B. Outdoor unit

C. Refrigerant piping

D. Controls

1.2 RELATED DOCUMENTS

A. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.

B. Section 230100 - General Provision for Mechanical Work

C. See drawings for further conditions, requirements and schedules.

1.3 WARRANTY

A. Provide five-year warranty on compressors.

PART 2 - PRODUCTS

2.1 DUCTLESS SPLIT SYSTEMS

A. Provide self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, controls, air filter, refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.

2.2 ACCEPTABLE MANUFACTURERS

A. Daikin, Trane, Carrier, Sanyo, Mitsubishi, Friedrich.

2.3 INDOOR UNIT

A. The indoor unit shall be completely factory assembled and tested. Units shall have factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto restart function, 3-minute fused time delay and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The front grille shall be easily removed for cleaning.

B. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

C. Both refrigerant lines shall be insulated from the outdoor unit.

D. The indoor units shall be equipped with a return air thermistor.

E. Unit Cabinet

1. The indoor unit shall have a white, "flat screen" finish.
2. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, right bottom, left side, left back and left bottom).
3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.

F. Fan

1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
3. An auto-swing louver for adjustable air flow (vertically) shall be standard.

G. Coil

1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
2. All tube joints shall be brazed with silver alloy or phoscopper.
3. All coils will be factory pressure tested.
4. Condensate pad shall be located in unit.
5. Provide with a remote condensate pump for condensate removal. Power from unit.

H. Filter

1. The return air filter provided will be a mildew proof, removable and washable filter.

I. Refrigerant Piping

1. All refrigeration piping shall be Type ACR hard drawn copper tubing and shall be precapped, precleaned and dry nitrogen charged at the factory. This piping shall be capped throughout the construction to prevent any foreign materials from entering the piping. Fittings shall be wrought copper solder joint type. Dry nitrogen shall be bled through piping while joints are being brazed. Joints shall be as follows:

a. Copper to Brass - Silver Solder
b. Copper to Copper - Silfos.

2. Joints: Copper tubing connections shall be made up with 95/5 tin antimony solder or silfos, in accordance with the recommendations of the manufacturer or as specified hereinafter.
3. Refrigerant Piping Insulation: Armstrong Armaflex insulation ½" thick with fittings covered with mitered sections of insulation and sealed with 520 adhesive. All insulation on outdoor installation shall be additionally protected with two (2) coats of Armaflex vinyl-lacquer type finish. All exterior piping insulation shall be protected with aluminum jackets.
4. All exterior refrigerant piping shall be supported with Miro Industries 8-Base Strut-5 piping supports or equivalent. Piping supports shall be on 10-foot centers.

J. Controls

1. As noted in equipment schedule, unit shall be provided with either a wall-mounted thermostat or a remote mounted with wall bracket.
2. The unit shall also be provided with wall-mounted thermostat to be mounted adjacent to light switch. Unit shall be capable of operating based on return air temperature or thermostat reading, as programmed at the wall-mounted thermostat.
3. The wall controller shall consist of an On/Off Power switch, Mode Selector, Fan Setting, On/Off Timer Setting, Temperature Adjustment.

a. On/Off switch power the system on or off mode.
b. Mode selector shall operate the system in auto, cool, heat (if available), fan or dry operation.
c. Fan setting shall provide high, medium or low fan speed.
d. On/Off timer is used for automatically switching the unit on or off.
e. Temperature adjustment allows for the increase or decrease of the desired temperature.

2.4 OUTDOOR UNIT

A. Unit Cabinet

1. The outdoor unit shall be completely weatherproof and corrosive resistant.
2. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

B. Fan

1. The fan shall be a direct drive, propeller type fan.
2. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
3. A fan guard is provided on the outdoor unit to prevent contact with fan operation.

C. Coil

1. The outdoor coil shall be nonferrous construction with corrugated fin tube.
2. Refrigerant flow from the condenser will be controlled via a metering device.

D. Compressor

1. The compressor shall be a rotary swing inverter-driven compressor.
2. The compressor shall have an internal thermal overload.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all components in accordance with manufacturer's recommendation.

B. Install all components in a manner to provide clearances required for proper operation and maintenance.

C. Furnish equipment with charge of refrigerant and oil.

D. Coordinate electrical connections required.

3.2 DEMONSTRATION

A. Provide owner's maintenance personnel training as required to adjust, operate and maintain pumps.

PART 4 - SUBMITTALS

A. In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	CATALOG DATA	PARTS LISTS	OPERATING MANUAL	WIRING DIAGRAM	CERTIFICATION	SAMPLES	OTHER
Mini-Split System AC	X	X	X	X	X			

END OF SECTION 238127

DIVISION 26

ELECTRICAL

SECTION 260000 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 CONTRACTOR'S UNDERSTANDING

A. Contractor's bidding work under this Contract shall read and understand Division 00 and Division 01 - General Requirements. If any discrepancies are discovered between the Basic Electrical Materials and Methods and General Requirements, the above-mentioned documents shall overrule this section. The Basic Electrical Materials and Methods are intended as a supplement to the above-mentioned documents.

B. The Contractor shall bid as outlined in the above-mentioned Specifications and shall be governed by any alternates or unit prices called for in the form of proposal.

C. Each Contractor bidding on the work included in these Specifications shall view the building site and carefully examine the contract Drawings and Specifications, so that he/she may fully understand what is to be done, and to document existing conditions.

D. The electrical design depicted in the Contract Drawings, is a concept. As the Contractor and Subcontractors layout the job in the field and submit Shop Drawings, it is likely that minor changes will need to be made to the layout, field control wiring, or branch circuits/feeders, from what is shown on the Contract Drawings. These changes will be indicated by Engineer review comments on Shop Drawings or issuance of field orders. It is the Contractors job to coordinate these changes among Subcontractors and equipment vendors, to assure a complete and fully operational electrical system at completion of construction. The Contractor shall not layout the job from the Contract Drawings, but rather from accepted Shop Drawings. Electrical rough-in shall be done based on templates provided from the electrical switchgear and MCC manufacturers showing allowable conduit entry locations. Do not submit electrical panelboard Shop Drawings, Motor Control Center Shop Drawings, Switchboard or Switchgear Shop Drawings until all utilization equipment submittals have been made and accepted. Short Circuit, Coordination and Arc Flash studies must be accepted prior to submittal of Shop Drawings for panelboards, MCC's, switchboards or switchgear.

E. The Contractor shall perform the work of this contract in a "neat and workmanlike manner" as required by NEC Article 110.12, and further delineated in ANSI/NECA 1, latest edition, "Standard for Good Workmanship in Electrical Construction".

1.2 SCOPE OF WORK

A. Work included in this section of the Specifications shall include the furnishing of all labor, material, tools, approvals, utility connection fees, excavation, backfill, and other equipment necessary to install the electrical system as shown on the Contract Drawings and as specified herein.

B. It also includes installation and connection of all electrical utilization equipment included in this Contract but furnished by other contractors or suppliers.

C. It is the general intent that all motors shall be furnished with the particular object of equipment it drives.

D. The Contractor shall furnish and install all conduit, wire, disconnect switches and miscellaneous material to make all electrical connections to all items of utilization equipment or wiring devices except as otherwise specified.

E. Equipment connections shall be made with flexible or rigid conduit as required. Controllers for motors, disconnect switches, and all control, protective and signal devices for motor circuits, except where such apparatus is furnished mounted and connected integrally with the motor driven equipment, shall be installed, connected, and left in operating condition. The number and size of conductors between motors and control or protective apparatus shall be as required to obtain the operation described in these Specifications, and/or by the Contract Documents, and/or as shown in manufacturer furnished, Engineer reviewed Shop Drawings.

F. All devices and items of electrical equipment, including those shown on the Contract Drawings but not specifically mentioned in the Specifications or those mentioned in the Specifications but not shown on the Contract Drawings, are to be furnished under this section of the specifications. Any such device or item of equipment, if not defined in quality, shall be equal to similar Equipment and/or devices specified herein.

G. All devices and items of equipment mentioned in this section of the Specifications whether electrical or not or whether furnished under this or other Division of the Specifications, shall be installed under this Division of the Specifications, unless specifically indicated otherwise.

H. Where wiring diagrams are not shown on the Contract Drawings, they are to be provided by the supplier of the equipment served and such diagrams shall be adhered to except as herein modified.

I. The following is a list of items that may not be defined clearly on the Contract Drawings or in other parts of these Specifications. The list is meant to be an aid to the Contractor and is not necessarily a complete list of all work to be performed under this Contract:

1. Connect all motors, enclosed starters, and accessories furnished by equipment suppliers.
2. Furnish, install, and connect all motor controls.
3. Furnish, install, and connect lighting, indoor and outdoor.
4. Furnish, install, and connect power and signal lines to all instrumentation equipment, and accessories.
5. Furnish, install, and connect all electrical conduit and cables.
6. Furnish, install, and connect all utility poles and hardware.
7. Furnish, install, and connect all power distribution equipment.
8. Furnish and install communications system equipment.
9. Furnish, install, and connect all radios, antennas, antenna support conduits, and coaxial cabling.

1.3 SHOP DRAWINGS, DESCRIPTIVE LITERATURE, INSTALLATION, OPERATION AND MAINTENANCE INFORMATION

A. Shop Drawings including descriptive literature and/or installation, operation and maintenance instructions shall be submitted for this Division.

B. Shop Drawings shall be submitted on the following materials specified in this Division:

1. Conduit - all types and sizes, including liquid-tight flexible.
2. Boxes - all types and sizes.
3. Coal tar epoxy paint.
4. Wiring devices.
5. Device plates.
6. Metal framing system (Strut type channel).
7. Conduit fittings, expansion joints, support hardware.
8. Motor control equipment - including individually mounted items and pole top items.
9. Power distribution equipment - including individually mounted items.
10. Miscellaneous spare parts and hardware, i.e., terminators, lugs, etc.
11. Wire - all types and sizes.
12. Light fixtures - all types.
13. Wire markers and labels.
14. Lightning/transient suppressors.
15. Utility poles, cross arms, pole line hardware.
16. Electrical studies and calculations.
17. Grounding.

C. The Engineer reserves the right to make modifications to motor control and power distribution equipment ratings after Shop Drawing review, if the Shop Drawings are submitted prematurely (prematurely meaning submitted before all utilization equipment has been reviewed and accepted). Cost of modifications shall be the Contractor's responsibility.

1.4 SYMBOLS AND ABBREVIATIONS

A. The symbols and abbreviations generally follow standard electrical and architectural practice; however, exceptions to this shall be as shown on the Contract Drawings.

1.5 COORDINATION WITH OTHER TRADES

A. The Contractor shall coordinate the electrical work with that of other trades to ensure proper final location of all electrical equipment and/or connections. The Contractor shall verify door swings to see that light switches are located properly.

1.6 CODES

A. The minimum standard for all work shall be the latest revision of the Kentucky Building Code (KBC), and the National Electrical Code (NEC). Whenever and wherever state and/or local laws or ordinances and/or regulations and/or the Engineer's design require a higher standard that the current NEC or KBC, then these laws and/or regulations and/or the design shall be followed.

B. Following is a list of other applicable Standards and Codes:

1.	Kentucky Building Code	KBC
2.	National Electrical Code	NEC
3.	National Electrical Safety Code	NESC

4.	Underwriters Laboratories, Inc.	UL
5.	Factory Mutual System	FM
6.	National Fire Protection Association	NFPA
7.	National Electrical Manufacturers Association	NEMA
8.	Occupational Safety and Health Administration	OSHA
9.	Insulated Cable Engineers Association, Inc.	ICEA
10.	Illuminating Engineering Society of North America	IES
11.	Instrument Society of America	ISA
12.	Institute of Electrical and Electronic Engineers, Inc.	IEEE
13.	Certified Ballast Manufacturers Association	CBM
14.	American National Standards Institute, Inc.	ANSI
15.	Anti-Friction Bearing Manufacturers Association, Inc.	AFBMA
16.	Joint Industry Council	JIC
17.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.	ASHRAE
18.	Federal Communications Commission	FCC
19.	American Society for Testing and Materials	ASTM
20.	American Wood Preservers Association	AWPA
21.	Rural Electrification Association	REA

1.7 INSPECTIONS AND PERMITS

A. Inspection of the electrical system on all construction projects is required. If the local government has appointed a state licensed inspector, the Contractor shall be required to use that person to perform the inspections. If a locally mandated inspector does not exist, the Contractor shall select and hire a state licensed inspector, who has jurisdiction before any work is concealed. The Contractor shall notify the electrical inspector in writing, immediately upon notice to proceed, and a copy of the notice shall be submitted to the Engineer.

B. At the time of completion of the project, there shall be furnished to the Owner a certificate of compliance, from the agency having jurisdiction pursuant to all electrical work performed. The Engineer shall also receive a copy.

C. All costs incurred by the Contractor to execute the above-mentioned requirements shall be paid by the Contractor at no extra cost to the Owner.

D. All permits necessary for the complete electrical system shall be obtained by the Contractor from the authorities governing such work. For further information, see Division 01.

1.8 STORAGE

A. All work, equipment, and materials shall be protected against dirt, water, or other injury during the period of construction.

B. Sensitive electrical equipment such as light fixtures, motor starters, controls, and panel boards, delivered to the job site, shall be protected against injury or corrosion due to atmospheric conditions or physical damage by other means. Protection is interpreted to mean that equipment

shall be stored under roof, in a structure properly heated in cold weather and ventilated in hot weather. Provision shall be made to control the humidity in the storage area to 50 percent relative. The stored equipment shall be inspected periodically, and if it is found that the protection is inadequate, further protective measures shall be employed. Electrical equipment other than boxes and conduit shall not be installed until the structure is under roof with doors and windows installed.

C. No light fixtures or device plates shall be hung or installed until after painting is completed; however, temporary lighting shall be provided by the Contractor.

1.9 MATERIALS

A. All materials used shall be new and at least meet the minimum standards as established by the NEC and/or National Electrical Manufacturers Association (NEMA). All materials shall be UL listed for the application, where a listing exists. Additional requirements are found in Division 01. All equipment shall meet applicable FCC requirements and restrictions.

B. The material and equipment described herein has been specified according to a particular trade name or make to set quality standards. However, each Contractor has the right to substitute other material and equipment in lieu of that specified, other than those specifically mentioned at matching or for standardization, providing such material and equipment meets all of the requirements of those specified and is accepted, in writing by the Engineer.

C. The reuse of salvaged electrical equipment and/or wiring will not be permitted unless specified herein or indicated on the Contract Drawings.

1.10 ERRORS, CORRECTIONS, AND/OR OMISSIONS

A. Should a piece of utilization equipment be supplied of a different size or horsepower than shown on the Contract Drawings, the Contractor shall be responsible for installing the proper size wiring, conduit, starters, circuit breakers, etc., for proper operation of that unit and the complete electrical system at no extra cost to the Owner.

B. It is the intent of these Specifications to provide for an electrical system installation complete in every respect, to operate in the manner and under conditions as shown in these Specifications and on the Contract Drawings. The Contractor shall notify the Engineer, in writing, of any omission or error at least 10 days prior to opening of bids. In the event of the Contractor's failure to give such notice, he/she may be required to correct work and/or furnish items omitted without additional cost. Further requirements on this subject may be found in the General Requirements, Division 01.

C. Necessary changes or revisions in electrical work to meet any code or power company requirement shall be made by the Contractor without additional charge.

1.11 GUARANTEES AND WARRANTIES

A. The Contractor shall guarantee all work including equipment, materials, and workmanship. This guarantee shall be against all defects of any of the above and shall run for a period of 1 year

from the date of acceptance of the work, concurrent with the one-year guarantee period designated for the general construction contract under which electrical work is performed. Date of acceptance shall be considered to be the date on which all "punch list" items are completed ("punch list" is defined to be the written listing of work that is incomplete or deficient that must be finished or replaced/repaired before the Contractor receives final payment).

B. Repair and maintenance for the guarantee period is the responsibility of the Contractor and shall include all repairs and maintenance other than that which is considered as routine. (That is oiling, greasing, etc.) The Engineer shall be the judge of what shall be considered as routine maintenance.

C. Lamps shall bear the manufacturer's warranty.

1.12 TESTING

A. After the wiring system is complete, and at such time as the Engineer may direct, the Contractor shall conduct an operating test for acceptance. The equipment shall be demonstrated to operate in accordance with the requirements of these Specifications and the Contract Drawings. The test shall be performed in the presence of the Engineer or his authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, as well as the necessary electrical power.

B. Before energizing the system, the Contractor shall check all connections and set all relays and instruments for proper operation. He shall obtain all necessary clearances, approvals, and instructions from the serving utility company and/or equipment manufacturers prior to placing power on the equipment.

C. Tests may be performed by the Engineer to determine integrity of insulation on wiring circuits selected by the Engineer at random.

D. Cost of utilities for testing done prior to beneficial occupancy by the Owner shall be borne by the Contractor.

1.13 CLEANUP

A. Cleanup shall be completed as soon as possible after the electrical installation is complete. All light fixtures, outlets, switches, starters, motor control centers, disconnect switches and other electrical equipment shall be free of shipping tags, stickers, etc. All painted equipment shall be left free of scratches or other blemishes, such as splattered or blistered paint, etc. All light fixture diffusers shall be clean and the interior of all motor controls, etc., shall be free of dust, dirt, wire stripping, etc. Surplus material, rubbish and equipment resulting from the work shall be removed from the job site by the Contractor upon completion of the work.

B. During construction, cover all Owner equipment and furnishings subject to mechanical damage or contamination in any way.

1.14 CUTTING AND PATCHING

A. Cutting and patching shall be held to an absolute minimum and such work shall be done only under the direction of the Engineer or Owner. The Contractor shall be responsible for and shall pay for all openings that may be required in the floors or walls, and he shall be responsible for putting said surfaces back in their original condition. Every attempt shall be made to avoid cutting reinforcing steel bars when an opening is required in a reinforced concrete wall or floor slab.

1.15 EXCAVATION AND BACKFILL

A. Excavation

1. Excavation for conduits shall be of sufficient width to allow for proper jointing and alignment of the type conduit used. Conduit shall be bedded on original ground. Where conduit is in solid rock, a 6-inch earth cushion must be provided. Conduit shall be laid in straight lines between pull boxes and/or structures unless otherwise noted on the Contract Drawings. The cost of solid rock excavation shall be included in the lump sum bid with no extra pay allowed (unclassified).

B. Backfill

1. Backfill shall be hand placed, loose granular earth for a height of 6 inches above the top of the largest conduit. This material shall be free of rocks over 2 inches in diameter. Above this, large rocks may be included but must be mixed with sufficient earth to fill all voids.

1.16 SLEEVES, CHASES AND OPENINGS

A. Sleeves shall be required at all points where exposed conduits pass through new concrete walls, slabs, or masonry walls. Sleeves that must be installed below grade or where subject to high water conditions must be installed watertight.

B. Wiring chases shall be provided where shown on the Contract Drawings. The Contractor shall have the option of installing chases below surface mounted panel boards provided all structural requirements are met.

C. It is the Contractor's responsibility to leave openings to allow installation of the complete, operational electrical system. Openings required but not left shall be cut as outlined under cutting and patching. The Contractor shall coordinate all holes and other openings with necessary diameters for proper fire stopping.

1.17 POWER COMPANY COORDINATION

A. The Contractor is responsible for coordinating all activities onsite by the power company.

B. All power company metering equipment shall be electrically located "upstream" of any manual/automatic transfer equipment on projects requiring onsite emergency power generation equipment.

C. Any special provisions required by the serving electrical utility shall be as outlined on the Contract Drawings or as advised by the utility at the time of construction, and work required by these special provisions shall be executed with no extra cost to the Owner.

1.18 TEMPORARY ELECTRICAL POWER

A. The Contractor shall be responsible for providing temporary electrical power as required during the course of construction and shall remove the temporary service equipment when no longer required. Temporary power is also addressed in Division 01.

1.19 OVERCURRENT PROTECTION

A. Circuit breakers or fused switches shall be the size and type as written herein and shown on the Contract Drawings. Any additional overcurrent protection required to maintain an equipment listing by an authority having jurisdiction shall be installed by the Contractor at no extra cost to the Owner.

B. The Contractor shall submit to the Engineer actual nameplate data from motors shipped to the site, stating motor identification as well as characteristics. Overload relay thermal unit selection tables shall accompany the motor data. The Engineer will select thermal unit sizes from this data for use by the Contractor in ordering proper thermal units.

1.20 AS BUILT DRAWINGS

A. The Contractor shall maintain 1 set of the Contract Drawings on the job in good condition for examination at all times. The Contractor's qualified representative shall enter upon these drawings, from day to day, the actual "as-built" record of construction and/or alteration progress. Entries and notes shall be made in a neat and legible manner and these drawings delivered to the Engineer after completion of the construction, for use in preparation of Record Drawings.

1.21 GROUNDING AND BONDING

A. All metallic conduit, cabinets, equipment, and service shall be grounded in accordance with the latest issue of the National Electrical Code. All supporting framework and other metal or metal clad equipment or materials which are in contact with electrical conduit, cable and/or enclosures shall be properly grounded to meet the code requirements.

1.22 RELATED SPECIFICATION DIVISIONS

A. The following divisions contain Specifications on utilization equipment, equipment accessories, and procedures related to execution of the electrical work, and are included here for the Contractor's information. Bids shall still be based on complete Contract Documents.

Division 00 - Procurement and Contracting Requirements
Division 01 - General Requirements
Division 02 - Existing Conditions

Division 03 - Concrete
Division 05 - Metals
Division 09 - Finishes
Division 10 - Specialties
Division 23 - HVAC
Division 31 - Earthwork
Division 32 - Exterior Improvements
Division 33 - Utilities
Division 40 - Process Integration
Division 46 - Water and Wastewater Equipment

1.23 SERVICE ENTRANCE

A. Conductors and terminations for service entrances shall be furnished and installed by the Contractor. Voltage, phase, and number of wires shall be as shown on the Drawings. Clearances for overhead entrance wires shall be per Power Company, NEC, and NESC requirements.

B. Any details not shown on the Drawings or written in the Specifications pertaining to the service entrance shall be per power company requirements. It is the Contractor's responsibility to contact the utility prior to bidding and obtain any special requirements or costs they will be imposing. Those costs shall be included in the bid.

1.24 CONTRACTOR LICENSING

A. The Contractor performing the electrical work on this project shall be locally licensed, if required by local law or ordinance. If the Contractor has passed the State test, it may not be necessary to meet local testing requirements. It shall be the Contractor's responsibility to investigate these requirements and comply with same.

1.25 ANCHORING/MOUNTING

A. Electrical conduits and/or equipment shall be rigidly supported. Anchors used shall be metallic expansion type, or if appropriate to prevent spalling concrete, epoxy set type. Plastic or explosive type anchors are prohibited.

B. Seismic Anchorage & Qualification of Electrical Components

1. Refer to the structural drawings for seismic design criteria, including seismic design accelerations, Seismic Design Category, and structure Risk Category.
2. All electrical components shall be anchored to resist seismic forces in buildings with seismic design category D, E, or F except when ALL of the conditions exist:

    a. The component is not required for life safety.
    b. The component is not needed for continuing operation of a Risk Category IV structure.
    c. The component is positively attached to the structure.
    d. The component is flexibly connected to associated conduit and is one of the following:

1) The component weighs less than 400 lb. and has a center of mass less than 48 in above the adjacent floor level OR
2) The component weighs less than 20 lb. or less than 5 lb./s.f. if distributed.

3. All electrical components required for life safety shall be anchored to resist seismic forces in buildings with Seismic Design Category C, D, E or F.
4. All electrical components required for continued operation of a Risk Category IV structure shall be anchored to resist seismic forces in buildings regardless of the Seismic Design Category.
5. Where anchorage to resist seismic forces is required, the following shall be submitted:

a. Designs of all connections of electrical components to the structure, either supplied and certified by the manufacturer; or by a licensed professional engineer qualified and experienced in such design - FOR APPROVAL prior to installation.
b. Certifications by manufacturers of electrical equipment in accordance with 13.2.2.1 of ASCE 7 - FOR APPROVAL prior to purchase.
c. Special Inspection Reports verifying that the electrical components were installed in accordance with the seismic anchorage designs - FOR RECORD after installation.

1.26 ELECTRICAL COMPONENT MOUNTING HEIGHTS

A. Unless otherwise indicated, mounting height for components shall be as defined herein. In cases of conflicts with architectural or structural aspects, the components may be relocated. If an indicated height conflicts with a code requirement, the code shall govern.

B. Mounting heights are given from finished floor elevation to the centerline of the component, unless otherwise noted.

	Component	Height	Comments
1.	Wall type light switch	4'-0"	To top of box
2.	Low wall outlet (power, TV, Comm)	16"	To bottom
3.	Wall type buzzers, horns, etc.	8'-0" Max.	Top 2" below ceiling
4.	Wall type exit signs	8'-0" Max.	Top of sign 2" below ceiling
5.	Push-button or control stations	4'-0"	
6.	Top of panelboards or control panels	6'-6"	Maximum (except for handicapped areas)
7.	Top of telephone back boards	6’-6”	Maximum
7.		6'-6"	Maximum
8.	Top of switch handle on motor control center	6'-6"	Maximum
9.	Top of local motor controller	6'-0"	Maximum
10.	Top of local disconnect switch	6'-0"	Maximum

	Component	Height	Comments
11.	Wall mount exterior light fixtures	8'-0"	Except as noted on Drawings
12.	Wall mount emergency light fixtures	6'-6"	Maximum to test button

In situations where there appears to be a conflict with Americans with Disabilities Act (ADA) legislation, utilize the ADA requirements.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 260000

SECTION 260519 – CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. All wire and cable shall conform to the latest requirements of the NEC and shall meet all ASTM/UL specifications. Wire and cable shall be new; shall have size, grade of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Complete descriptive literature shall be submitted to the Engineer for review and acceptance prior to installation.

B. Building wire #12 - #1 shall be applied based on a 60 degrees C temperature rise. Building wire larger than #1 may be applied at its 75 degrees C temperature rise.

1.2 DELIVERY, STORAGE AND HANDLING

A. Wire and cable shall be suitably protected from weather and damage during storage and handling and shall be in first class condition when installed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Building Wire (types THWN and THW-cu.) - American, Carol, or Collyer, Rome, equal.

B. Flexible Cords and Cables (Types SO (600V) SJO - 300V) - American, Carol, Collyer, or equal.

C. Power cables, for conduit installation (600V, 5KV or 15 KV) - Anaconda, Okonite, Triangle PWC, or equal.

D. Control Cables (Shielded or unshielded) 600V max. - Belden, Eaton-Dekoron, Okonite, Anixter, or equal.

E. Instrumentation Cables (Shielded) 600V mx. - American, Belden, Eaton-Dekoron, Manhatton, Okonite, or equal.

2.2 MATERIALS

A. General

1. In general, all conductors shall be 98 percent conductive, annealed copper unless otherwise noted on the Contract Drawings.
2. Conductors shall be type THW or THWN insulation. Conductor size shall be AWG (American Wire Gauge) Standard. Minimum conductor size shall be AWG number 12 except branch circuits in excess of 75 feet from panel to first outlet not smaller than no.

10 AWG. Minimum voltage rating shall be 600 volts. Conductors for small power may be solid (i.e., lighting, receptacles), but conductors for control work shall be stranded.

3. Conductors with high temperature rated insulations and special construction shall be used where required in connecting to light fixtures or appliances that have special requirements.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/ERECTION

A. General

1. Conductors shall be continuous from outlet to outlet and no splices shall be made except accessible in junction or outlet boxes. Wire connectors of insulating material or solderless pressure connectors, properly taped, shall be used for all splices in wiring, wherever possible.
2. Conductors shall be color coded in accordance with the following schedule:

	120/240 Single Phase
Phase A	Black
Phase B	Red
Phase C	
Neutral (Grounded)	White or Light Gray
3-Way Tracers	Blue
Grounding	Green
Remote Energized Conductors (Control)	Yellow
Control	

3. Conductors shall be pulled into raceways in strict accordance with manufacturer's recommendations.
4. Ample slack conductors shall be allowed at each terminal point, and pull or junction box, to permit installation with ease and without crowding.
5. All conductors terminating at terminal blocks shall be identified with numbers and/or letters identical to circuit or control identification.
6. No conductors shall be drawn into conduits until all work which may cause wire or cable damage is completed. Wire pulling shall be accomplished utilizing machinery and accessories intended for the purpose.
7. All connections and splices shall be made in accordance with conductor manufacturer's recommendations, and as written herein.

8. If the size and number of conductors in a conduit on the Drawings is not shown, then it shall be assumed to be 3 #12, 3/4 inch.
9. In general, feeder sizes shown are based on no more than three current carrying conductors in a conduit. Multiple small branch circuit feeders may be combined in a common conduit, provided conductors are derated in accordance with NEC article 310-15.
10. Unless otherwise specifically indicated, neutrals may not be shared.

B. Low Voltage Feeders

1. All low voltage feeders shall be 240-volt as noted in the Contract Drawings. Single-phase, 120/240-volt, 4-wire for power and general lighting, unless otherwise noted. The Contractor shall furnish and install all feeders from the distribution center(s) to each of the other structures/subpanels as shown on the Contract Drawings.
2. Wire shall be factory color coded for each phase and neutral, with green used for the ground conductor. As far as practical, all feeders shall be continuous from origin to panel termination without running splices in intermediate pull boxes.

C. Control Cable

1. Control cable shall be the size and have the number of conductors shown on the control system drawings. Control cable shall be used for motor controls and monitoring only. Color coding shall be ICEA, Method 1. Control cables between buildings shall be underground in conduit of the size shown in the control system schematic. Cabling shall provide a minimum of 25 percent spare conductors. Voltage rating shall be 600 volts.

D. Instrument Cable

1. General

a. All signal lines should be constructed of individually twisted pairs (6 to 10 twists per foot), including thermocouple extension leads. Cables should be made of twisted pairs, with all lays and pairs twisted in the same direction for maximum flexibility.
b. Wire size is #16 AWG minimum for single pair runs under 5,000 feet in length. Wire size shall be #16 - #20 AWG for multi-pair cable runs under 5,000 feet in length.
c. Stranded tinned copper conductor shall be used for all wiring other than thermocouple extension leads.
d. Insulation resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.
e. Multi-pair cable should be jacketed with poly-vinyl-chloride, polyethylene, or Teflon at least 0.045 inch thick. Voltage rating shall be 600 volts.

2. Signal Wiring

a. Low level analog (less than 500 millivolt d-c). Use twisted pairs which may be cabled with other pairs carrying similar voltage levels. Foil wraps or equivalent shielding is required for each cable with the shield insulated from ground.

b. High level analog (greater than 500 millivolts d-c). Use twisted pairs which may be cabled with other pairs carrying similar voltage levels and current levels less than 100 ma. Shielding is required.
c. Analog outputs (normally 0-4 d-c or 4-20 ma). Same as b.
d. Contact inputs - use twisted pairs and run in separate conduit.
e. Contact outputs - same as d.
f. Pulse inputs - same as d.

3. Signal and Shield Grounding

a. All shields must be grounded at one point only as close as possible to the signal source.
b. Thermocouples may be grounded or ungrounded.
c. Analog signals, if grounded, should be grounded as near the signal source as possible.
d. Resistance bulbs should not be grounded.

4. Signal and Wiring Separation

a. High level analog signals may share the same conduit or run with contact or pulse signals.
b. Thermocouple and low-level signals should be run in a separate conduit.
c. A minimum separation of 12 inches between analog signal leads and a-c power leads should be maintained. For a-c power leads carrying 100 amps or greater, a 24-inch separation should be maintained. Parallel runs should be limited to less than 500 feet. Perpendicular runs may be as close as 6 inches.

END OF SECTION 260519

SECTION 260526 – SECONDARY GROUNDING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Grounding shall be done in accordance with the NEC, as described in these Specifications, and as shown on the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Grounding equipment shall be Cadweld, Cathodic Engineering Equipment Co., Connector Castings, Inc., Copperweld Bimetallics Group, Harger, Thomas and Betts Blackburn, or equal.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/ERECTION

A. Grounding shall utilize a counterpoise and driven ground rod system to achieve the design ground resistance.

B. The ground system shall be continuous with all structures on a common ground. This can be accomplished by bonding all conduits together and bonding to the ground bus at each equipment enclosure. Bonding jumpers shall be required at all pull boxes, and at all motor casings. A separate grounding conductor shall be pulled in all conduits in addition to wire counts shown on Drawings.

C. Ground rods shall be 3/4-inch x 10 foot-0-inch copper clad type. Where multiple rods are driven, they shall be separated by at least 20 feet to assure maximum effect.

D. Ground resistance between ground and absolute earth shall not exceed 5 ohms.

E. All grounding and grounding electrode systems shall be as required by the NEC as for types of electrodes utilized and sizing of grounding conductor to service equipment from the electrode system. These shall include footer rebar, buried metal water pipe, buried bare copper conductor, etc.

F. All concealed grounding electrode system connections shall be made using exothermic welds, Cadweld, Harger, or equal. No splices are allowed in the grounding electrode conductor.

G. Should ground rods be impractical for use due to rocky conditions, then grounding electrode plates may be used after acceptance by the Engineer on a case-by-case basis.

3.2 FIELD QUALITY CONTROL

A. Testing

1. The Contractor shall be required to provide all labor, tools, instruments, and materials as necessary to perform testing of the grounding electrode system. Results shall be submitted in writing to the Engineer. The testing shall be done to determine the effectiveness of the selected grounding scheme and to see that it conforms to resistance specified (5 ohms maximum).
2. The testing should be done using a fall-of-potential method test at the point of grounding electrode conductor connection to main power distribution equipment and at each separately derived system or MCC. The test shall be performed no sooner than 48 hours after a rainfall event.
3. The written report should contain the following information:

    a. Type of ground scheme used, i.e., building steel, driven rod, mat, etc.
    b. Type of instrument used.

        1) Manufacturer
        2) Model Number
        3) Confirm fall-of-potential test
        4) *Serial Number
        5) *Where instrument was obtained

        * These 2 items are required so that the same instrument may be utilized should reproduction of the test be necessary due to unsatisfactory readings/instrument miscalibration.

    c. Ground resistance readings obtained at various test distances.
    d. Ground resistance/distance curve.
    e. Value of Grounding Electrode Resistance at knee of curve.
    f. Sketch showing setup of instrumentation and location of grounding electrode and test probes.
    g. Proposed method to achieve the specified resistance, should an unacceptable reading be obtained.
    h. Ground resistance readings obtained (if applicable) after modifications incorporated.

3.3 GROUND ENHANCEMENT MATERIAL

A. Where indicated on the Drawings or as deemed necessary by the Contractor to achieve design grounding electrode system resistance, a ground enhancement material shall be utilized, in accordance with manufacturer’s recommendations.

B. The ground enhancement material must be permanent and maintenance free (no recharging with salts or chemicals which may be corrosive) and maintain its earth resistance for the life of the system. It must set up firmly and not dissolve or decompose, or otherwise pollute the soil or local water table. The material shall be capable of being applied dry or in a slurry form and shall reduce resistance by at least 40 percent.

C. Basic components of this material shall be carbon, hydraulic cements, and hydrous aluminum silicates. Minimum 4-inch diameter holes shall be used with ground rod installations, with depth 6 inch shorter than length of rod, completely filled with the material. Trenches for grounding electrode conductor shall also utilize this material the full length from electrode to building, in accordance with manufacturer installation recommendations, except trench depth shall allow buried conductor to be at least 2'-6 inch deep.

D. Ground enhancement material shall be GEM by Erico Products, Powerfill by Cathodic Engineering Equipment Company, Harger UltraFill, or equal.

END OF SECTION 260526

SECTION 260529 – SUPPORTING DEVICES AND HANGERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide a system of supporting devices and hangers to ensure secure support or bracing for conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, cabinets, etc.

B. All electrical equipment shall be rigidly mounted, and installed using supporting devices as indicated, required by the work, or as described herein.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide appropriate supporting devices and hangers as manufactured by Erico Products, Inc., Steel City, Rayco, or equal:

1. Vertical flange clamps (beam clamps).
2. "Z" purlin clips.
3. Conduit clips.
4. Universal clamps (Beam clamps).
5. Beam clamps (set screw type).
6. Combination push-in conduit clips.
7. Combination conduit hanger clamps.
8. Flexible conduit clips.
9. Special combination conduit clips.
10. One hole steel straps.
11. Minerallac conduit hangers.

B. Strut type channel shall be Unistrut, Kindorf, or equal.

2.2 MATERIALS

A. All mounting brackets and strut used outside shall be aluminum. Fasteners used to mount equipment outside shall be stainless steel. The only exception to the above shall be anchor bolts for area light poles which shall be allowed to have galvanized threads and galvanized nuts.

B. All mounting brackets and strut used inside shall be galvanized or aluminum. If galvanized is used, then the cut ends shall be cold galvanized. Fasteners used inside to mount equipment into concrete shall be stainless steel. Ungalvanized strut is prohibited.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure conduits to within 3 feet'-0 inches of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed ten feet (10 feet-0 inches) for rigid steel, or EMT, conduit and in accordance with Table 344.30 (B) (2) for Rigid Steel conduit.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers or racks to support conduits run apart from the structure.

C. Furnish and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, outlet boxes, etc.

D. Fasteners used to mount equipment into concrete shall be stainless steel.

E. All freestanding equipment shall be anchored to its foundation using stainless steel expansion bolts of the type, size, and number recommended by the equipment manufacturer.

F. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

G. Use of chains, perforated iron, bailing wire, cable ties, duct tape, Velcro, or tie wire for supporting conduit runs will not be permitted.

H. All ends of strut (cut or not) shall have safety cap installed.

END OF SECTION 260529

SECTION 260533 – RACEWAYS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section of the Technical Specifications includes all raceways for accommodation of electrical conductors, communications conductors, and sleeves for underground electrical installations, conduit stubs for future installations, fittings, and accessories.

B. All raceways shall be marked with the manufacturer's name or trademark as well as type of raceway and size. This marking shall appear at least once every 10 feet and shall be of sufficient durability to withstand the environment involved. All raceways shall be furnished and installed as outlined under Part 3 of this Specification.

C. All raceways and fittings shall be painted to match existing or surrounding surfaces except in mechanical spaces.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Tubular Raceways

1. Steel, Galvanized, Rigid, Heavy-Wall, Threaded - Allied Tube & Conduit Corp., Triangle, Wheatland Tube Co., or equal.
2. Steel, Galvanized, Thin-Wall, Electric-Metallic-Tubing (EMT) - Allied Tube & Conduit Corp., Triangle, VAW, or equal.
3. Aluminum, Rigid, Heavy-Wall, Threaded – Alcoa, Reynolds, VAW, or equal.
4. Plastic (PVC); Type 80 (or Schedule 80) (Heavy -Wall) - Carlon, Robin-Tech, or equal.
5. Flexible Metal Conduit – AFC, Alflex, or equal.
6. Liquidtight Flexible Metal Conduit – Carol Cable Co., Inc., OZ Gedney, Superflex, or equal.
7. Factory Coated Aluminum Conduit - Alumax ALX-1, or equal.

B. Wireways

1. Hoffman, Square-D, or equal.

C. Raceway Fittings

1. Conduit fittings - Appleton, Crouse-Hinds, OZ Gedney, or equal.
2. Non-metallic conduit fittings - Carlon, Robin-Tech, Scepter, or equal.
3. Flexible conduit fittings - OZ Gedney, Raco, T & B, or equal.

2.2 MATERIALS

A. Aluminum Conduit

1. Aluminum conduit shall be extruded from alloy 6063 and shall be the rigid type, non-toxic, corrosion resistant, and non-staining. It shall be manufactured per UL standards as well as listed/labeled by same.
2. Fittings, boxes, and accessories used in conjunction with aluminum conduit shall be die cast, copper free type. They shall be resistant to both chemical and galvanic corrosion. All covers shall have neoprene gaskets.
3. Aluminum conduit shall not be used in underground applications.

B. Rigid Steel Conduit

1. Rigid steel conduit and fittings shall be of mild steel piping, galvanized inside and out, and shall conform to UL standards. The conduit and fittings hall be listed and labeled by UL as well. The galvanized coating of zinc shall be of uniform thickness applied by the hot-dipped process and shall be applied also to the threads. It shall be further dipped in a chromic acid bath so as to chemically form a corrosion resistant protective coating of zinc chromate which has a characteristic yellow-green color. Each piece of conduit shall be straight, free from blisters and other defects, cut square and taper reamed. It shall be delivered with plastic protectors on the threads.

C. Polyvinylchloride (PVC) Conduit

1. PVC conduit and fittings shall be Schedule 40, 80 heavy wall, or thinwall, as indicated in these Specifications manufactured to conform to UL standards. It shall be listed and labeled by UL. It shall have at least the same temperature rating as the conductor insulation. Expansion joints shall be used as recommended by the manufacturer in published literature. PVC systems shall be 90 degrees C minimum UL rated, have a tensile strength of 7,000 psi @ 73.4 degrees F, flexural strength of 11,000 psi and compressive strength of 8,000 psi.

D. Electrical Metallic Tubing (EMT)

1. EMT shall be high grade steel with an exterior galvanized coating of zinc applied uniformly by the electro-galvanized process. The interior surface shall be uniformly coated with aluminum lacquer or enamel. After galvanizing, it shall be dipped in a chromic acid bath to chemically form a protective coating of zinc chromate. The conduit shall conform to UL standards and be listed as well as labeled by UL.

E. Flexible Conduit

1. Flexible metallic conduit shall be constructed from flexibly or spirally wound elecro-galvanized steel. Connections shall be by means of galvanized malleable iron squeeze type fittings, or tomic twist-in type in sizes not exceeding 3/4 inch. Liquidtight conduit shall be light gray in color and have sealtight fittings, type UA.

F. PVC coated rigid conduit shall be hot dip galvanized prior to PVC coating. All threads shall be galvanized. The exterior galvanized surface shall be coated with a primer prior to PVC coating to insure adhesion. The bond on conduit and fittings shall be greater than the tensile strength of

the plastic coating. The PVC coating on the exterior of the conduits shall be applied by a plastisol dip method to a nominal thickness of 40 mils, minimum. The interior of the conduit and fittings, and threads shall be painted with a urethane coating. The coating shall allow flexibility for field bending without cracking. PVC sleeves shall be formed at each female opening, with the inside diameter of the sleeve matching the outside of the conduit.

G. Conduit Fittings

1. Rigid Steel Conduit Fittings

a. Standard threaded couplings, locknuts, bushings, and elbows made only of steel or malleable iron are acceptable. Integral retractable type IMC couplings are acceptable also.
b. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
c. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
d. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted or use to complete a conduit run where conduit is installed in concrete. Use set screws of case-hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
e. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, installed fittings in flush steel boxes with blank coverplates having the same finishes as that of other electrical plates in the room.

2. Rigid Aluminum Conduit Fittings

a. Standard threaded couplings, locknuts, bushings, and elbows: Malleable iron, steel, or aluminum alloy materials. Zinc or cadmium plate iron or steel fittings. Aluminum fittings containing more than 0.4 percent copper are prohibited.
b. Locknuts and bushings: As specified for rigid steel and IMC conduit.
c. Set screw fittings: Not permitted for use with aluminum conduit.

3. Electrical Metallic Tubing Fittings

a. Only material of steel or malleable iron is acceptable.
b. Couplings and connectors: Concrete tight and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 2-inches and smaller. Use set screw type couplings with four set screws each for conduit sizes over 2-inches. Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
c. Indent type connectors or couplings are prohibited.
d. Die-cast or pressure-cast zinc-alloy fittings or fittings made of pot metal are prohibited.

4. Expansion and Deflection Couplings

a. Accommodate 1.9 cm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30-degree angular deflections.
b. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL, and the NEC code tables for ground conductors.
c. Watertight, seismically qualified, corrosion-resistant, threaded for and compatible with rigid or intermediate metal conduit.
d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material and stainless-steel jacket clamps.

PART 3 - EXECUTION

3.1 PREPARATION

A. Exterior underground metallic conduits shall be degreased, pretreated, and coated with 2 coats of Carboline 888 epoxy, or equal. Other finishes may be acceptable upon the Engineer's review.

3.2 INSTALLATION

A. Conduit

1. All conduit shall be installed in a first class workmanship manner. It shall be installed in horizontal and vertical runs in such a manner as to ensure against trouble from the collection of trapped condensation and shall be arranged so as to be devoid of traps wherever possible. Special care shall be used in assuring that exposed conduit runs are parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. No open wiring is allowed.
2. Fittings or symmetrical bends shall be required wherever right-angle turns are made in exposed work. Bends and offsets shall be avoided wherever possible, but where necessary, they shall be made with an approved conduit bending machine. All conduit joints shall be cut square, reamed smooth and drawn up tight, using couplings intended for the purpose.
3. Conduits shall be securely fastened to all sheet metal outlets, junction and pull boxes with double galvanized locknuts and insulating-grounding bushings as required by the NEC. Conduit crossings in insulating roof fill will require both conduits to be secured to the roof deck, and these crossings can only be made where the insulating fill is a minimum of 3 inches deep. Runs of exposed conduit shall be supported in accordance with the NEC using cast aluminum or malleable iron one hole pipe straps with spacers to provide an air space behind the conduit. Stainless steel minerallac, one piece conduit clamps shall be acceptable where located such that building occupants are not in danger of inadvertent contact, since this type fitting has several sharp edges. In general terms, they may be considered in areas such as on or above ceilings, or high on walls. All conduit in walls and slabs shall be securely braced, capped (wooden plugs are prohibited), and fastened to the forms to prevent dislodgement during vibration and pouring of concrete.
4. During construction, all conduit work shall be protected to prevent lodgement of dirt, plaster or trash in conduits, fittings, or boxes. Conduits which have been plugged shall be entirely freed of accumulations or be replaced. All conduits in floors or below grade shall

be swabbed free of debris and moisture before wires are pulled. Crushed or deformed conduit shall not be permitted.

5. All open conduit work through new walls or slabs shall be run through sleeves that shall be made watertight. These sleeves shall be PVC of suitable diameter to permit the passage of the conduit used.
6. Where GRS conduit penetrates a floor slab the conduit shall be painted with 2 coats of Koppers Bitumastic 300-M or equal to a point 6 inches above the penetration.
7. The final section of conduit connecting each motor or piece of utilization equipment subject to vibration shall be of the flexible type. Type UA shall be used in all process areas and in outdoor or wet locations. Flexible conduit to space heaters shall be long enough to allow swivel action.
8. All underground conduits entering a building shall be sealed against water/condensate entering around the conductors. Sealant may be silicone rubber-based caulk.
9. In certain situations, conduit expansion joints shall be required to ensure against conduit and/or cable damage due to settling or thermal expansion and contraction. These expansion joints shall be required where required by the manufacturer or the Contract Drawings and shall be installed per manufacturer's instructions.
10. All conduit work in the finished space of each new structure shall be concealed except for conduits to lighting fixtures in buildings with precast roof slabs, open joist ceilings, or excepted as noted on the Contract Drawings. All conduit work below ground floor level in each structure shall be exposed. Conduits entering from underground into buildings shall be watertight through the wall, both inside and outside.
11. PVC conduit installed underground for low voltage application shall be schedule 80 without encasement. Where PVC conduit is installed, transition shall be made to GRS conduit at bends where wire pulling could cut conduit.
12. Aluminum conduit shall not be used underground, or placed in concrete slabs, unless it is UL listed for the purpose and factory pre-coated.
13. Conduit stubs, for future use, extended through outside walls shall be capped with threaded pipe caps and coated to prevent corrosion. Stubs shall extend 5 feet beyond the walls from which they are stubbed unless otherwise indicated on the Contract Drawings.
14. All metal raceway systems shall be grounding conductive solidly bonded throughout and grounded in accordance with NEC requirements and/or as noted on the Contract Drawings. In addition, all raceway systems shall be provided with separate grounding conductors.
15. Minimum conduit size shall be ¾-inch. The following table shows the minimum burial depth, in inches, required for all exterior conduit or cable:

Conduit below Roadways, Ramps, and Ditch Lines	60
Rigid Metal Conduit	42

16. Wire pulling shall be facilitated by the use of a UL approved pulling compound in pulls over 30 feet in length or where there are 2 or more 90-degree bends. Only polypropylene, nylon, or manila pulling ropes will be permitted. Standard industry recognized wire pulling equipment shall be used.
17. All conduits entering and leaving instrument enclosures shall be sealed around the wires with silicone caulk.
18. All conduits for emergency lighting systems shall be separate from other building power conduits.
19. Areas of use for each type of conduit:

Area of Use	Schedule 80 PVC	EMT	GRS	Aluminum
Buildings - Interior				
Base Cone (Exposed)				X
Instrument Building (Exposed)		X		X
Exterior Underground				
Low Voltage	X		X	X**
Exterior Exposed				
Low Voltage				X

**Aluminum conduit for this application must be factory pre-coated and UL listed for the application.

20. Underground raceways (conduit) shall be provided with steel sleeves where they pass over or under obstructions, such as: sidewalks; roadways; piping; etc.
21. All conduit shall have an insulated ground wire pulled to all equipment and receptacles.
22. EMT conduit fittings shall be compression type.
23. All raceway runs are shown diagrammatically to outline the general routing of the raceway. The installation shall be made to avoid interference with pipes, ducts, structural members, or other equipment. Should structural or other interference prevent the installation of the raceways, or setting of boxes, cabinets, or the electrical equipment, as indicated in the Drawings, deviations must be approved by the Owner and after approval, shall be made without additional charges and shown on the Record Drawings.
24. Fire Stop: Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases, with rock wool fiber or silicone foam sealant only. Completely fill and seal clearances between raceways and openings with the fire stop material.
25. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
26. No conduit shall be run exposed across roofs without first obtaining permission from the Engineer.
27. Conduit may be run inside concrete slabs as long as the slab is at least 6-inches thick, and conduit will have at least 1-1/2-inches of cover on both sides.
28. Flexible conduit used in mechanical rooms shall be liquid tight.
29. Runs of exposed flexible conduit shall be limited to 5 feet. All runs of flexible conduit shall be supported in accordance with NEC requirements.

END OF SECTION 260533

SECTION 260534 – BOXES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Outlet and junction boxes shall be furnished and installed where indicated on the Contract Drawings, and\or as required by the work in accordance with the NEC.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Boxes – Appleton, Bauers, Carlon, Cloud Concrete Products, Crouse-Hinds, Hoffman, Queen, Raco, Robroy Industries, Sedco, Spring City, Wiegmann, or equal.

2.2 GENERAL

A. All junction and/or pull boxes for dry (non-corrosive) areas shall be of code gauge sheet metal construction, of the inside dimensions as required by code, with covers.

B. Junction and/or pull boxes for wet or damp locations shall be cast metal, rust and corrosion resistant (NEMA 4X), with at least 5-1/2 full threads for each (bossed) conduit opening and shall be suitable for flush or surface mounting as required with drilled external, cast mounting extensions (bossed to provide at least 1/8 inch between back of box and mounting surface for drainage). Box covers shall be hinged or cap screw retained as required, of the same material as the box and provided with stainless steel (rustproof) hardware.

C. Junction boxes for out-of-doors use, not mounted in concrete may be sheet metal (NEMA 4X), waterproof, rustproof, rain and sleetproof, with hinged covers and latches and provided means of locking by means of keyed locks, tamper-resistant screws or padlocking as required and with clamping cap-screws top and bottom door edges to provide firm contact with gasketing. All gaskets shall be molded (unbroken) neoprene or butyl rubber.

D. NEMA 4X junction and/or pull boxes may be stainless steel, if called for on the Contract Drawings; or non-metallic or cast aluminum.

E. Underground junction or pull boxes shall be constructed of reinforced concrete cast-in-place or pre-fabricated as detailed on the Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION, APPLICATION, AND ERECTION

A. General

1. Outlets shall be installed in the locations shown on the Contract Drawings. The Contractor shall study the general building plans in relation to the space surrounding each outlet, in order that his work may fit the other work required by these Specifications. When necessary, the Contractor shall relocate outlets so that when fixtures or other fittings are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment.
2. All supports for outlet boxes shall be furnished and installed by the electrical trades.

B. Exposed Work

1. Outlet or junction boxes for use with exposed steel conduit shall be cast steel. In dry areas sheet steel with rounded corners, made for the purpose.
2. Outlet or junction boxes for use with exposed aluminum conduit shall be copper free, cast aluminum type.

C. Pull Boxes

1. Pull boxes for exterior underground work is shown on the Contract Drawings and are the minimum number required. Others may be added at the Contractor's option, but no extra pay shall be allowed. Interior pull boxes are not shown but shall be used as needed. Pull box types are as follows:

Exterior	Per detail on the Contract Drawings.
Interior	Interior pull boxes in dry areas shall be of code gauge steel of not less than the minimum required by the NEC and shall be provided with hinged covers. In wet areas or pipe galleries, they shall be rated watertight, of stainless steel, cast aluminum, PVC, fiberglass, or equal. Hardware shall be stainless steel.

D. Openings in Electrical Boxes

1. All openings in electrical equipment, enclosures, cabinets, outlet and junction boxes shall be by means of welded bosses, standard knockouts, or shall be sawed, drilled, or punched with tools specially made for the purpose. The use of a cutting torch is prohibited. Unused openings shall be plugged per the NEC.

END OF SECTION 260534

SECTION 260542 – HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to utilize the trenchless technology of horizontal directional drilling (HDD) for the installation of below grade piping and appurtenances as specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

1.3 EXISTING CONDITIONS

A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

1.4 SUBMITTALS

A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 013323.

B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

C. Work Plan - Prior to beginning work, the Contractor must submit to the Engineer a general work plan outlining the procedure and schedule to be used to execute the project. Work Plan should be realistic and document the thoughtful planning required to successfully complete the project.

D. Bore Plan – Prior to beginning the work, the Contractor shall submit a drawing indicating the pilot bore plan.

E. Equipment - Contractor shall submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project. Specifications for any

drilling fluid additives that the Contractor intends to use shall be submitted for review by the Engineer.

F. The Contractor shall submit calculations to verify that the specified pipe wall thickness (DR) is sufficient to withstand the installation (i.e., pull back force).

1.5 QUALITY ASSURANCE

A. The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a mixing and delivery system for drilling fluid of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, control, and containment of drilling fluid, along with trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials, and spare parts on hand to maintain the system in good working order for the duration of the project.

2.2 DRILLING SYSTEM

A. Drilling Rig - The directional drilling machine shall consist of a hydraulically powered system to rotate, push, and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations.

B. Drill Head - The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

C. Mud Motors (if required) - Mud motors shall be of adequate power to turn the required drilling tools.

D. Drill Pipe - Shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

2.3 GUIDANCE SYSTEM

A. The Guidance System shall be of a proven type and shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall be capable of tracking all required depths in any soil condition and rock encountered along the proposed installation route.

B. The guidance system shall be setup and operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies and shall consider such influences in the operation of the guidance system if using a magnetic system.

2.4 DRILLING FLUID (MUD) SYSTEM

A. Mixing System - A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud mixture. Mixing system shall continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids - Drilling fluid shall be composed of clean water and an appropriate additive. Water shall be from a clean source with a pH of 8.5 – 10 and/or as per mixing requirements of the Manufacturer. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No hazardous additives may be used. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall.

C. Delivery System - The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant required pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A berm, minimum of 12 inches high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage facilities.

2.5 OTHER EQUIPMENT

A. Pipe Rollers - Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

B. Pipe Rammers - Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.

C. Restrictions - Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the

Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.6 HIGH DENSITY POLYETHYLENE (HDPE) ELECTRICAL CONDUIT

A. HDPE electrical duct pipe shall be manufactured in accordance with ASTM F2160, non-pressure-rated conduit. The PE 334420E/C resin used in HDPE non-pressure conduit shall meet ASTM D3350.

B. HDPE pipe shall have a high stress crack resistance and a coefficient of friction 30 percent less than PVC. The pipe shall come on a continuous reel, at least 500 feet of pipe on a single reel.

C. Schedule 80, UL 651 listed.

D. The Contractor shall adhere to the pipe manufacturer's most current calculation for safe pulling force and bend radius for trenchless application. This calculation shall be part of the required submittal prior to work.

E. Pipe shall be black in color.

F. HDPE pipe used on this project shall be nominal 2-inch diameter size.

G. HDPE pipe used on this project shall be manufactured by Carlon or equal.

H. Conduit crossing Pride Parkway shall be sleeved within steel conduit.

I. Conduit shall be buried a minimum of 60" below roadways, ramps, and ditch lines.

PART 3 - EXECUTION-

3.1 GENERAL

A. The Engineer must be notified 48 hours in advance of starting work. The Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate.

B. The Contractor shall be fully responsible for all damages resulting from his failure to comply with all applicable state, federal and local regulations, and requirements of these specifications.

3.2 DRILLING PROCEDURE

A. Site Preparation - Prior to any alterations to work-site, contractor shall photograph or video tape entire work area, including entry and exit points. One copy shall be given to the Engineer and

one copy to remain with contractor for a period of one year following the completion of the project. Work site as indicated on drawings, within right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

B. Drill Path Survey - Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If contractor is using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.

C. Environmental Protection – Contractor shall have in place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations.

D. Safety - Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to Engineer.

E. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.

F. Pilot Hole - Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100 feet. In the event that pilot does deviate from bore path more than 5% of depth in 100 feet, contractor will notify Engineer and Engineer may require contractor to pull-back and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, contractor will cease operations and notify Engineer. Engineer and contractor will discuss additional options and work will then proceed accordingly.

G. Reaming - Upon successful completion of pilot hole, contractor will ream bore hole to a minimum of 25% greater than outside diameter of pipe using the appropriate tools. Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

H. Pull-Back - After successfully reaming bore hole to the required diameter, contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel. Once pullback operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations contractor will not apply more than the maximum safe pipe pull pressure at any time. In the event that pipe becomes stuck, contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, contractor will notify Engineer. Engineer and contractor will

3.3 SITE RESTORATION

A. Following drilling operations, contractor will de-mobilize equipment and restore the worksite to original condition. All excavations will be backfilled and compacted to 95% of original density. Landscaping will be restored to original. All mud shall be disposed of by the CONTRACTOR.

END OF SECTION 260542

SECTION 260553 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 EQUIPMENT LABELING

A. All starters, feeder units in panelboards, disconnects, instruments, etc., shall be marked to indicate the motor, outlet, circuit they control, or variable monitored. Marking is to be done with engraved laminated nameplates and shall bear the designation shown on the Contract Drawings where this information is given. Nameplates shall be fastened to equipment with stainless steel screws, minimum of one each side. In no way shall the installation of mounting screws void the NEMA enclosure rating of the equipment in which they are installed. If there are more than one identical unit, they shall be given consecutive numbers or other descriptions as designated by the Engineer. Nameplate background color shall be white, with black engraved letters, unless otherwise noted.

B. Branch circuits in lighting panels shall be typed on a card suitable for the card frame furnished with the panel. The card shall bear the panel designation listed on the Contract Drawings where this information is given, as well as indicate what each circuit controls.

C. Individual wall mounted starters, panelboards, and disconnect switch shall be labeled with vinyl self-adhesive signs that warn of “High Voltage” (state the specific voltage). Main service entrance conduits to a building, where exposed, shall be labeled with the voltage of the service they carry. Other major equipment such as transformers, pump control panels, etc., shall be labeled as such. The type of labels to be used shall have orange as the basic color to conform to OSHA requirements, letters shall be black. The labels shall be of proper size to fit flatly on the surface of the enclosure to make for a neat appearance and not interfere with the operating function of the device it is attached to. These labels shall be as manufactured by the Brady Identification Systems Division, Safety Sign Company, Westline Products Company, or equal.

D. Furnish and install a maximum available fault current sign with date calculated on each structure main service device.

1.2 LOCATING UNDERGROUND UTILITIES

A. Plastic tape bearing the general notation of “buried high voltage cable” shall be placed in trenches with backfill about 12 inches below finished grade on all low voltage underground conduit runs, and on others as indicated on the Contract Drawings.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 260553

SECTION 260573 – ELECTRICAL STUDIES AND CALCULATIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Panelboard manufacturer shall provide detailed computer-based, fault-current and overcurrent protective device coordination studies, and the setting of these devices. This shall apply to new work at existing facilities as well as new facilities.

B. As part of the short circuit study above, the manufacturer shall provide an Arc Flash Analysis.

1.2 SUBMITTALS

A. Provide Fault-Current Study as detailed in IEEE standards during design review submittals.

B. Submit an Over Current Protective Device Coordination Study and Arc Flash Analysis prepared in accordance with IEEE standards at the time of shop drawing submittals. The study shall show and include the following:

1. That each over current protective device in the project is applied within its fault current rating.
2. The coordination study shall include time current curves plotted on log-log graph paper for all over current devices. Curves for adjustable devices shall be shown adjusted to afford maximum coordination with upstream and downstream devices, including devices provided on the primary of service transformers.
3. The interrupting capacity of all over current devices shall equal or exceed the maximum fault current level where they are installed in the system. The system shall be fully rated in that the ability of the device to interrupt a fault at its terminals and shall not depend on the characteristics of an over current device upstream. Series rated devices shall not be acceptable.
4. A schedule of all adjustable devices indicating proper dial and tap settings to achieve the plotted characteristics. A schedule of Arc Flash values and corresponding boundary distances and PPE requirements.

1.3 QUALITY ASSURANCE

A. Coordination-Study Specialist Qualifications: An entity experienced in the application of computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.

1. Professional engineer, licensed in the state where project is located, shall be responsible for the study. All elements of the study shall be performed under the direct supervision and control of engineer.

PART 2 - EXECUTION

2.1 INSTALLATION/APPLICATION/ERECTION

A. Manufacturer's Field Service: Engage a factory-authorized service representative of electrical distribution equipment being set and adjusted to assist in the setting of overcurrent protective devices within equipment.

B. Overcurrent devices are to be visually inspected to verify that settings determined from the final Over Current Protection Coordination Devices Study have been programmed and/or set.

C. Labels shall be applied to all enclosures, with appropriate site specific Arc Flash warnings, PPE requirements, and boundaries. Boundaries shall be painted on the floor in front of switchgear, switchboards, panelboards and MCC's.

D. Each building main service device shall be provided with a permanent nameplate stating the maximum fault current available and the date it was calculated.

END OF SECTION 260573

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section of the Technical Specifications includes furnishing all labor, materials, equipment, and incidentals required for the installation of all lighting and distribution panelboards as hereinafter specified and as shown on the Contract Drawings.

B. The panelboards for installation under this Contract shall be selected from the following types with the panel voltage and main sizes the determining factors. All panelboards shall be by the same manufacturer.

C. Circuit breakers of size and type shown on Contract Drawings and described herein shall be provided with the panelboards.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Eaton, Square D, General Electric, or equal.

2.2 EQUIPMENT

A. Rating

1. Panelboard ratings shall be as shown on the Contract Drawings. All panelboards shall be rated for the intended voltage.

B. Standards

1. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

C. Panelboard Interior

1. Interiors

a. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper or aluminum wire of the sizes indicated.
b. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall

be so designed that circuits may be changed without machining, drilling, or tapping.

c. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.

d. A nameplate shall be provided listing panel type, number of circuit breakers and ratings.

2. Bussing

a. Bus-bars for the mains shall be of copper. Full size neutral bars shall be included. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

b. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

c. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

d. Separate neutral and ground bus shall be provided, insulated, and isolated from each other.

D. Panelboard Enclosures

1. Type 1 Boxes

a. Surface mounted boxes shall be painted to match the trim. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides.

b. Surface mounted boxes shall have an internal and external finish as hereinafter specified. Surface mounted boxes shall be field punched for conduit entrances.

c. At least 4 interior mounting studs shall be provided.

2. Type 1 Trims

a. Hinged doors covering all circuit-breaker handles shall be included in all panel trims.

b. Doors shall have semi flush type cylinder lock and catch, except that doors over 43 inches in height shall have a vault handle and 3-point catch complete with lock, arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Two keys shall be supplied for each lock. All locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door.

c. The trims shall be fabricated from code gauge sheet steel.

d. All exterior and interior steel surfaces of the panelboard shall be properly cleaned and finished with manufacturer's standard gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere without cracking or peeling.

e. Trims for flush panels shall overlap the box by at least 3/4 inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.

E. Overcurrent Protective Devices (Circuit Breakers)

1. Panelboards shall be equipped with circuit breakers with frame size and trip settings as shown on the Contract Drawings.
2. Circuit-breakers shall be molded case, bolt-in, thermal-magnetic trip.
3. Circuit-breakers used in 120/240-volt panelboards shall have an interrupting capacity of not less than 10,000 amperes, RMS symmetrical, unless otherwise shown in the panelboard schedule or Contract Drawings.
4. GFCI (ground fault circuit interrupter) shall be provided for circuits where indicated on the Contract Drawings. GFCI units shall be 1-pole, 120-volt, molded case, bolt-on circuit breakers, incorporating a solid-state ground fault interrupter circuit insulated and isolated from the circuit-breaker mechanism. The unit shall be UL listed Class A Group I device (5 milliamp sensitivity, 25 millisecond trip time), and an interrupting capacity of 10,000 amperes RMS.
5. Trip elements of multi-pole breakers shall be effectively insulated from one another. Multi-pole breakers shall be designed so that an overload on any pole shall open all poles simultaneously.
6. The breaker operating mechanism shall be the quick-make, quick-break type and shall be entirely trip free to prevent the contacts being held in a closed position against a short circuit.
7. Breakers shall have a thermal bimetallic element for time delayed overload protection and a magnetic element for short circuit protection.
8. The breaker shall be trip indicating with the trip position midway between the "On" and "Off" positions.
9. Breakers for power distribution panels shall be F frame or larger. All breakers rated above 225 amps shall have interchangeable magnetic trip elements.
10. All breakers shall be UL listed and conform to requirements of NEMA Standards.
11. Breakers for HVAC equipment shall be HACR rated.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/ERECTION

A. Boxes for surface mounted panelboards shall be mounted so there is at least 1/2-inch air space between the box and the mounting surface.

B. Circuit directories shall be typed giving location and nature of load served.

C. Each panelboard shall be nameplated with plastic engraved nameplates stating the panel's name, voltage, and the name of panel serving the panel. Nameplates shall be secured by use of stainless-steel screws.

END OF SECTION 262416

SECTION 262700 – WIRE CONNECTIONS AND CONNECTING DEVICES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Wire connection and connecting devices shall be as herein specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Connectors, Lugs, etc. - Anderson, Burndy, T & B, or equal.

B. Ties and Servings - Panduit, T & B, or equal.

C. Termination and splice connectors - 3M Scotchlok, Anderson, Burndy, T & B, or equal.

2.2 MATERIALS

A. Wire Splicing and Terminations (600 Volts and Below)

1. Electrical Terminal and Splice Connectors (#22 - #4 AWG)

a. Terminals and splice connectors from #22 - #4 AWG shall be compression types with barrels to provide maximum conductor contact and tensile strength. Performance, construction, and materials shall be in conformance with UL standards for wire connectors and rated for 600 volts and 105 degrees Celsius.

b. Connectors shall be manufactured from high conductivity copper and entirely tin plated. Terminal barrels shall be serrated on the inside surface and have a chamfered conductor entry. Terminals shall have funnel entry construction to prevent strand fold-back. All barrels shall be brazed seam or seamless construction.

c. Spade type terminals shall be sized for the appropriate stud and shall be locking type that snap firmly onto studs with a close fit for maximum retention. Spade type terminals shall be insulated with an insulation suitable for maintaining a high dielectric strength when crimped and be made form nylon, PVC, or equal.

2. Electrical Lugs and Connectors (#6 AWG - 1000 Kcmil)

a. Lugs and splice connectors from #6 AWG - 1000 Kcmil shall be compression types with barrels to provide maximum conductor contact and tensile strength. They shall be manufactured from high conductivity copper and entirely tin plated. They shall be crimped with standard industry tooling. The lugs and connectors must have a current carrying capacity equal to the conductors for which they are rated and must also meet all UL requirements. All lugs above 4/0 AWG shall be 2 hole lugs with NEMA spacing. The lugs shall be rated for operation through 35

KV. The lugs shall be of closed end construction to exclude moisture migration into the cable conductor.

3. Twist-on Wire Connectors (#22 AWG - #10 AWG)

   a. All twist-on wire connectors must have a corrosion resistant spring that is free to expand within a steel jacket. The steel jacket must be insulated with a flexible vinyl jacket capable of withstanding 105 degrees Celsius ambient temperatures and of sufficient length to cover wires that are inadvertently overstripped.
   b. Each connector size must be listed by UL for the intended purpose and color coded to assure that the proper size is used on the wire combinations to be spliced. The connectors must be compatible with all common rubber and thermoplastic wire insulations.

4. Solderless/re-usable lugs shall be used only when furnished with equipment such as control panels, furnished by others, where specification of compression type lugs is beyond the Contractor's control. In the event their use is necessary, the Contractor shall be responsible for assuring that they are manufactured to NEMA standards, with proper number and spacing of holes and set screws.

PART 3 - EXECUTION

3.1 INSTALLATION, APPLICATION, & ERECTION

A. Insulation of Splices and Connections

1. Connections/splices with a smooth even contour shall be insulated with a conformable 7 mil thick vinyl plastic insulating tape which can be applied under all weather conditions and is designed to perform in a continuous temperature environment up to 105 degrees Celsius. The tape shall have excellent resistance to abrasion, moisture, alkalies, acids, corrosion, and varying weather conditions (including sunlight). The tape shall be equal to Scotch 33+ and shall be applied in conformance with manufacturer's recommendations. In addition, it shall be applied in successive half-lapped layers with sufficient tension to reduce its width to 5/8 of its original width. The last inch of the wrap shall not be stretched.
2. Connections/splices with irregular shapes or sharp edges protruding shall be first wrapped with 30 mil rubber tape to smooth the contour of the joint before being insulated with 33+ insulating tape specified in the previous paragraph. The rubber tape shall be high voltage (69 KV) corona-resistant based on self-fusing ethylene propylene rubber and be capable of operation at 130 degrees Celsius under emergency conditions. The tape must be capable of being applied in either the stretched or unstretched condition without any loss in either physical or electrical properties. The tape must not split, crack, slip, or flag when exposed to various environments. The tape must be compatible with all synthetic cable insulations. The tape must have a dissipation factor of less than 5 percent at 130 degrees Celsius, be non-vulcanizing, and have a shelf life of at least 5 years. The rubber tape shall be applied in successive, half-lapped wound layers and shall be highly elongated to eliminate voids. Other manufacturer's recommendations on installation shall be adhered to. The rubber tape shall be equal to Scotch 23 or 130C electrical splicing tape.

3. Splices made in wet or damp locations shall be made submersible and watertight with special kits made for the application and compatible with type of cables employed.

B. Connection Make-up

1. Connections of lugs to bus bars, etc., shall be made up with corrosion resistant steel bolts having non-magnetic properties with matching nuts, and shall utilize a Belleville spring washer (stainless steel) to maintain connection integrity. Connections shall be torqued to the proper limits. Prior to bolting up the connection, electrical joint compound shall be brushed on the contact faces of the electrical joint.
2. All motor lead connections shall be made up to match the type of lead furnished on the motor. If the lead is not lugged, then twist-on wire connectors may be used. To prevent possible vibration problems, twist-on connectors shall be taped after installation.
3. All lugged motor lead connections (excluding motors over 200 horsepower) shall be made up using ring tongue compression lugs with proper size stainless steel nuts and bolts. Belleville type spring shall be used to maintain tension on the connections. The connections shall then be insulated using the procedure described for irregular shapes, utilizing rubber tape in conjunction with vinyl electrical tape.
4. At the time of final inspection, the Engineer may request the Contractor to disassemble 3 randomly selected motor lead connections in the Engineer's presence, to assure conformance with these Specifications.
5. The Contractor shall include all necessary tools, materials, and labor in his bid for disassembly of the connections and for remaking them with new insulating materials after inspection.

END OF SECTION 262700

SECTION 262716 – CONTROL PANELS AND ENCLOSURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Equipment control panels and enclosures shall be as specified herein and shown on the Contract Drawings. Legends for starter nameplates shall be taken from the one line diagram in the Contract Drawings.

1.2 CUSTOM CONTROL PANELS

A. General

1. All control panels furnished under this Contract shall be manufactured in accordance with industry standards and as herein specified. Some control panels are specified to be furnished with the equipment controlled and others are to be furnished by the Contractor, as written elsewhere.
2. Control panels shall be as manufactured by Adgo, Inc., Control Works, Inc., or other panel vendor. Panel construction shall comply with OSHA and other code requirements as applicable and may be attested to by UL listing the panels as an assembly. Otherwise, panel modifications as required by the Electrical Inspector shall be performed by the supplier at no extra cost to the Owner.
3. Control panels to be furnished on this project shall be wired to function according to schematics shown on the contract Drawings. In addition to the requirements shown on the Contract Drawings, the panels shall adhere to additional requirements as written herein, and in the utilization equipment specifications. All motor starters shall be U.S. NEMA sized, field rebuildable. IEC duty rated devices are unacceptable.
4. Enclosures shall be dead front with all operators' devices accessible without opening the enclosure door. All relays, timers, terminal strips, etc., shall be mounted to a subpanel inside the enclosure. All wiring must be stranded and sized to be protected by a 20A/1P circuit breaker. Supplemental overcurrent protection may be used in lieu of oversized wiring. All panels mounted outside shall have operators' devices mounted inside a NEMA 4X switch compartment with lockable window door.
5. All terminal strips and lugs shall be of a type UL listed to terminate the size and quantity of wires encountered. Where conduits enter the boxes, if they are NEMA 4 or 3R, sealing locknuts or hubs must be used to maintain the box rating.
6. Certain equipment starters contain non-resettable elapsed time meters as shown in the Contract Drawings. Also, certain motor starters have remote control devices and require connections to operate these control devices as shown on starter schematics (control circuits).
7. All starters contain green "on" lights, control transformers, and auxiliary contacts to operate as defined on the control circuits of the Contract Drawings. Reset pushbuttons shall also be provided for overloads built into the starters.
8. Enclosures shall be provided with a locking hasp or latch handle with provision for padlocking and any exterior hardware shall be stainless steel or other corrosion resistant material. Enclosures for interior use in dry areas shall be NEMA 12 enclosed, unless otherwise indicated.

9. Elementary control schematics and connection diagrams showing the spatial relationship of components and wiring shall be submitted for review. Also, a bill of materials, drawing of device arrangement on front, and enclosure fabrication drawings shall be submitted. Further, descriptive literature is required on all components. A copy of the shop drawings shall be furnished and stored in a pocket inside the enclosure.
10. Provide metal data pocket, with white enamel finish, on interior of door.
11. Sleeve type wire markers or other "permanent" type marker shall be installed on all wires, keynoted back to the elementary schematic or the connection diagram, and all terminals identified.
12. Environmental Suitability: Indoor and outdoor control panels and enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all devices within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide all power wiring for these devices. Enclosures suitable for the environment shall be provided. Enclosures in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.
13. The control panel controls shall be 120 VAC. Where the electrical power supply to the control panel is 240 VAC single-phase, the control panel shall be provided with a control panel transformer. Control conductors shall be provided in accordance with the indicated requirements.
14. Control panels shall be freestanding, floor-mounted, pedestal-mounted, or wall-mounted, as indicated. Internal control components shall be mounted on an internal back-panel or side-panel as required.
15. Adequately support and restrain all devices and components mounted on or within the panel to prevent any movement.
16. Provide subpanels for installation of all internally mounted components. All freestanding control panels shall include full height rear and side subpanels, where enclosure layout permits. All wall, pedestal, and floor-mounted enclosures shall include full height rear subpanels.
17. Freestanding and floor-mounted panels shall be provided with switched fluorescent back-of-panel lights. One light shall be provided for every 4-feet of panel width and shall be mounted inside and in the top of the back-of-panel area.
18. Freestanding and floor-mounted panels shall be provided with a 15-amp, 120-volt, service outlet circuit within the back-of-panel area. The circuit shall be provided with 3-wire, 120-volt, 20 ampere, GFI type duplex receptacle, one for every 4-feet of panel width (one minimum per panel), spaced evenly along the back-of-panel area.
19. Wall mounted or pedestal mounted panels shall be so sized as to adequately dissipate heat generated by equipment mounted in or on the panel.
20. Panels mounted outside or in unshaded areas shall be provided with thermostatically controlled heaters that maintain inside temperature above 40 degrees F.
21. Provide a hand switch controlled fluorescent light and a breaker protected 120-volt, 20-amp GFI type duplex receptacle within each wall mounted or pedestal mounted panel larger than 4 cubic feet volume.
22. Provide enclosure mounting supports, bases, or legs as required for floor, pedestal, or wall mounting and for free standing enclosures.
23 Provide sun shields for all outdoor control panels.

    a. Sun shields shall be fabricated from minimum 10-gauge aluminum, and shall be designed, fabricated, installed, and supported to fully cover and shade the top, sides, and back of the enclosure, from direct exposure to sunlight.

b. Sun shields shall not be attached directly to the enclosure by drilling holes through, or welding studs to, the enclosure surfaces, and shall be designed and mounted to provide a minimum 1-inch air gap all around the enclosure for air circulation and heat dissipation.
c. The top section of all sun shields shall be sloped at a minimum angle of 5 degrees from the horizontal. For wall-mounted enclosures, the top section shall slope downward away from the wall and towards the front of the enclosure. For freestanding, floor-mounted enclosures the top section shall slope downward towards the backside of the enclosure.
d. The front edge of the top section of all sun shields shall incorporate a narrow and more steeply sloped drip shield segment which sheds water away from the front of the enclosure and prevents it from dripping and/or running directly onto the front panel of the enclosure.
e. All seam welds used in the sun shield fabrication shall be continuous and shall be ground smooth.
f. All exposed corners, edges and projections shall be smooth rounded or chamfered to prevent injury.
g. Contractor shall submit detailed sun shield fabrication and support drawings with the enclosure shop drawings for review and approval.

B. Construction Features

1. Control panel enclosure sizing shall be by supplier in accordance with appropriate standards and codes.
2. Panels and enclosures shall meet the NEMA requirements for the type specified and/or as shown on the drawings.
3. Provide lifting eye bolts to facilitate handling of the enclosures, where required.
4. External welds shall be made by using the Heliarc welding method, whereas internal welds will be made by the wire welding method. All welds shall be neatly formed and free of cracks, blow holes and other irregularities.
5. All inside and outside edges of the panel shall be free of burrs.
6. The panel door or doors shall be a minimum of 80 percent of the front surface area and shall be hinged on the left side when facing the cabinet (right and left outside edges for double door enclosures).
7. Main feeder disconnects shall have a door-mounted handle unless otherwise indicated.

C. Control Panels Located in Dry Non-Corrosive Areas (NEMA 12)

1. The enclosure(s) will meet or exceed the requirements of a NEMA 12 rating and shall be UL listed.
2. Panels shall be minimum 14-gauge steel for wall or pedestal-mount and minimum 12-gauge for floor-mount or freestanding enclosures.
3. Floor-mount enclosures shall be provided with 12-gauge steel floor stand kits bolted to the bottom of the enclosure and sealed and gasketed to maintain NEMA 12 rating. Floor stands shall be mounted on concrete housekeeping pads using anchor bolts and/or expansion anchors.
4. Freestanding enclosures shall be constructed with an integral fully enclosed solid bottom section at least 6-inches in height. Enclosure shall be mounted on concrete housekeeping pads using anchor bolts and/or expansion anchors.

5. Panels shall be provided with 3-point latching mechanism operated by oil-tight key-locking handle. Latch rods shall be provided with rollers for ease of use. The latch handle shall have a provision for padlocking in the closed position.
6. Panels shall be provided with oil-resistant gasket attached with oil-resistant adhesive.
7. Enclosures shall be thoroughly cleaned and sand blasted per Society for Protective Coatings SP 6 (Commercial Blast) after which surfaces shall receive a prime coat of Amercoat 185 or equal, 3-mils DFT, for a total thickness of the prime plus finish system of 6 mils. The finished color of the outside surfaces shall be ANSI 61 gray, lacquer or enamel. Interior of the control panel, back-panel, and side panels shall have a white enamel finish coat.
8. Wall and pedestal-mount enclosures shall be constructed with rolled flanges around three sides of door and all sides of enclosure opening prevent infiltration of liquid or contaminants.
9. Freestanding and floor-mount enclosures shall be provided with body flange trough collar to prevent infiltration of liquid or contaminants.
10. Hinges shall be continuous with stainless steel hinge pins. The hinge pin shall be capped top and bottom by weld to render it tamper proof.
11. Light and/or alarm brackets shall be provided where indicated.

D. Control Panels Located in Wet, Damp, or Corrosive Areas (NEMA 4X)

1. The enclosure(s) will meet or exceed the requirements of a NEMA 4X rating and shall be UL listed.
2. Panels shall be Type 304 stainless steel construction with a minimum 14-gauge for wall or pedestal-mount and minimum 12-gauge for floor-mount or freestanding enclosures.
3. Floor-mount enclosures shall be provided with 12-gauge stainless steel floor stand kits bolted to the bottom of the enclosure and sealed and gasketed to maintain NEMA 4X rating. Floor stands shall be mounted on concrete housekeeping pads using anchor bolts and/or expansion anchors.
4. Panels shall be provided with heavy duty 3-point latching mechanism with 316L stainless steel key-locking handle. Latch rods shall be provided with rollers for ease of use.
5. Panels shall be provided with continuous heavy-duty stainless-steel hinge with stainless steel hinge pin(s). The hinge pin shall be capped top and bottom by weld to render it tamper proof.
6. Panels shall be provided with oil-resistant gasket attached with oil-resistant adhesive and shall form a weathertight seal between the cabinet and door.
7. All external hardware shall be 316L stainless steel.
8. Wall and pedestal-mount enclosures shall be constructed with rolled flanges around three sides of door and all sides of enclosure opening prevent infiltration of liquid or contaminants.
9. Freestanding and floor-mount enclosures shall be provided with body flange trough collar to prevent infiltration of liquid or contaminants.
10. Door restraints shall be provided on all exterior panels to prevent door movements in windy conditions.
11. All bolt holes shall be gasketed.
12. Light and/or alarm brackets shall be provided where indicated.

E. Equipment Mounting

1. Adjustable Channels

a. The enclosure shall be equipped with two adjustable "C" mounting channels on both side walls and back wall of the enclosure, allowing versatile positioning of shelves or panels.
b. The mounting channels shall provide infinite vertical and horizontal adjustment and not limit the positioning of shelves or panels. All mounting hardware will be furnished.

2. Shelves

a. If equipment is to be shelf mounted, the enclosure shall be provided with shelves fabricated from 5052-H32 aluminum having a thickness of 0.125 inch.
b. The shelf depth shall be a minimum of 10.5 inches. The enclosure will have provision for positioning shelves or panels to within 4 inches of the bottom and to within 8 inches of the top of the enclosure.

3. Aluminum Back Panel

a. If the equipment is to be panel mounted, the enclosure shall be provided with a 5052-H32 aluminum back panel having a thickness of 0.125 inch.
b. The panel shall be natural finish. All mounting hardware will be furnished.

4. Print Storage Pocket

a. A control panel shop drawing storage pocket shall be provided inside the enclosure at a convenient location.

F. Cabinet Mounting

1. Wall Mounted Enclosure

a. Enclosures intended for wall mounting shall be provided with stiffener plates with a thickness of 0.125-inch aluminum welded to top and bottom of rear wall for added strength and rigidity.
b. All mounting holes must be gasketed.

2. Pedestal Mounted Enclosure

a. Enclosures intended for pedestal mounting shall be provided with a reinforced base plate. If the enclosure is fabricated from 0.125-inch-thick aluminum, the base plate will be a thickness of 0.250 inch thick aluminum.
b. All mounting holes must be gasketed.

3. Pad Mounted Enclosure

a. A solid plate shall be bolted and gasketed in place on the bottom of the enclosure to provide a weathertight seal.

G. Thermal Management

1. Indoor Panels

a. The following panel accessories shall be provided where shown on Contract Drawings or where required to maintain an interior panel environment suitable for interior panel mounted components. Panel manufacturer shall size required temperature control equipment per their panel design.

1) Provide cooling fans with exhaust grille and filter kits of sufficient size to maintain temperature within enclosure below maximum operating temperature rating of sensitive panel mounted components. Units shall be powered from 115VAC from a dedicated circuit breaker. Cooling fans shall be Hoffman series SF, or equal.

b. Provide internal corrosion inhibitor devices, Hoffman HCI series or equal, for corrosion control inside each enclosure.

2. Outdoor Panels

a. The following panel accessories shall be provided where shown on Contract Drawings or where required to maintain an interior panel environment suitable for interior panel mounted components. Panel manufacturer shall size required temperature control equipment per their panel design.

1) Provide thermostatically controlled heaters of sufficient size to maintain temperature inside each enclosure to prevent interior condensation. Heaters shall be fan-driven, with all components mounted in an anodized aluminum housing for sub panel mounting. The heaters shall be powered from 115VAC from a dedicated circuit breaker. Heater shall be Hoffman DAH series, or equal.

b. Provide internal corrosion inhibitor devices, Hoffman HCI series or equal, for corrosion control inside each enclosure.

I. Surge Suppression

1. A surge protection device shall be installed on the power supply feed to each panel. The power surge protector shall be rated for 120VAC.
2. The power surge protection devices shall have the following performance characteristics:

a. Maximum Continuous Operating Voltage (MCOV): 150VAC
b. Maximum Discharge Current (8x20µs, Imax): 40kA
c. Nominal Discharge Current (8x20µs, In): 20kA
d. Protection Level (Up): 0.9KV
e. UL1449 Voltage Protection Rating (VPR): 700V

3. The power surge protection device shall provide (2) form C contacts for remote status indication.
4. The power surge protection device shall be Allen Bradley 4983 series or equal.

J. Power Supplies

1. Power supplies shall be provided for all DC powered panel components. Power supplies shall be single output, regulated, plug-in type, 12 or 24V as required. Power supply shall be rated at 120VAC. Power supply shall be Allen Bradley 1606 sereis, or equal.

K. Uninterruptible Power Supply

1. A 500 VA uninterruptible power supply, Phoenix Contact Quint AC UPS, or equal shall be provided where shown on Contract Drawings.

L. Acceptable Manufacturers

1. Enclosures shall be as manufactured by Hoffman Enclosures, Inc., or a UL listed equivalent.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION 262716

SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Wiring devices shall be installed where indicated on the Contract Drawings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Bryant, Cooper, Hubbell, Intermatic, Leviton, P&S, Taymac, Wiremold, or equal.

2.2 RECEPTACLES AND SWITCHES

A. General

1. Switch and receptacles for sump pump motors shall be rated at 20 amps at 125 volts and shall be equipped with a manual motor starting switch in lieu of toggle switch, as specified elsewhere this division.

B. Receptacles

1. Twin-convenience - outlet (interior) - "Hubbell" cat. no. 5362, or equal. Hospital grade equivalent cat. no. 8300.
2. Twin-convenience - outlet (exterior) - "Hubbell" cat. no. 5362 with Taymac Corporation or Intermatic, Inc. safety outlet enclosure.
3. Ground fault interrupting receptacles shall be required where shown on the Contract Drawings and shall be indicated by the abbreviation "G" beside the circuit symbol on the Contract Drawings. They shall be rated 20 amps (125 volts) and shall be of the duplex, feed through type, capable of protecting all downstream receptacles on the same circuit. They shall be UL listed and interrupt the current between 4-6 milliamps of ground fault leakage. Appropriate plates shall be furnished and installed. The 20 ampere rating shall apply not only to device internals but to the faceplate as well. Receptacle shall be "Hubbell", Cat. GF20LA or equal. The hospital grade equivalent cat. no. is GF 8300.
4. Weather-resistant type receptacles shall be required in all outdoor, damp, and wet locations or where shown on Contract Drawings. Receptacle type shall be indicated by the abbreviation "WP" beside the circuit symbol on the Contract Drawings. Receptacle shall be UL Listed. Weather-resistant receptacles shall be "Hubbell" Cat 5362WR or equal. Weather-resistant ground fault interrupting type receptacles shall be "Hubbell" Cat. GFTR20 or equal.

C. Plates and Covers

1. Furnish and install plates of the appropriate type and size for all wiring and control devices outlets.

2. All plates on surface mounted boxes shall be of 302 stainless steel (nonmagnetic) with rounded or beveled edges, except in pump rooms, pipe galleries, and pipe trenches, then weatherproof covers shall be installed. All device plate screws shall be nylon or stainless steel with countersunk heads. Plates shall be installed vertically and with an alignment tolerance of 1/16 inch. Device plates shall be of the one-piece type, of suitable shape for the devices to be covered. Plates shall have a smooth finish with no crevices to collect dirt. Oversize plates are not acceptable.
3. Covers for boxes serving equipment where flexible conduit is to be tapped into cover plates shall be sheet metal drilled for conduit. Gaskets shall be required as well as all special adapters for mounting.
4. Weatherproof plates shall be Hubbell 5205/5206/CWP26H/CWP8H/WP26 as appropriate for the box utilized, vertical or horizontal mounting. Use the appropriate plate for the mounting, affixed with security fasteners if in inmate accessible areas.

D. Wall Switches (Tumbler Type)

1. Single pole (interior) - "Hubbell" cat. no. 1221, or equal.
2. Single pole (exterior) - "Hubbell" cat. no. 1222-gray, or equal, and Bryant 7420 or equal plate.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/ERECTION

A. Wall Switches

1. Wall switches shall be mounted at a height as indicated in Section 260000, unless otherwise noted on the Contract Drawings.

B. Receptacles

1. Outlets shall be located as shown on the Contract Drawings. Where located in special interior finishes, they shall be properly centered. Boxes shall be of the type noted and accepted for the specific installation.
2. Furnish and install receptacle circuits where called for on the Contract Drawings and/or by these Specifications. Circuits shall be installed in conduit from panel to receptacle, with flush mounted boxes except as noted on the Contract Drawings.
3. Receptacles and lighting circuits shall not be combined on the same overcurrent device. For runs over 75 feet or for 30-amp receptacles, minimum wire size shall be AWG No. 10.
4. The minimum free length of conductor at each box for the connection of a fixture, switch or receptacle shall be 8 inches. All connections shall be made mechanically and electrically secure.
5. Receptacles shall be duplex type, rated at 20-amps, 125-volts, ivory colored, unless otherwise noted. Mounting height shall be as specified for low outlets in Section 260000, except in pipe galleries and pump rooms subject to floods, where they shall be medium height. All receptacles shall be of the grounding type.

6. Receptacles over workbenches or countertops or at medium or high mountings shall be mounted so that the grounding slot is below the neutral and hot. All other receptacles shall be mounted with the grounding slot above the neutral and hot.
7. Duplex receptacles that are located in wet locations and normally have something plugged in (i.e., kitchen), shall be weatherproof while in use. This requirement shall apply as indicated on the Drawings. To meet this requirement, appropriate safety outlet covers as manufactured by Taymac Corporation, Intermatic Guardian Series, or equal shall be utilized in these areas.

END OF SECTION 262726

SECTION 262816 – SAFETY SWITCHES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide horsepower-rated, quick-make, quick-break, safety switches provided with the number of poles and fuses as required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Safety switches shall be as manufactured by Eaton, General Electric, Square D Company, or equal.

B. For 208- and 240-volt circuits, use general-duty type switches with Class R fuse clips.

C. Switches shall have arc shields, shall be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 250-volt AC or 600-volt AC service as required.

D. All switches shall be capable of interrupting locked rotor current of motor which it serves.

E. Enclosures shall be NEMA-1 for interior use and NEMA-4X for exterior use unless noted otherwise.

F. Provide dual-element Bussman type FRN (250 volt) fuses for any fusible safety switch serving a motor circuit.

G. For non-motor loads, provide dual element Bussman type LPN (250 volt).

H. All switches shall be capable of being padlocked in either the "On" or "Off" position.

I. Safety switches shall be provided with auxiliary contacts where indicated on Contract Drawings.

J. Safety switches shall be UL listed and shall conform to NEMA Standards. NEMA 4X enclosed safety switches where called for shall be stainless steel, or fiberglass.

K. NEMA 1 enclosed switches shall be phosphate coated as equivalent, code gauge steel with baked enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide non-fusible switches at remote motor locations (raintight where required) as indicated on drawings.

B. Provide fusible disconnects at package A/C units, fused as specified on unit nameplate.

C. Mount switches to walls or to equipment enclosures with a minimum of 4 bolts using toggle anchors for masonry construction, Phillips "Red Head" anchors for poured concrete construction and bolts, jumbo washers, lock washers and nuts for equipment enclosure mounting.

D. All safety switches to be identified with nameplates per Section 260553.

END OF SECTION 262816

SECTION 264113 – LIGHTNING PROTECTION SYSTEMS (AIR TERMINALS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The lightning protection system shall be furnished, installed, and connected as detailed on the Contract Drawings to provide a complete and functional system. Installation and equipment construction shall comply with UL Master Label Code 96A, and NFPA 780.

B. The Contractor shall provide shop drawings indicating location and installation of equipment for review of the Engineer before beginning installation.

C. All equipment shall be of the same manufacturer, insofar as possible.

D. Equipment specified herein supplements actual suppression devices specified in Section 264313.

E. Details provided in the drawings shall supersede this general specification in case of conflict.

F. Refer to Elevated Storage Tank specifications (Multi-Column or Pedesphere) for additional grounding and lightning protection requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. AC Erico, Harger Lightning & Grounding, Inc., Independent Protection Co., Inc., Thompson Lightning Protection, Inc., Robbins Lightning, or equal.

2.2 EQUIPMENT

A. All equipment used in this installation shall be UL approved and labeled in accordance with UL procedures.

B. All equipment shall be new, and of design and construction to suit the application where it is used in accordance with accepted industry standards and NFPA and UL code requirements and as per manufacturers recommendations.

C. Unless otherwise shown, downlead conductors from roof to ground shall be Class I copper of 29 strands, 17 gauge minimum.

D. Unless otherwise shown, air terminals shall be Class I solid, round aluminum rod of ½-inch minimum diameter, and shall project 10-inch minimum above the object to be protected.

E. Air terminal bases shall be of cast aluminum with bolted pressure cable connections and shall be securely mounted with stainless steel screws or bolts. Bases on built-up tar and gravel roofs

shall be secured with a proper adhesive and shall have a minimum surface contact area of 18.5 square inches.

F. Ground rods shall be a minimum of 3/4 inch in diameter and 10 feet long. They shall be connected to the system using exothermic welds, Cadweld, Harger, or equal.

G. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface and shall be spaced according to NFPA and UL code requirements.

H. Bonding devices, cable splicers and miscellaneous connectors shall be of cast aluminum with bolted pressure connections to cable. Cast or stamped crimp fittings are not acceptable.

I. Equipment on stacks and chimneys shall be protected from corrosion and sized in accordance with NFPA and UL requirements.

J. All miscellaneous bolts, nuts, and screws shall be stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/ERECTION

A. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible. The system shall consist of a complete cable network on the roof including all air terminals, splices, and bonds with cable downleads routed concealed either directly in the building construction for a new structure or in conduit to ground for an existing structure.

B. The copper downlead cables shall not be brought directly through the roof. Through roof connectors with solid rods or conduits though pitch pockets shall be utilized for this purpose.

C. The limitations on areas of usage for aluminum cables and for copper and aluminum materials together as outlined in UL 96A and NFPA 780 shall be observed. The lightning protection installer will work with other trades to ensure a correct, neat, and unobtrusive installation.

D. It shall be the responsibility of the lightning protection installer to assure a sound bond to the metallic main water service and to assure interconnection with other building ground systems, including both telephone and electrical and also to ensure that proper arresters have been installed on the power service.

E. Downlead conductors from roof to ground shall be protected from mechanical damage from a point 8 feet above to 1 foot below grade by conduit or other means.

F. The lightning protection installer shall secure and deliver a UL Master Label to the Engineer for the Owner for each structure upon completion of the installation.

G. The Contractor shall also submit as-built shop drawings, with the UL Master Label Application Form.

END OF SECTION 264113

SECTION 264313 – SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The specified unit(s) shall provide effective high energy surge suppression, surge current diversion, and high frequency noise attenuation in all electrical modes for equipment connected downstream from the SPD unit. The unit(s) shall be connected in parallel with the facility's wiring system.

B. All products that are submitted according to these specifications will be required to meet this specification in its entirety. Any product that is submitted and does not comply with all parts of this specification will be subject to rejection.

C. Instrumentation Transient Suppressors

1. Transient suppressors are intended for use on all instrument control loops for power and signal protection on transmitters/receivers, etc., and shall be furnished and installed as specified in Division 40.

D. Type 1 SPD (Secondary Power Arrestors) (480, 240, or 240/120 Volts)

1. Type 1 Surge Protective Devices shall be furnished and installed on all control equipment supplied as outlined on the Contract Drawings.

E. Type 2 SPD (Surge Protective Device) (480, 240, or 240/120 Volts)

1. Type 2 Surge Protective Devices shall be furnished and installed in all Power Distribution Panels and on all equipment supplied having solid state components as the central control/monitoring device. These shall include, but not be limited to, computer systems, level control systems, and/or variable speed equipment. They shall be shown on the Drawings where required.

F. Service entrance SPD's shall be listed to be used as part of a UL master labeled lightning protection system.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Air Terminal Systems are specified in Section 264113.

1.3 SUBMITTALS

A. Provide UL1449 Fourth Edition listing documentation including Voltage Protection Ratings for all modes of protection, Short Circuit Current Rating (SCCR), Maximum Continuous Operating Voltage Rating (MCOV), and Nominal Discharge Current (I-n) Rating.

B. Indicate the type of internal or external fusing that is incorporated in the SPD system and what impact the fusing has on the performance of the device with respect to surge capacity and clamping levels.

C. Provide independent third party testing documentation demonstrating that the SPD is capable of surviving the specified maximum 8x20 μs surge current pulse without suffering performance degradation or more than 10 percent.

D. Submittals shall include shop drawings including manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure, internal wiring diagram illustrating all modes of protection in each type of SPD required, wiring diagram showing all field connections and manufacturer's recommended wire and breaker sizes.

1.4 STANDARDS

A. Underwriters laboratories 1449 - (UL 1449 4th edition or current safety standard for surge protection devices)

1. Underwriters laboratories 1283 - (UL 1283 listed as an electromagnetic interference filter that provides noise attenuation)
2. Underwriters laboratories 67 - (UL 67 internal integration of SPD in panelboard)

B. National electrical code latest edition - (NEC article 285 SPD installation practice/NEC article 250 grounding)

1. NFPA-780 and CSA - (National Fire Protection Association)
2. ISO 9001:2000 - quality standard / military standards (mil-std 220a)

C. IEEE (Institute of Electrical and Electronic Engineering Inc.) C62.41.1 and C62.41.2 – 2002 rev. - (system shall be designed to meet C62.41)

1. IEEE C62.41.2-2002 section 7.2 long duration 10 x 1,000 μsec test to be compliant if the device exhibits less than 10 percent deviation from initial readings. Units must be tested to withstand and pass the 10 x 1,000 μsec test
2. IEEE C62.45 – 2002 rev. - (system shall be tested to meet the C62.45)
3. Category A & B - (0.5 μs x 100 kHz ring wave)
4. Category B3 bi-wave - (8 x 20 μs at 3,000 amperes and 1.2 x 50 μs at 6,000 volts)
5. Category C3 bi-wave - (8 x 20 μs at 10,000 amperes and 1.2 x 50 μs at 20,000 volts)

D. CBEMA (ITIC) and IEC - (Computer Business Equipment Manufacturers Association or Information Technology Industry Council and International Electrotechnical Commission define clamping voltage tolerance guidelines for sensitive equipment)

E. All manufacturers must comply with above listed standards and any current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Type 1 SPD (Secondary Power Arrestors)

1. Dale, General Electric, or equal.

B. Type 2 SPD (Surge Protection Devices)

1. Advanced Protection Technologies, Atlantic Scientific Corporation, Current Technology, LEA International, or equal.

2.2 EQUIPMENT

A. Type 1 SPD (Secondary Power Arrestors)

1. The arrestor shall be hermetically sealed with pre-ionized spark gap. The unit shall be capable of repeated over-voltages without significant change in breakdown level or insulation resistance. The arrestor shall be capable of mounting in any position and shall be capable of mounting through a box knockout with standard locknuts and shall be weatherproof.
2. Capacitance shall be less than 50 picofarads, and insulation resistance shall be at least 100 megohms. Maximum arc-over with 10 KV/micro second rise time pulse applied shall be 1,500 volts. The arrestor shall be capable of withstanding repeated application of 10 kiloampere current surges and extinguish power-follow current in 2 cycle or less. Maximum voltage between terminals shall be 2,500 volts when conducting 10 kiloampere current surges.
3. Operating temperature range shall be -40 degrees Celsius to +75 degrees Celsius.

B. Type 2 SPD (Surge Protection Devices)

1. The nominal operating voltage and configuration shall be as indicated on the contract drawings.
2. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449 4th Edition.
3. SPD shall be UL labeled with 20kA Inominal (I-n) for compliance to UL 96A Lightning Protection Master Label and NFPA 780.
4. The system shall provide a noise filtering system capable of attenuating noise levels produced by electromagnetic interference and radio frequency interference. The system's filtering characteristics shall be expressed in decibels (dB) of attenuation per NEMA LS1 publication. The noise filtering system shall also be UL 1283 listed as an Electromagnetic Interference Filter.
5. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD, per NEC 285.6.
6. Unit shall have not more than 10 percent deterioration or degradation of the UL1449 3rd Edition Voltage Protective Rating (VPR) due to repeated surges.

7. The unit shall be UL 1449 4th Edition Listed. The UL 1449 3rd Edition voltage protection ratings (VPR) for the unit including integral disconnect shall be equal to or below the following values:

UL 1449 4th Edition Voltage Protection Ratings (VPR)				
System Voltage	Mode of Protection			
	L-N	L-G	N-G	L-L
120/240	700	700	700	1200
120/208	700	700	700	1200
277/480	1200	1200	1000	2000

8. The maximum single-pulse surge current capacity per mode shall be verified through testing at an independent third party testing facility and shall be conducted per NEMA LS-1-1992 (R2000), paragraphs 2.2.9 and 3.9. The unit shall be tested in all modes at rated surge currents and all tested modes shall be from the same test sample. This test shall include all components of the system, including disconnects (if applicable), fusing, and monitoring as a completed assembly. Individual component testing, module testing only, or subsystem testing of the unit for compliance with this section will not be acceptable. Testing that causes damage to the device, fuse operation, or voltage clamping performance degradation by more than 10 percent is not acceptable.
9. The fusing elements must be capable of allowing the suppressor's rated single impulse current to pass through the suppressor at least one time without failure. The system shall be tested to 1,000 sequential per C62.45-2002 section B.38 referencing C62.41.1 and C62.41.2 category C3 combination wave transients. The category C3 combination wave is defined as a 1.2 x 50 microsecond wave at 20,000 volt open circuit voltage waveform and 8 x 20 microsecond wave at 10,000 ampere short circuit current waveform. In addition, the system components shall be tested repetitively 1,000 times testing based on an IEEE C62.33 (MOV test) and C62.35 (SAD test) without failure or degradation exceeding ±10 percent.
10. Service Entrance Suppressors

    a. Equipment shall Equipment shall be a multi-stage parallel protector rated for 480Y/277. See one line diagram and panelboard schedule to confirm voltages. The equipment's minimum surge current capacity shall be 200kA per mode (L-N, L-G, L-L and N-G).
    b. The system protection modules shall contain a technology that utilizes a symmetrical array of balanced metal oxide varistors (MOV). Each MOV will be individually coordinated to pass UL 1449.
    c. All primary transient paths shall utilize copper wire, aluminum bus bar and lugs of equivalent capacity to provide equal impedance interconnection between phases. No plug-in module or components shall be used in surge carrying paths.
    d. Each protection module shall have a visual indicator that signifies that the protection circuitry is on line. The unit shall not be taken off line to verify integrity of system. Redundant status indicators shall be mounted on the front of the door that monitors the system protection circuitry (or be visible through the enclosure front).
    e. The system shall be modular with field replaceable modules. Modular units shall contain a minimum of one module per phase.
    f. Equipment shall utilize a NEMA 1 enclosure.

11. Panelboard Suppressors & Auxiliary Panel Suppressors

    a. Device shall meet all specification requirements for service entrance suppressors except as follows:

        1) Equipment shall be a multi-stage parallel protector rated for 480Y/277 or 208Y/120. See one line diagram and panelboard schedule to confirm voltages. The equipment's minimum surge current capacity shall be 100kA per mode (L-N, L-G, L-L and N-G).
        2) The system protection shall contain a technology that utilizes a symmetrical array of balanced metal oxide varistors (MOV). Each MOV will be individually coordinated to pass UL 1449. The unit shall be non-modular type.
        3) Equipment shall utilize a NEMA 1 enclosure.

12. Accessories

    a. Device Monitoring

        1) As a minimum, device monitoring shall include audible alarm with alarm disable switch, surge counter, and two sets of Form C contacts for remote monitoring.

    b. Integral Disconnect Switch

        1) The unit shall include an integral safety interlocked disconnect located in the unit enclosure with an externally mounted manual operator. If fuses are included with this switch, the fusing shall not effectively lower the rating of the SPD unit.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/ERECTION

A. Where the SPD unit is not specified with an integral safety/disconnect switch an appropriately sized disconnect switch or thermal magnetic breaker shall be installed before and in-line with the SPD. It shall be capable of electrically isolating the SPD from the electrical service for repair without interrupting service to the building. If a safety/disconnect switch is utilized the switch shall be rated for 600VAC. If fuses are included with this switch, the fusing shall not effectively lower the rating of the SPD unit and shall have a minimum interrupt rating of 200kAIC. Connection means utilizing breakers shall be sized at 60A/3P and 30A/3P respectively for service entrance/switchboard/switchgear and branch panelboard units unless otherwise recommended by manufacturer.

B. The specified SPD system shall be installed with #6 AWG minimum copper conductors tapped from the electrical power distribution system. The conductors are to be as short and straight as practically possible and shall not exceed 5 electrical feet from the power conductor(s) it is protecting for service entrance/switchboard/switchgear units and 1.5 electrical feet for branch

panelboard units and shall avoid any unnecessary or sharp bends. The input conductors are to be twisted together to reduce the SPD system inductance.

C. The SPD shall be installed following the SPD manufacturer's recommended practices and in compliance with these specifications and all applicable codes.

3.2 WARRANTY

A. Manufacturer shall provide a full 5-year limited warranty against failure or workmanship defects when installed in compliance to the manufacturer's written installation instructions, UL listing requirements and the National Electrical Code.

END OF SECTION 264313

SECTION 265110 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior luminaires with LED lamp and drivers.
2. Poles and accessories.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Luminaire: Complete lighting fixture, including ballast housing if provided.

E. Pole: Luminaire support structure, including tower used for large area illumination.

F. Standard: Same definition as "Pole" above.

1.4 STRUCTURAL ANALYSIS CRITERIA FOR POLE SELECTION

A. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied as stated in AASHTO LTS-4-M.

B. Live Load: Single load of 500 lbf, distributed as stated in AASHTO LTS-4-M.

C. Ice Load: Load of 3 lbf/sq. ft., applied as stated in AASHTO LTS-4-M Ice Load Map.

D. Wind Load: Pressure of wind on pole and luminaire and banners and banner arms, calculated and applied as stated in AASHTO LTS-4-M.

1. Basic wind speed for calculating wind load for poles 50 feet high or less is 115 mph.

a. Wind Importance Factor: 1.0
b. Minimum Design Life: 25 years
c. Velocity Conversion Factors: 1.0

1.5 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.
2. Details of attaching luminaires and accessories.
3. Details of installation and construction.
4. Luminaire materials.
5. Photometric data based on laboratory tests of each luminaire type, complete with indicated LED lamps, drivers, and accessories.

    a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
    b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Drivers, including energy-efficiency data.
7. LED lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.
8. Materials, dimensions, and finishes of poles.
9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
10. Anchor bolts for poles.
11. Manufactured pole foundations.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.6 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements in AASHTO LTS-4-M and that load imposed by luminaire and attachments has been included in design.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and poles to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with IEEE C2, "National Electrical Safety Code."

E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Package aluminum poles for shipping according to ASTM B 660.

B. Store poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

C. Retain factory-applied pole wrappings on metal poles until right before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.10 WARRANTY

A. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the Luminaires for a period of 5 years after acceptance of the Luminaires. Warranty shall cover all components comprising the luminaire. All warranty documentation shall be provided to customer prior to the first shipment.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Poles: Repair or replace lighting poles and standards that fail in finish, materials, and workmanship within manufacturer's standard warranty period, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Base Bid Manufacturers: Are listed on fixture schedule. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.
2. LER Tests Fluorescent Fixtures: Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
3. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Luminaires shall have the International Dark-Skys Association seal of approval.

C. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

F. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

H. Exposed Hardware Material: Stainless steel.

I. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

J. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

K. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.

3. Diffusing Specular Surfaces: 75 percent.

L. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

M. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

N. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
3. Color: As selected by Architect from manufacturer's full range.

O. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
    a. Color: As selected by Architect from manufacturer's full range.

P. Factory-Applied Labels: Comply with UL 1598. Include recommended LED lamps and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

2.3 LED LUMINAIRES

A. LED Lamps

1. LEDs shall be manufactured by Nichia, Samsung, Osram or equal.

    a. Lumen Output – minimum initial lumen output of each luminaire shall be as specified in light fixture schedule.

2. High-efficacy LEDs mounted to metal-core circuit boards to maximize heat dissipation and promote long life 100,000 hours at 40 degrees C, L70.
3. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.

4. LED Boards shall be suitable for field maintenance or service with plug-in connectors. LED boards shall be upgradable.
5. Light Color/Quality

    a. Correlated Color temperature (CCT) shall be 4000K, unless otherwise indicated.
    b. The color rendition index (CRI) shall be 67 or greater.

B. Drivers

1. Class 1 electronic driver designed to provide a power factor >90%, THD <20%, with an expected life of 100,000 hours with <1% failure rate.
2. Easily-serviceable surge protection device meets a minimum Category C Low operation (per ANSI/IEEE C62.41.2).
3. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
4. Driver shall be UL listed.
5. Maximum stand-by power shall be 1 Watt.
6. Driver disconnect shall be provided where required to comply with codes. The electronics/power supply enclosure shall be internal to the luminaire and be accessible per UL requirements.
7. IP66 rated.

C. Electrical

1. Operation Voltage - The luminaire shall operate from a 50 or 60 HZ ±3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
2. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
3. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent at any standard input voltage.
4. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference.
5. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.
6. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.
7. All electrical components shall be RoHS compliant.

D. Photometric Requirements

1. Luminaire performance shall be tested as described herein.

    a. Luminaire performance shall be judged against the specified minimum illuminance in the specified pattern for a particular application.
    b. Luminaire lighting performance shall be adjusted (depreciated) for the minimum life expectancy.

c. The performance shall be adjusted (depreciated) by using the LED manufacturer's data or the data from the IESNA Standard TM-21 test report, which ever one results in a higher level of lumen depreciation.

2. The luminaire may be determined to be compliant photometrically if the initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern.
3. The measurements shall be calibrated to standard photopic calibrations.

E. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
2. The LED manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient.
3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient.
4. The luminaire shall have an UL IC rating.
5. The Driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

2.4 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

E. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 – Concrete.

2.5 ALUMINUM POLES

A. Poles: Seamless, extruded structural tube complying with ASTM B 429/B 429M, Alloy 6063-T6 with access handhole in pole wall.

B. Poles: ASTM B 209, 5052-H34 marine sheet alloy with access handhole in pole wall.

1. Cast from A356 aluminum alloy and heat treated to T6 temper. Shaft and tilting section of the hinged base circumferentially welded top and bottom. The tilting and anchored sections of the hinged base shall be joined by a 3/4" diameter solid aluminum pivot rod. The tilting section of the hinged base shall be held in a vertical position by three 1/2"-13 x 2" stainless steel hex head bolts that attach to stainless steel inserts cast into the aluminum base.

C. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Secondary Grounding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

D. Brackets for Luminaires: Detachable, with pole and adapter fittings of cast aluminum. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.

1. Tapered oval cross section, with straight tubular end section to accommodate luminaire.
2. Finish: Same as pole and luminaire.

E. Prime-Coat Finish: Manufacturer's standard prime-coat finish ready for field painting.

F. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

a. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.

3.2 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.

B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:

1. Fire Hydrants and Storm Drainage Piping: 60 inches.
2. Water, Gas, Electric, Communication, and Sewer Lines: 10 feet.
3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Division02 – Concrete.

D. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level recommended by pole manufacturer.

1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
2. Grout void between pole base and foundation. Use non shrink or expanding concrete grout firmly packed to fill space.
3. Install base covers unless otherwise indicated.
4. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

F. Raise and set poles using web fabric slings (not chain or cable).

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 GROUNDING

A. Ground metal poles and support structures according to Section 260526 "Secondary Grounding."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.

C. Verify operation of photoelectric controls.

D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265110

DIVISION 31

EARTHWORK

SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor, equipment and services necessary to do all clearing and grubbing, excavation, backfilling, providing of additional fill material and topsoil, control of surface drainage and ground water, finished site grading and erosion control required to construct the work as shown.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. State and local code requirements shall control the disposal of trees and shrubs.

B. All burning shall be controlled by applicable local regulations.

C. Excavation Support and Protection: Section 315000

D. Erosion and Sedimentation Control: Section 312502

E. The report of geotechnical exploration titled "Geotechnical Exploration NKWD Taylor Mill Tank" by Geotechnology, LLC., included in Appendix A. The geotechnical report shall be used as a reference for the execution of this work and all recommendations included therein shall be followed in full.

1.3 JOB CONDITIONS

A. Weather: Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought or other adverse weather conditions.

B. Existing Utilities: Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

C. Use of Explosives: The Contractor (or any of his Subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines, and Minerals, Division of Explosives and Blasting. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

a. Operate warning lights as recommended by authorities having jurisdiction.

b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Dust Control: Use all means necessary to control dust on or near the project site where such dust is caused by the Contractor's operations or directly results from conditions left by the Contractor.

1.4 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.

B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.

C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7 ½ minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.

D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.

E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction form entering the watercourse.

G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished with 14 days after disturbance.

H. To the maximum extent practicable, all in stream work under this certification shall be performed during low flow.

I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.

K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.

L. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/928-2380.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Definitions:

1. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH and PT. The Contractor shall notify the Engineer if these soil materials are encountered.
3. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
4. Drainage Fill: Washed, evenly graded mixture of crushed stone, or uncrushed gravel, with 100 percent passing a 1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
5. Backfill and Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

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

B. Trees, bushes, and all natural vegetation shall only be removed with the approval of the Engineer. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface. All holes and

depressions left by grubbing operations shall be filled with suitable material and compacted to grade, as recommended in Paragraph 3.06.

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

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

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

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

3.2 EROSION CONTROL

A. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods.

B. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.

C. Refer to Section 312502, Erosion and Sedimentation Control for requirements.

3.3 EXCAVATION

A. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.

B. All excavated materials that meet the requirements for fill, subgrades or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill, and any surplus of excavated material that is not required for fill shall be disposed of by the Contractor.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The

Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.

D. Excavations for concrete structural slabs on grade shall extend two (2) feet below the indicated bottom of slabs. The over-excavation shall be backfilled with 18 inches, compacted thickness, of over lot fill material or suitable material as herein specified. The remaining six (6) inches of over-excavation shall be backfilled with porous fill material. The porous fill layer shall extend beyond the limits of the concrete slab a minimum of two (2) feet on all sides as indicated on the Drawings. The porous fill shall be crushed stone or gravel and shall have the following U.S. Standard Sieve gradation:

Sieve	1-1/2	1	3/4	1/2	3/8
% Passing	Min 100	95±5	58±17	Max 15	Max 5

E. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not, or as indicated on the design drawings. Footings and grade beam bottoms shall be inspected by the Engineer before any concrete is placed thereon.

F. In excavations for structures where, in the opinion of the Engineer, the ground is spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with suitable material properly compacted.

G. Sheeting and shoring shall be provided as necessary for the protection of the work and for the safety of the personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing and cofferdamming. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving; or, if so directed by the Engineer, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.

H. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted, except that in excavation for columns, walls or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

3.4 FILL

A. All existing fill below structures and paved areas must be stripped. The upper six (6) inches of the natural subgrade below shall be scarified and recompacted at optimum moisture to at least ninety-five percent (95%) of Standard Proctor Density ASTM D 698 (latest revision).

B. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas. Additional fill stockpiled at the site can be used for structural fill if approved by the Engineer. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the Engineer. All fill material shall be free from trash, roots and other organic material. The best material to be used in fills shall be reserved for backfilling pipe lines and for finishing and dressing the surface. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material shall be placed in successive layers and thoroughly tamped or rolled in a manner approved by the Engineer, each layer being moistened or dried such that the specified degree of compaction shall be obtained. No fill shall be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

C. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the Engineer, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried such that the specified degree of compaction shall be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the Engineer. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

3.5 BACKFILLING

A. After completion of footings, grade beams and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.

B. The trenches shall be backfilled following visual inspection by the Engineer and prior to pressure testing. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, or other suitable materials, free from large clods of earth or stones. Each layer shall be compacted to a density at least equal to that of the surrounding earth and in such a manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving, if required, can proceed immediately after backfilling is completed.

3.6 COMPACTION

A. Suitable material as hereinbefore specified shall be placed in maximum 8-inch horizontal layers. Compaction shall be performed by rolling with approved tamping rollers, pneumatic-tired rollers, three wheel power rollers or other approved equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Fill Utilized For	Required Density (%)	Maximum Permissible Lift Thickness As Compacted, Inches
Backfill & Utility Trenches Under Foundations & Pavements	95-100	8
Backfill Around Structures	95-100	8
Field and Utility Trench Backfill Under Sidewalks and Open Areas	90-100	8

B. Field density tests shall be performed in sufficient number to ensure that the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed as authorized by the Engineer. Payment for field density tests shall be by the Contractor. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

3.7 SITE GRADING

A. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil, or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

B. Following stripping, fill areas shall be scarified to a minimum depth of six (6) inches to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding twelve (12) inches uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.

C. In general and unless otherwise specified, the Contractor may use any type of earth moving equipment he has at his disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.

D. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.

E. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in Paragraph 3.06 and not less than 90% maximum density at optimum moisture content as determined by field density tests made by the Standard Proctor method. In general and unless otherwise specified, the Contractor may use any type of compaction equipment such as sheepsfoot rollers, pneumatic rollers, smooth rollers and other such equipment he has at his disposal, provided such equipment is in satisfactory condition and is of such design, type, size, weight, and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by the Contractor, the Engineer may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.

F. The Contractor shall be responsible for the stability of all embankments and shall replace any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

3.8 TOPSOIL

A. Provide all labor, materials, equipment and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than one (1) inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sand loam or heavy clay loam will not be acceptable.

B. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on site for structure backfilling and top soiling.

END OF SECTION 312000

SECTION 312319 – DEWATERING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor and equipment required to dewater all excavations.

B. Dewatering of all excavations shall be the responsibility of the Contractor, and no additional compensation will be allowed for same unless specifically included as a bid item.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork is included in Section 312000.

B. Erosion and Sedimentation Control is included in Section 312502.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Dewatering equipment shall be of adequate size and quantity to assure maintaining proper conditions for installing pipe, concrete, backfill or other material or structure in the excavation.

B. Dewatering shall include proper removal of any and all liquid, regardless of its source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.

D. Dewatering operations should not discharge into the sanitary sewer system, or into any ditch, pipe or other conveyance that leads to a regulated water body, except as authorized by a KPDES permit.

END OF SECTION 312319

SECTION 312500 – EROSION AND SEDIMENTATION CONTROL (Areas Less Than One Acre)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and equipment required for erecting, maintaining and removing temporary erosion and sedimentation controls as shown on the Drawings and as specified herein and as recommended by state and local regulatory agencies.

B. Temporary erosion controls include, but are not limited to grassing, mulching, seeding, providing erosion control and turf reinforcement mats on all disturbed surfaces including waste area surfaces and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.

C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances on sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.

D. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures prior to and during construction or until final controls become effective.

E. The Contractor shall be responsible for placement of erosion and sedimentation controls. Prior to construction, the Contractor shall develop an erosion control plan and submit to the Engineer for review. Prior to excavation, fill or grade work, the Contractor shall place controls in locations required by the erosion control plan. If during the course of construction, the Engineer determines additional controls are required, the Contractor shall furnish, install and maintain additional mulching, blankets and/or sediment barriers to control erosion and sedimentation to the satisfaction of the Engineer.

F. The Contractor shall notify the appropriate state agency before beginning construction, and shall implement erosion control measures as may be required by state and federal agencies. If disturbed area is greater than one acre, Contractor shall submit a signed Notice of Intent form to the Division of Water at least 48 hours prior to beginning of construction activity.

G. The Contractor shall inspect and repair all erosion and sedimentation controls every seven (7) days and after each rainfall of 0.5 inch or greater.

H. Bare soil areas must be seeded, mulched, or covered after 14 days if no work will be done in the area within the next 7 days.

1.2 RELATED WORK

A. Dewatering is included in this Division, Section 312319.

B. Final erosion protection measures where required are included in this Section.

C. Utility Line Stream Crossings - Division 2

PART 2 - PRODUCTS

2.1 SEED

A. The seed mixture to be sown shall be in the following proportions:

Common Name	Proportion By Weight	% of Purity	% of Germination
Fine Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.

2.2 FERTILIZER

A. Just prior to the planting of turf, evenly broadcast 15 pounds per thousand square feet of fertilizer, 10-10-10 (nitrogen, phosphorus, potassium). Disc or harrow fertilizer 2 to 4 inches into the soil.

B. Fertilizer shall be delivered to the site in the original unopened container bearing the manufacturer's guarantee analysis. Any fertilizer that becomes caked or damaged making it unsuitable for use, will not be accepted.

2.3 SOD

A. Sod shall be at least 70% Bluegrass, strongly rooted and free of weeds.

B. It shall be mowed to a height not to exceed 3 inches before lifting, and shall be of uniform thickness with not over 1-1/2 inches of soil.

2.4 MULCH

A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.

B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2 inches loose depth).

C. Mulch on slopes at or greater than 3:1 shall be held in place with turf reinforcement mat.

D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with turf reinforcement mat.

2.5 EROSION CONTROL BLANKETS

A. Erosion Control Blanket shall be made up of biodegradable and/or photodegradable products such as jute, wood fiber, coconut fiber, straw and degradable plastic netting. They shall degrade at a rate of approximately 6 months to 24 months.

B. Erosion Control Blanket shall be installed on slopes less than 3:1.

2.6 TURF REINFORCEMENT MAT

A. Where indicated on the Contract Drawings or as described in the Specifications, in all ditches and drainage channels and on all slopes equal to or greater than 3:1, Turf Reinforcement Mat shall be installed for long-term erosion control.

B. Turf Reinforcement Mat shall consist of top and bottom heavy weight netting and biodegradable matrix such as coconut fiber or aspen curled wood excelsior, as manufactured by Western Excelsior Excel PP5-8 Turf Reinforcement Mat or equal. Product shall degrade at a minimum rate of 36 months.

C. Where slope and hydraulic conditions are severe, a synthetic matrix may be used, based on manufacturer's recommendations.

2.7 SILT FENCE

A. Temporary Silt Fence shall consist of woven geotextile fabric attached to 2-inch by 2-inch by 48-inch tall hardwood stakes.

1. Exposed Fabric shall be 36 inches and a minimum of 4 inches shall be buried in trench as shown on the Detail Drawings.
2. Stakes shall be at 6' centers unless stated otherwise on Contract Documents.

B. Temporary Reinforced Silt Fence

1. For areas of steep slopes and high flows, where indicated on the Contract Drawings, or as directed by state or local regulations, Reinforced Silt Fence shall be installed.
2. Fabric shall be woven monofilament geotextile attached to 11 gauge steel fencing of 2 inches by 4 inches grid.
3. Stakes shall be 5 feet tall steel and shall be installed on 4' centers.
4. Fabric and fencing shall be buried in trench as shown on the Detail Drawings.

C. Spacing of Silt Fences on slopes shall be according to the following table, or as directed by state or local regulatory agencies:

Slope Angle	Soil Type		
	Silty	Clays	Sandy
Very Steep (1:1)	50 ft.	75 ft.	100 ft.
Steep (2:1)	75 ft.	100 ft.	125 ft.
Moderate (4:1)	100 ft.	125 ft.	150 ft.
Slight (10:1)	125 ft.	150 ft.	200 ft.

D. If runoff flows along the uphill side of the silt fence, Contractor shall install "J-hooks" every 40 to 80 feet. These are curved sections of silt fence above the continuous fence that serve as small dams to stop and hold the flow to allow sediment to settle.

2.8 FIBER ROLLS

A. On long slopes less than 10:1, and where indicated on the Contract Drawings or recommended by the regulatory agency, Fiber Rolls shall be installed.

B. Fiber Rolls shall be made of wood shavings, coconut fiber or other similar material encased in heavy duty netting.

C. Wooden stakes at 4'-0" on center shall be used to anchor the Fiber Rolls along the contours of the slope.

2.9 AGGREGATE SILT CHECKS

A. Where needed to slow flow velocity, to cause ponding or to protect storm water inlet structures, Aggregate Silt Checks shall be installed.

B. Aggregate Silt Checks shall consist of rock of various sizes ranging from 2 inches to 6 inches contained in or placed on geotextile filter fabric. Pea-stone or gravel-filled bags are acceptable for temporary silt checks in low-flow conditions.

2.10 RIP RAP

A. Rip Rap shall be installed at the outlets of storm drains and on channel banks as noted on the Contract Drawings and/or recommended by state and local regulatory agencies.

B. Rip Rap shall have no less than 80%, by volume, of individual stones that range in size from 0.0247 to 1.483 cubic feet.

2.11 CONSTRUCTION ENTRANCE PAD

A. Contractor shall construct entrance pads at all locations where vehicles will enter or exit the site.

B. Pad shall be a minimum of 20 feet wide, 50 feet long and 6 inches thick, and consist of No. 2 stone laid on top of filter fabric.

PART 3 - EXECUTION

3.1 GENERAL

A. Erosion and sediment control practices shall be consistent with the requirements of the state and local regulatory agencies and in any case shall be adequate to prevent erosion of disturbed and/or regraded areas.

B. Contractor is responsible for notifying the state regulatory agency concerning inclusion under the NPDES General Permit for Storm Water Discharges From Construction Activities.

C. Gravity sewer lines and force mains that cross steams shall be constructed by methods that maintain normal stream flow and allow for a dry exaction. Water pumped from the excavation shall be contained and allowed to settle prior to reentering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the sewer line excavation shall not be allowed to enter the flowing portion of the stream. The provisions of this condition shall apply to all types of utility line stream crossings.

D. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regrading and reseeding will be accomplished with 14 days after disturbance.

3.2 SEEDING

A. The areas to be seeded shall be thoroughly tilled to a depth of at least 4 inches by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer. After harrowing or discing, the seed bed shall be dragged and/or hand raked to finish grade.

B. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied no less than 24 hours nor more than 48 hours before the seed is to be sown.

C. Seed shall be broadcast either by hand or approved sowing equipment at the rate of ninety (90) pounds per acre (two pounds per 1,000 square feet), uniformly distributed over the area. Broadcasting seeding during high winds will not be permitted. The seed shall be drilled or raked into a depth of approximately 2 inch and the seeded areas shall be lightly raked to cover the seed and rolled. Drilling seeding shall be done with approved equipment with drills not more than 3 inches apart. All ridges shall be smoothed out, and all furrows and wheel tracks likely to develop into washes, shall be removed.

D. After the seed has been sown, the areas so seeded shall be mulched with clean straw at the rate of one (1) bale per 1,000 feet (approximately 2 inch loose depth). Mulch on slopes and in all ditches and drainage channels shall be held in place with erosion control blankets.

E. Areas seeded shall be watered and protected until a uniform stand develops, and then inspected periodically and maintained appropriately. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall

refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square yard in size will be allowed up to a maximum of 10 percent of any area.

F. Payment for seeding and mulching shall be included in the Contractor's bid.

3.3 SOD

A. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer at approximately 1000 lbs per acre.

B. Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork type pattern. Use torn or uneven pieces on the end of the row.

C. Notch into existing grass. Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.

3.4 INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES

A. All erosion and sediment control products and materials shall be installed per manufacturer's recommendations and in accordance with the Kentucky Erosion Prevention and Sediment Control Field Guide.

B. Contractor shall pay special attention to the trenching-in of the bottoms of silt fence, the staking of sediment barriers, and the stapling of erosion control blankets.

3.5 MAINTENANCE OF EROSION AND SEDIMENT CONTROL DEVICES

A. Erosion and sedimentation controls shall be inspected weekly and after rain events of 0.5 inch or greater. Replace silt fencing as needed, filter stone which is dislodged, erosion control blanket which is damaged, and make other necessary repairs.

B. Remove sediment from fences and barriers when it accumulates to half the height of the barrier, or more often as needed.

3.6 CLEAN UP

A. Upon completion of the project and/or establishment of satisfactory turf, vegetation or permanent erosion control structures, Contractor shall remove all temporary devices and properly dispose of such.

END OF SECTION 312500

SECTION 315000 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes, but is not limited to, the following:

1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
2. Maintenance of shoring and bracing.
3. Removal of shoring and bracing, as required.

B. Types of shoring and bracing systems include, but are not limited to, the following:

1. Steel H-section (soldier) piles.
2. Timber lagging.
3. Steel sheet piles.
4. Portable Steel Trench Box.

C. Building excavation is specified in another Section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Section 013323.

Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction. This submittal is for information only. Engineer's review is not for adequacy design, but to verify that it has been designed by a licensed professional. Design of shoring is part of means and methods of construction and remains solely the responsibility of the contractor.

1.4 QUALITY ASSURANCE

A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.

C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.

B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

A. Protect existing active sewer, water, gas, electricity and other utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.

B. Structural Steel: ASTM A 36.

C. Steel Sheet Piles: ASTM A 328.

D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.

E. Portable Steel Trench Box shall be OSHA approved.

PART 3 - EXECUTION

3.1 SHORING

A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 315000

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 321615 – SIDEWALKS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and services required for constructing concrete sidewalks where shown on the Drawings and as specified herein,

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

B. Concrete: Section 033100

PART 2- PRODUCTS

2.1 CRUSHED STONE

A. Stone for sidewalk base shall be No. 57 aggregate, or equal.

2.2 CONCRETE

A. Concrete for sidewalks shall be 3000 psi concrete.

2.3 REINFORCEMENT

A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A615. All bar reinforcement shall be deformed.

B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction, and securely wired or clipped with standard clips.

2.4 PREMOLDED EXPANSION JOINT FILLER

A. Premolded expansion joint filler shall be closed cell polyethylene foam type, Sonneborn Sonoflex F, Williams Products Expand-O-Foam, or equal. Seal joint with one-part self. leveling polyurethane sealant, Sonneborn Sonolastic SL 1, or equal, maximum 3/8 inches deep. Prepare and prime joints per manufacturer's instructions.

PART 3 - EXECUTION

3.1 BASE

A. Following finished grading, a base course of crushed stone shall be placed to a compacted thickness of four (4) inches. Immediately prior to placing concrete, crushed stone base shall be thoroughly wetted, or the concrete placed on a layer of heavy building paper.

3.2 SURFACE

A. Concrete paving shall consist of 4 or 6 inches (as noted) of 3,000 psi reinforced concrete, struck off to accurately placed screens and worked with a float until mortar appears on the top. After surface has been thoroughly floated, it shall be brushed to leave markings of a uniform type, providing non-slip finish. No dusting or plastering will be allowed.

3.3 FINISHING

A. All joints and edges shall be finished with an edging tool. Dummy joints shall be formed about five (5) feet apart to form rectangular blocks. Expansion joints of 1/2 inch premolded expansion joint material shall be provided at the intersection of all vertical surfaces with the sidewalks slabs and at approximately 20-feet intervals along the walks.

3.4 QUALITY CONTROL

A. The allowable variation shall be 1/8 inch to 10 feet transversely and longitudinally.

END OF SECTION 321615

SECTION 323100 – ELECTRONIC GATE OPERATOR

PART 1 - GENERAL

1.1 INCLUDED IN THIS SECTION

A. Pre-wired gate operator for slide gates, including all selected attachments and accessory equipment.

B. For further information, call the manufacturer at (833) 707-1984 or visit the website at https://www.liftmaster.com/

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Fencing: See section 323113.

B. Cast in place concrete: See section 033000.

C. Electrical service and connections: See Division 26.

1.3 SUBMITTALS

A. Shop drawings: Submit shop drawings under the provisions of Section 013300. Submit drawings showing connections to adjacent construction, range of travel, and all electrical and mechanical connections to the equipment. All underground runs of electrical and hydraulic lines; and inductive vehicle obstruction loop locations shall be indicated on drawings. Drawings shall also show the size and location of the concrete mounting pad.

B. Installation instructions: Submit two copies of manufacturer's installation instructions for this specific project.

C. Submit manufacturer's completed warranty registration form to Project Manager.

D. Project list: Submit list of product installations comparable to the subject job. Include date of product installation, installer, and owner's name and location of the project.

E. Test reports:

1. Submit affidavits from the manufacturer demonstrating that the gate mechanism has been tested to 200,000 cycles without breakdown.
2. Each operator shall bear a label indicating that the operator mechanism has been tested. Operator is tested for full power and pressure of all hydraulic components, full stress tests of all mechanical components and electrical tests of all overload devices.

1.4 QUALITY ASSURANCE

A. Manufacturer: A company specializing in the manufacture of gate operators of the type specified, with a minimum of five years' experience manufacturing operators of this type and design.

B. Installer: Must have a minimum of three years' experience installing similar equipment or obtain other significant manufacturer endorsement of technical aptitude, if required, during the submittal process.

1.5 CODES AND REGULATORY REQUIREMENTS

A. Operators shall be built to UL 325 standards and be listed by a nationally recognized testing laboratory. Complete all electrical work according to local codes and National Electrical Code. All fieldwork shall be performed in a neat and professional manner, completed to journeyman standards.

B. Current safety standards require the use of multiple external sensors to be capable of reversing the gate in either direction upon sensing an obstruction. See also 2.2E.

C. Vehicular gates should never be used by pedestrians. A separate pedestrian gate must always be provided when foot traffic is present.

1.6 PRODUCT DELIVERY AND STORAGE

A. Store products upright in the original shipping containers, covered, ventilated and protected from all weather conditions.

1.7 WARRANTY

A. Provide a warranty against all defects in materials or workmanship for five years or 500,000 gate cycles (whichever occurs first) after the date of installation. Defective materials shall be replaced at manufacturer's discretion with new or reconditioned materials furnished by the manufacturer, at no cost to the owner. Freight, labor and other incidental costs are not covered under the factory warranty, but may be covered by a separate service agreement between installing company and the owner.

PART 2 - PRODUCTS

2.1 GATE OPERATORS

A. LiftMaster gate operator model, or other comparable operator, as approved by the architect or specifier. Substitute operators that are approved will be published in an addendum, not less than ten days prior to bid opening. Requests for substitution will include the amount of savings to be passed on to the owner.

2.2 OPERATION

A Slide Gate Operators:

1. Model: CSL24UL.
2. Operation: Gear driven.
3. Meet UL 325, UL 991, ASTM F2200, and CAS C22.2 No. 247.
4. Motor: 24 VDC, continuous duty type, sized to gate conditions.
5. Traveling speed: 12 inches per second.
6. Battery backup: [33Ah.]
7. Monitoring and controls:

B. Internet connectivity: MyQ technology with 50 channel FHSS.

C. Radio receiver: Security+ 2.0 technology.

D. Monitored retro-reflective photo eyes.

E. Monitored small profile wired safety edge.

F. Accessories:

1. Monitored safety devices: [Reflective photo eyes.] [Thru-beam photo eyes.] [Wireless edge with transmitter and receiver.] [Wireless edge transceiver.]
2. Wired monitored edges: [Small profile monitored edge.] [Large profile monitored edge.]
3. Plug-in loop detector.
4. Wireless commercial keypad.
5. Internet gateway.
6. [CAPXLV] Smart video intercom.
7. Commercial access control receiver.
8. Heater kit.
9. Transformer: 75 VA, non-jumpered taps, for all common voltages.
10. Control circuit: 24 VDC
11. Required external sensors: See 1.5B. Specify photo eyes or gate edges or a combination thereof to be installed such that the gate will reverse in either direction upon sensing an obstruction.
12. Optional control devices (choose one, or more, of the following): card reader, key-switch, radio control, pushbuttons, free egress vehicle detectors, vehicle obstruction loop detectors, keypads, seven day timers or various emergency vehicle open devices as dictated by local code.

2.3 CONCRETE MIX

A. Concrete for pad shall be ASTM C-94 Portland Cement concrete with maximum 3/4-inch aggregate having a minimum compressive strength of 3,000 PSI at 28 days.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Locate concrete mounting pad in accordance with approved shop drawings and in compliance with local building codes.

B. Make sure that supporting posts or pilasters are adequate to support the gate and operator. Do not proceed with installation if supports are inadequate.

3.2 INSTALLATION

A. Install gate operator in accordance with the safety regulations and the manufacturer's product literature and installation instructions, current at the time of installation. Coordinate locations of operators with contract drawings; other trades and shop drawings.

B. Installer shall ensure that the electrical service to the operator is at least 20A. Electrical wiring to conform to NEC and manufacturer's installation instructions.

3.3 FIELD QUALITY CONTROL

A. Test operator through ten full open and close cycles and adjust for operation without binding, scraping or uneven motion. Test limit switches for proper open and close limit positions.

B. All anchor bolts and support post connections shall be fully tightened in the finished installation.

C. Owner, or owner's representative, shall complete "check list" with installing contractor prior to final acceptance of the installation and submit completed warranty documentation to manufacturer.

3.4 CONTINUED SERVICE AND DOCUMENTATION

A. Train owner's personnel on how to safely shut off electrical power, release and manually operate the gate. Additionally, demonstrate the general maintenance of the gate operator and accessories and provide one copy of "Programming and Operations Manual" for the owner's use. Manuals will identify parts of the equipment for future procurement.

END OF SECTION 323100

SECTION 323113.1 – STEEL SECURITY FENCES AND GATES - ORNAMENTAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and service required to furnish and install ornamental fencing, and gates according to the layout shown on the Contract Drawings. Height of the fencing shall be eight (8) feet tall.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Concrete: Section 031000

1.3 SUBMITTALS

A. Comply with provisions of Section 013323. At the time of submission, the Contractor shall in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

B. Shop Drawings:

1. Indicate details of fabrication and installation, including but not limited to fence height, post spacing, dimensions, unit weights and footing details.

C. Manufacturer's Literature:

1. Descriptive data of installation methods and procedures;
2. Standard drawings of fence and gate installation.

1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Deliver materials with manufacturer's tags and labels.

B. Handle and store material as to avoid damage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel material for fence framework (i.e., corrugated pales, rails and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/A924M, with a minimum yield strength of 45,000 psi (310 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM

A653/A653M with a minimum zinc coating weight of 0.90 oz/ft^2 (276 g/m^2), Coating Designation G-90.

B. Material for corrugated pales shall be a nominal 2.75 inches by 75 inches by 14 Ga. The cross-sectional shape of the rails shall conform to the manufacturer's (Impasse II® rail, or approved equal) design a nominal 2 inches by 2 inches by 11 Ga. Pre-drilled holes in the rail shall be spaced 6 inches on center, providing a pale airspace of no greater than 3.25 inches. Tamperproof fasteners shall be used to fasten each pale to rail at every intersection. Fence posts and gate posts shall meet the minimum size requirements of Table 1.

2.2 COMPONENTS

Components of the fencing system shall be in accordance with the following requirements:

Table 1 – Minimum Sizes for Impasse II Posts (or approved equal)

Fence Posts (Nominal)	Panel Height
3" x 2.75" x 12 Ga. I-Beam	Up to & Including 8' Height
4" x 2.75" x 11 Ga. I-Beam	Over 8' Height up to & including 10' Height

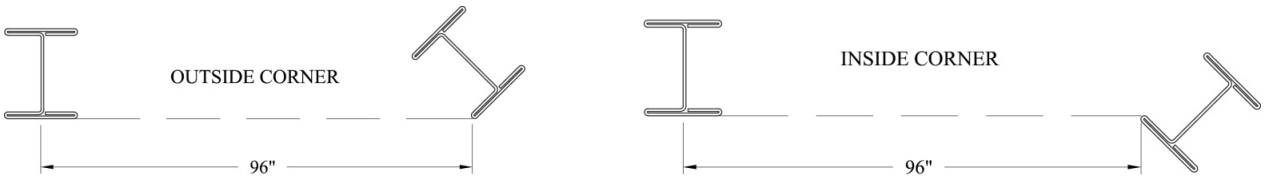
Gate Leaf	Gate Height			
	Up to & Including 6'	Over 6' Up to & Including 8'	Over 8' Up to & Including 10'	Over 12'
Up to 4'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
4'1" to 6'	3" x 12Ga.	3" x 12 Ga.	4" x 11 Ga.	4" x 11 Ga.
6'1" to 8'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
8'1" to 10'	4" x 11 Ga.	6" x 3/16"	6" x 3/16"	6" x 3/16"
10'1" to 12'	6" x 3/16"	6" x 3/16"	6" x 3/16"	8" x 1/4"
12'1" to 16'	6" x 3/16"	6" x 3/16"	8" x 1/4"	8" x 1/4"

Table 2 – Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117, D714 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D2244, D523 (60˚ Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 3 –Post Spacing		
Span	8' Nominal (95" Rail)	
	Line & End Posts	
Post Size	3" x 2.75" x 12 Ga. I-Beam	4" x 2.75" x 11 Ga. I-Beam
Post Settings ± ¼" O.C.	96"	96"

**For Corner Posts see Figure 1*



2.3 CONCRETE MIX

A. Concrete for footings shall be ASTM C-94 Portland Cement concrete with maximum 3/4-inch aggregate having a minimum compressive strength of 3,000 PSI at 28 days.

2.4 GATES

A. Gates shall be of the types and sizes shown on the Drawings. Gate filler fabric shall be of the same as that used in fence.

B. Hinges shall be per manufacturer drawings of ornamental fence.

C. Latches and Keepers:

1. Gate latch shall be of eccentric double locking type, which engages strike securely bolted to either gate frame or gatepost at both top and bottom. Latches shall be readily locked with padlock.
2. Gatekeeper shall be furnished with each gate frame to automatically engage gate frame when swung to open position.

D. Gate manufacturer and supplier shall be responsible for all hardware associated with attaching gates and removable panels. All hardware and accessories shall be of similar color of the fence materials, where possible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All new installation shall be laid out by the contractor in accordance with the construction plans.

B. Fence post shall be spaced according to Table 3, plus or minus 1/4 inch. For installations that must be raked to follow sloping grades, the post spacing dimension must be measured along the grade. Fence panels shall be attached to the line and end posts with fasteners supplied by the manufacturer. Attachment to corner post shall be made using brackets and fasteners supplied by the manufacturer

(See Figure 1). Posts shall be set in concrete footers having a minimum depth of 36" (Note: In some cases, local restrictions of freezing weather conditions may require a greater depth). The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

C. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces:

1. Remove all metal shavings from cut area.
2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
3. Apply 2 coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1-3 above will negate warranty. Ameristar spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of non-Ameristar parts or components will negate the manufacturer's warranty.

D. Gate posts shall be spaced according to the manufacturer's gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacture of the gate and shall be installed per manufacturer's recommendations.

3.2 COMPLETION

A. Adjust brace rails and tension rods for rigid installation.

B. Tighten hardware, fasteners, and accessories.

C. The area of installation shall be left free of debris caused by the installation of the fence.

END OF SECTION 323113.1

SECTION 329200 – LAWNS AND GRASSES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

1.2 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.

B. Earthwork: Section 312000

1.3 MAINTENANCE

A. Maintenance shall begin immediately following the last operation of installation for each portion of lawn.

B. Lawns shall be maintained by watering, mowing, and for resodding for a period of forty-five (45) days. At the end of this period an inspection will be made and any deficiencies, which may be attributable to the Contractor, will be noted in writing. At this time, the Owner will assume the maintenance. Another inspection will be made at the beginning of the next planting season, and any of the previously noted deficiencies still existing shall be repaired by the Contractor.

1.4 INSPECTION FOR ACCEPTANCE

A. The Inspection of the Work:

1. The inspection of the work of lawns to determine the completion of contract work exclusive of the possible replacement of plants, will be made by the Architect/Engineer upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.

B. Acceptance:

1. After inspection, the Contractor will be notified in writing by the Owner of acceptance of all work of this Section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies of the requirements of completion of the Work.

PART 2 - PRODUCTS

2.1 WATER

A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life.

B. Hose and other watering equipment required for the Work shall be furnished by the Contractor.

2.2 TOPSOIL

A. The Contractor shall furnish and place sufficient topsoil for the seeding and installation of sod.

2.3 FERTILIZER

A. Commercial fertilizer for lawn areas shall be complete fertilizer, formula 10-10-10, for lawns and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guarantee analysis. Any fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted.

B. Fertilizer shall be applied at the rate of 25 pounds per 1,000 square feet.

2.4 GRASS SEED

A. The seed mixture to be sown shall be in the following proportions:

Common Name	Proportion By Weight	% of Purity	% of Germination
Fine Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.

C. Germination must be certified to conform to the following minimums:

Purity	90%
Germination	85%

2.5 SOD

A. Sod shall be at least 70% Bluegrass, strongly rooted and free of pernicious weeds.

B. It shall be mowed to a height not to exceed 3 inches before lifting, and shall be of uniform thickness with not over 1-1/2 inches or less than 1 inch of soil.

2.6 MULCH

A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.

B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2-inch loose depth).

C. Mulch on slopes greater than 1: 3 shall be held in place with turf reinforcing mat.

D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with erosion control netting.

PART 3 - EXECUTION

3.1 TIME OF PLANTING

A. Planting operations shall be conducted under favorable weather conditions during seasons which are normal for such work as determined by accepted practice in the locality of the project. At the option and on full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

3.2 LAWNS

A. Areas to be sodded are designated on the Drawings. All other lawn areas, including areas of cut and fill and where existing ground has been disturbed by construction operations shall be seeded.

B. Fertilizer:

1. Fertilizer shall be applied at the rate of 25 pounds per 1,000 square feet to the lawn area being prepared for planting and mixed lightly into the top few inches of topsoil. Fertilizer may be mixed with and distributed with grass seed.

C. Planting of Lawns:

1. Sowing of Seed:

a. Immediately before any seed is to be sown, the ground shall be scarified as necessary, and shall be raked until the surface is smooth, friable and of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical spreader at the rate of 4 pounds per 1,000 square feet of area, lightly raked, rolled with a 200-pound roller and watered with a fine spray. The method of seeding may be varied at the discretion of the Contractor on his own responsibility to establish a

smooth, uniform turf composed of the grasses specified. The sowing of seed shall be done only within the season extending from March 1st to May 15th and from September 1st to October 15th, unless other seasons may be approved by the Owner.

2. Laying of Sod:

   a. Before any sod is laid, all soft spots and inequalities in grade shall be corrected. Fertilizer spread shall be raked in. Sod shall be laid so that no voids occur, tamped or rolled and then thoroughly watered. The complete sodded surface shall be true to finished grade, even and firm at all points. Sodding shall be done only within the seasons extending from March 1st to May 15th and from September 1st to October 15th, unless other seasons may be approved by the Owner.

3. Sod on Slopes:

   a. Sod on slopes 2 to 1 or steeper shall be held in place by wooden pins about 1-inch square and about 6 inches long driven through the sod into the soil until they are flush with the top of the sod, or by other approved methods for holding the sod in place.

4. Mulching:

   a. All seeded areas are to be mulched with Conwed Hydro Mulch, Silva-Fiber, or equal, or with clean straw as specified under PRODUCTS. Mulch shall be applied at the rate of 1,500 pounds per acre. It may be applied with hydraulic equipment or may be added to the water slurry in a hydraulic seeder and the seeding and mulching combined in one operation. Clean straw may be spread by hand to cover the seeded areas at a depth of two (2) inches. Erosion control netting shall be installed and anchored per manufacturer's instructions in areas of slopes, ditches, or surface water runoff.

3.3 CLEAN UP

A. All soil, peat or similar material which has been brought over paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of the planting all excess soil, stone and debris which have not previously been cleaned up shall be removed from the site or disposed of as directed by the Owner. All lawns shall be prepared for final inspection.

3.4 OTHER WORK

A. The Contractor also shall be responsible for the repair of any damage caused by his activities or those of his subcontractors, such as the storage of topsoil or other materials, operations or equipment, or other usages to all on-site areas outside the contract limits. Such repair operations shall include any regrading, seeding or other work necessary to restore such areas to an acceptable condition.

3.5 QUALITY CONTROL

A. Areas seeded shall be protected until a uniform stand develops, when it will be accepted and the Contractor relieved of further responsibility for maintenance. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square foot in size will be allowed up to a maximum of 10 percent of any area.

END OF SECTION 329200

SECTION 329300 – PLANTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, and services required for installation and maintenance of planting beds, plants and accessories as shown on the Drawings and required by the Specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to Work of this Section.

B. Earthwork: Section 312000

C. Erosion and Sedimentation Control: Section 312502

1.3 INSPECTION FOR ACCEPTANCE

A. The Inspection of the Work:

1. The inspection of the work of plantings to determine the completion of contract work exclusive of the possible replacement of plants, will be made by the Architect/Engineer upon written notice requesting such inspection submitted by the Contractor at least ten (10) days prior to the anticipated date.

B. Acceptance:

1. After inspection, the Contractor will be notified in writing by the Owner of acceptance of all work of this Section, exclusive of the possible replacement of plants subject to guaranty, or if there are any deficiencies of the requirements of completion of the Work.

1.4 WARRANTY

A. Furnished plants shall be guaranteed to be in a vigorous growing condition for a period of 24 months regardless of the contract time period. A plant shall be replaced one time under this guarantee. A written calendar time period for the guarantee of plant growth shall be furnished to the Owner.

PART 2 - PRODUCTS

2.1 WATER

A. Water used in this work shall be suitable for irrigation and free from ingredients harmful to plant life.

B. Hose and other watering equipment required for the Work shall be furnished by the Contractor.

2.2 TOPSOIL

A. The Contractor shall furnish and place sufficient topsoil for the installation of trees, shrubs, and other plants.

2.3 FERTILIZER

A. Commercial Fertilizer:

1. Commercial fertilizer for lawn areas shall be complete fertilizer, formula 10-10-10, for lawns and shall conform to the applicable state fertilizer laws. Fertilizer shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guarantee analysis. Any fertilizer which becomes caked or otherwise damaged making it unsuitable for use will not be accepted.

B. Lime:

1. The lime used for lawn areas shall be agricultural limestone.

2.4 PEAT

A. Peat shall be a natural product of peat humus mixed at a ratio of 1/3 peat to 2/3 topsoil.

2.5 PLANTS

A. Plants shall be provided that have the height and number of primary stems as recommended by the American Association of Nurserymen. Plants shall be furnished in the sizes indicated. Plants shall be nursery grown conforming to the American Association of Nurserymen standards and shall be the varieties specified on the Drawings.

2.6 MULCH

A. All shredded hardwood mulch shall be free from weeds, mold and other deleterious materials. All plantings shall be mulched within 48 hours of planting.

PART 3 - EXECUTION

3.1 TIME OF PLANTING

A. The Contractor shall be notified in writing by the Owner when other divisions of the Work have progressed sufficiently to commence work of planting. Thereafter, planting operations shall be conducted under favorable weather conditions during the next season or seasons which are normal for such work as determined by accepted practice in the locality of the project. At the option and on full responsibility of the Contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

3.2 PLANTING BEDS

A. Planting beds shall be treated with the following improvements:

1. Peat: Peat shall be a natural product of peat humus mixed at a ratio of 1/3 peat to 2/3 topsoil.
2. Fertilizer: Fertilizer shall be applied at the rate of 20 pounds per 1,000 square feet to the lawn area being prepared for planting and mixed lightly into the top few inches of topsoil.
3. Mulch: Mulch shall be applied at the rate of 3 inches to 4 inches of uniform thickness.

B. Plants shall be installed as recommended by the American Association of Nurserymen, and at the locations and spacings indicated on the Drawings.

3.3 MAINTENANCE

A. Maintenance shall begin immediately following the last operation of installation and shall continue in accordance with the requirements herein.

B. Planting Beds shall be maintained by watering and weeding for a period of forty-five (45) days. At the end of this period an inspection will be made and any deficiencies, which may be attributable to the Contractor, will be noted in writing. At this time, the Owner will assume the maintenance. Another inspection will be made at the beginning of the next planting season, and any of the previously noted deficiencies still existing shall be repaired by the Contractor.

3.4 CLEAN UP

A. All soil, peat or similar material which has been brought over paved areas by hauling operations or otherwise, shall be removed promptly, keeping these areas clean at all times. Upon completion of the planting all excess soil, stone and debris which have not previously been cleaned up shall be removed from the site or disposed of as directed by the Owner. All areas shall be prepared for final inspection.

3.5 OTHER WORK

A. The Contractor also shall be responsible for the repair of any damage caused by his activities or those of his subcontractors, such as the storage of topsoil or other materials, operations or equipment, or other usages to all on-site areas outside the contract limits. Such repair operations shall include any regrading, seeding or other work necessary to restore such areas to an acceptable condition.

END OF SECTION 329300

DIVISION 33

UTILITIES

SECTION 330523 – BORING AND JACKING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Northern Kentucky Water District (NKWD) Standard Specifications, Drawings and Details.

B. Earthwork: Section 312000

C. Piping: Division 33

1.3 SUBMITTALS

A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering.

B. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.

C. Comply with all requirements of Section 013323.

D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Carrier Pipe		X							X			
Casing Pipe		X										
Casing Spacers		X		X								
Casing End Seals		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

A. See Section 2.08 on NKWD Standard Drawing 100-E, NKWD Standard Drawing 114 and Division 33.

2.2 CASING PIPE

A. See Section 2.08 on NKWD Standard Drawing 100-E and NKWD Standard Drawing 114 for product specifications. Per KYTC requirements, 24-inch steel casing pipe shall be per AWWA C200 with a minimum wall thickness of 0.5 inches. This wall thickness requirement supersedes the minimum wall thicknesses listed on drawing 100-E.

2.3 CASING SPACERS

A. Stainless Steel Casing Spacers: Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.

B. See Section 2.08 on NKWD Standard Drawing 100-E and NKWD Standard Drawing 114 for additional requirements.

2.4 CASING END SEALS

A. Wrap-around end seals - Wrap-around end seals shall be made of a waterproof flexible coal tar membrane reinforced with fiberglass, or synthetic rubber. The two exposed edges of the wrap-around seal shall be adhesively bonded forming a watertight seal. The ends of the wrap shall be sealed on the casing and carrier pipe by stainless steel bands. Wrap-around end seals shall be made by Calpico Inc., Advance Products & Systems, Inc., or equal.

B. See Section 2.08 on NKWD Standard Drawing 100-E and NKWD Standard Drawing 114 for additional requirements.

PART 3 - EXECUTION

3.1 CROSSINGS - GENERAL

A. Where designated on the drawings, crossings beneath state maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.

B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place, and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75 inches from the casing pipe wall at all times. Manufacturer's recommendations may govern these requirements.

C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.

D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.2 CROSSING - RAILROAD

A. All water or sewer line crossings of railroads shall be prominently marked at railroad right-of-way lines, on both sides of the track crossing, by durable, weatherproof signs located over the center of the water line. When possible, signs shall be located so that when standing at one sign, the other marker is visible. Signs shall show the following:

1. Name and address of Owner.
2. Contents of pipe.
3. Pressure in pipe.
4. Pipe depth below grade at point of sign.
5. Emergency telephone number in event of pipe rupture.

B. Contractor must adhere to all safety requirements of the Railway line involved in the crossing.

1. All operations shall be conducted so as to not interfere with, interrupt, or endanger the operation of trains nor damage, destroy, or endanger the integrity of railroad facilities. The Contractor shall provide written acknowledgment to the Railway line that the Contractor and its employees have received, read, and understood the safety rules. Operations will be subject to inspection at any and all time.
2. All cranes, lifts, or other equipment that will be operated in the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded in an approved manner.
3. At all times, while work is in progress, a field supervisor with no less than twelve (12) months experience in the operation of the equipment being used shall be present. If boring equipment or similar machines are being used, the machine operator shall also have a minimum of twelve (12) months experience in the operation of the equipment being used.
4. Whenever equipment or personnel are working closer than fifteen (15) feet from the centerline of an adjacent track, that track shall be considered as being obstructed. Operations closer than fifteen (15) feet from the centerline of the track shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work.
5. Crossing the tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the railroad line. A separate permit must be obtained, by the Contractor, for any "at grade" crossing of the tracks.

C. All railroad costs incurred by the Railway line due to work associated with the crossing (inspection, flagging, track work, etc.) shall be paid by the Owner. However, it is the Contractor's responsibility to coordinate the work with the Railway.

D. Contractor shall notify the Railway line's area engineer a minimum of 14 working days prior to desired start of construction.

3.3 BORING AND JACKING

A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.

B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.

1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.

3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 1 inch. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
5. Any method which does not have this boring arrangement will not be permitted. Contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.

C. In the event an obstruction is encountered in boring which cannot be removed and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.

D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.

E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.4 CONTRACTOR'S RESPONSIBILITIES

A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.

B. Attend a preconstruction meeting at the construction site with the City Inspector, Railroad Inspector, Highway Inspector Engineer, and Contractor being present.

END OF SECTION 330523

SECTION 331113 – WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Northern Kentucky Water District (NKWD) Standard Specifications, Drawings and Details.

B. Valves - Utility Services: Section 331216

C. Boring and Jacking: Section 330523

1.3 SUBMITTALS

A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.

B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe and Fittings		X							X			
Couplings and Adapters		X										
Detectable UG Tape		X		X								
Tracer Wire		X		X								
Corp. Stops and Fittings		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.5 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:

1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1⁄2-acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.

2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1⁄10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials.

B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters means those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.

2. The activity will not occur within surface waters of the Commonwealth identified as perpetually-protected (e.g. deed restriction, conservation easement) mitigation sites.

3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.

4 For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.

5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.

6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.

7 Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).

8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.

9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.

10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.

11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50 foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.

12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.

13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.

14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.

15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:

    a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
    b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
    c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
    d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
    e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
    f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
    g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
    h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
    i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a

spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.6 CONSTRUCTION IN A FLOODPLAIN

A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.

B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. See Section 2.01 Water Main Pipe and Fittings on NKWD Standard Drawings 100-C and 100-D for product specifications.

2.2 POLYVINYL CHLORIDE (PVC) PLASTIC NON-PRESSURE PIPE

A. PVC Non-Pressure Pipe (4 inches thru 15 inches):

1. PVC sewer pipe shall be ASTM D3034, SDR 35, with ASTM D3213 integral bell and spigot rubber gasketed joints. Gasketed fittings shall conform to the same specifications and be supplied with the pipe.

2.3 COUPLING AND ADAPTORS

A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters.

The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Rockwell
Style 138	411

E. Transition couplings for joining pipe of different outside diameters-

Dresser	Rockwell
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Rockwell
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

2.4 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

A. Detectable underground utility warning tapes which can be located from the surface by a pipe detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.

B. The tape shall consist of a minimum thickness 0.35 mils solid aluminum foil encased in a protective inert plastic jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.

C. The minimum overall thickness of the tape shall be 5.5 mils and the width shall not be less than 2 inches with a minimum unit weight of 2-1/2 pounds/1 inch by 1,000 feet. The tape shall be color coded and imprinted with the legend as follows:

Type of Utility	Color Code	Legend
Water	Blue	Caution Buried Water Line Below

D. Detectable underground tape shall be "Detect Tape" as manufactured by Allen Systems, or equal.

E. Installation of detectable tapes shall be per manufacturer's recommendations and shall be as close to the grade as is practical for optimum protection and detectibility. Allow a minimum of 18" between the tape and the line.

F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.5 TRACER WIRE

A. See Section 2.01.E Tracing Wire on NKWD Standard Drawing 100-D for product specifications and NKWD Standard Drawing 111 for Tracing Wire additional requirements.

2.6 POLYEHTYLENE WRAP

A. See Section 2.02 Polyethylene Wrap on NKWD Standard Drawing 100-D for product specifications.

2.7 HYDRANTS

A. See Section 2.05 Fire Hydrants on NKWD Standard Drawing 100-E for product specifications and NKWD Standard Drawing 109 for additional Hydrant Assembly requirements.

2.8 TAPPING SLEEVE AND VALVE

A. See Section 2.03.B Tapping Sleeve and Valves on NKWD Standard Drawing 100-D for product specifications.

2.9 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.

B. Concrete shall be 3500 psi and reinforcing bars shall be installed as indicated on the details.

C. See NKWD Standard Drawings 104 and 104A for additional requirements.

2.10 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

PART 3 - EXECUTION

3.1 INSTALLATION

A. See Part III Installation of Water Mains and Appurtenances on NKWD Standard Drawings 100-E, 100-F, 100-G and 100-H and NKWD Standard Drawings 103 and 103A for installation requirements.

B. Final backfill of pipe above the pipe zone in gravel pavement yard areas, paved drive areas and within 3 feet of the KY 16 edge of pavement shall be flowable fill.

C. Pipe below Utility Building, including the footings, shall be encased with flowable fill in lieu of granular bedding and pipe zone backfill material per the Geotechnical report recommendations in section 7.6.

3.2 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.

B. For cradle and encasement, concrete shall be 3500 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.

C. For thrust blocks and anchors, concrete shall be 3500 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.

D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

D. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

E. See NKWD Standard Drawings 104 and 104A and Section 3.17 Thrust Blocking on NKWD Standard Drawing 100-G for additional requirements.

3.3 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. Contractor shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.

C. See NKWD Standard Drawing 103-A for installation and additional requirements.

3.4 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.

B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than that which existed prior to the Contractor's operation.

3.5 REPLACEMENT OF EXISTING MAIL BOXES, CULVERTS, CLOTHES LINE POSTS, FENCES AND OTHER SUCH FACILITIES

A. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.6 TESTING

A. See Section 3.22 Pressure Testing and Leak Detection on NKWD Standard Drawing 100-H for testing requirements.

B. Test pressure for new water lines shall be 250 psi.

3.7 CLEAN UP

A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.8 DISINFECTION OF POTABLE WATER LINES

A. See Section 3.21 Disinfection on NKWD Standard Drawing 100-H for disinfection requirements.

3.9 SETTLEMENT OF TRENCHES

A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

END OF SECTION 331113

SECTION 331216 – VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all valves shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. Northern Kentucky Water District (NKWD) Standard Specifications, Drawings and Details.

C. Piping is specified in Division 33 Specification sections.

1.3 SUBMITTALS

A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 013323.

B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Valves	X	X			X							
Valve Boxes		X										
Tapping Sleeve, Valve	X	X		X	X							

PART 2 - PRODUCTS

2.1 GATE VALVES

A. See Section 2.03 on NKWD Standard Drawing 100-D for product specifications.

B. All buried gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.

C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.

D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

2.2 VALVE BOXES - BURIED VALVES

A. See Section 2.04 on NKWD Standard Drawings 100-E for product specifications.

2.3 TAPPING SLEEVES AND VALVES

A. See Section 2.03 on NKWD Standard Drawing 100-D for product specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in accordance with details on the Contract Drawings, NKWD Standard Drawings and with the manufacturer's recommendations.

B. All valves shall be anchored in accordance with the details on the Contract Drawings.

END OF SECTION 331216

SECTION 331220 – SUBMERSIBLE TANK MIXER

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all materials, labor, equipment start-up services, testing services and training necessary to install a potable water submersible tank mixer as specified herein and shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A.	Water Distribution Piping:	Section 331113
B.	Valves:	Section 331216
C.	Multi-Column Elevated Water Storage Tank:	Section 331619
D.	Pedesphere Elevated Water Storage Tank:	Section 331620

1.3 SUBMITTALS

A. The awarded Bidder shall provide an electronic copy of the following documents.

1. Manufacturer Qualification Document
2. List of Supplied Equipment
3. Manufacturer Product Sheets
4. Electric Power Source Requirements
5. NSF / ANSI Standard 61 Documentation
6. Warranty Statement
7. Operation Manuals

1.4 QUALITY ASSURANCE

A. Continuous Operation Equipment. The mixer shall operate continuously, all day and all night, using 120 VAC as the power source.

B. No Visual Defects. The mixer shall have no visual defects, and shall have high quality welds, assembly, and corrosion resistant finish.

C. Qualified US Manufacturer. The manufacturer of the mixer shall have extensive experience in the production of such equipment, and the equipment shall be manufactured in the continental United States.

D. Warranty. The mixer shall be warranted to be free of defects in materials and workmanship for a period of five (5) years. This equipment warranty shall run directly from the manufacturer of

the equipment to the Owner. The equipment warranty shall not be part of the contract or any required bond.

1.5 REFERENCES

A. Occupational Safety and Health Administration, OSHA

B. Department of Transportation, DOT

C. NSF / ANSI Standard 61

D. Underwriters Laboratories Inc., UL 508

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. The mixer shall be manufactured by Ixom Watercare, Inc. of Dickinson, ND, or Engineer approved equal.

2.2 PERFORMANCE AND FEATURES

A. Complete Water Circulation Required. To meet the project objectives, the tank or reservoir circulation shall be achieved by a single submerged unit within the reservoir capable of providing long distance circulation of water. The mixer shall have a direct measurable flow rate where suction shall enter specified mixer's intake positioned within 2 inches of reservoir floor and discharging water vertically in a sheet flow pattern to induce a large volume, low velocity flow to reach the tank or reservoir water surface. The mixer shall be placement flexible in design to allow best hydraulic positioning for tank or reservoir conditions to prevent hydraulic short circuiting within tank or reservoir. Suction not within 2 inches of tank or reservoir floor is not allowed.

B. Number of units required. To meet the project objectives, the following number of mixers are required.

Qty	**Model**	**Tank or Reservoir**
1	GridBee GS-9 potable tank mixer or approved equal	Taylor Mill Tank

C. Complete Mix: The mixer manufacturer shall guarantee that the subject tank will be completely mixed by the mixer. In continuous operation of the mixer:

1. at least once per 24 hours all water temperatures within the tank shall converge to within 0.8 degrees C; and
2. at least once per 72 hours all chlorine concentrations within the tank shall converge to within 0.18 mg/l.

D. Fit Through Small Hatch Opening: The mixer shall be capable of fitting through a clear, unobstructed opening of 12 inches diameter without requiring disassembly or assembly.

E. Continuous Operation With 120VAC, 20 Amp Power Source: The mixer shall operate continuously during day and night while connected to electric grid power.

F. Stainless Steel Construction: The mixer shall be constructed primarily of Type 316 stainless steel metal for strength and superior corrosion resistance.

G. Motor: The mixer shall be mechanically operated by a submersible motor that meets the following criteria.

1. Direct Drive, with no gearbox and no lubrication maintenance required.
2. Designed for submersible operation. Mixer design shall include flow sleeve or housing around motor to provide water flow past motor per submersible motor design criteria to lower the total motor temperature and increase winding life.
3. Designed for Continuous Operation without overheating or compromising motor life expectancy. Constant, full speed operation, variable frequency drive or other method of speed reduction not required and not allowed.
4. 120 VAC, 20 Amp power source shall be supplied by others and not the mixer manufacturer.

I. Exposed Rotating Protection: The mixer shall not have any rotating equipment openly exposed. Rotating shafts, impellers, and motors shall not be openly exposed, and in the event of any part of the mixer exterior contacting the floor or cord, it shall not cause damage to either.

J. Low Elevation Intake: The mixer shall be supplied with an intake capable of being positioned at the lowest elevation of the tank or reservoir floor. The intake level shall bring water into the mixer at horizontal layer within 2 inches of the tank or reservoir floor to prevent hydraulic short circuiting of inflow water through the tank.

K. Restraint System: The mixer shall not require any brackets, penetrations, rope, ties, or fixed connections to the tank or reservoir columns, walls, or floor below the overflow elevation. The mixer shall allow for placement and servicing without requiring tank or reservoir to be drained. The mixer shall not require the use of a diver or diving team to enter the tank or reservoir to complete placement or service of the specified equipment.

L. Functional for All Water Levels: The mixer shall function properly and not be negatively impacted by fluctuating water levels down to 24 inches of water depth. Devices requiring more than 24 inches of water depth to properly function without damage not allowed.

M. Electrical Control Box: The mixer equipment shall be supplied with a Control Box capable of disconnecting 120 VAC outgoing power to the mixer equipment and meeting the following criteria:

1. NEMA 4X enclosure shall be provided with protection against condensation and moisture in a marine environment.
2. Control Box shall be UL 508 Listed for sound electrical design and safety.
3. Control Box shall include exterior mounted HOA switch, definite purpose contactor for mixer control, exterior display showing green run, red fault indication, and motor

operating amperage, grounding lug, 120 VAC standard three-prong male molded plug, and locking latch for security.

4. Control Box shall include dry contact output (Normally Open and Normally Closed) for run and fault indication, 4-20 mA analog output scaled signal for motor current, and HOA switch position auxiliary dry contacts. Control Box shall include a 24 VDC relay to allow for remote on and off control of the mixer. Integration of inputs/outputs to site PLC/RTU shall be provided by others and not by the mixer equipment manufacture.
5. Control Box shall require a 120 VAC power source, Minimum 20 Amp rated service located near the final placement of the Control Box. SCADA and control functions of the Control Box shall include 24 VDC power for automatic operation, run and fault indication, and 4-20 mA current output. The 120 VAC power source shall be supplied by others and not the mixer equipment manufacturer.

N. The complete mixer shall be NSF / ANSI Standard 61 and NSF / ANSI Standard 372 listed for safe contact with potable water. The mixer shall be NSF / ANSI Standard 61 listed to be safely in contact with a potable water volume as low as 5,000 gallons.

O. Maintenance Requirements: The mixer shall operate normally with the following maintenance features.

1. No scheduled lubrication is required of any system components including motor.
2. No spare parts shall be required to be kept on hand.

P. Equipment Support: The mixer manufacturer shall offer full factory support with the following staff and support services.

1. Customer Service, Application Engineering, and Equipment Engineering staff available by email or toll free phone.
2. Field personnel for placing and servicing the specified mixer.
3. Public website with detailed information available describing the mixer for this project and related applications of this equipment into potable water tanks and reservoirs.
4. Service plans for preventative maintenance and continued technology improvements for the specified mixer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of the tank mixer shall be in accordance with the installation plans and guidelines provided by the mixer manufacturer and as specified in the installation section of the IOM manual.

3.2 FIELD SERVICES

A. Placement and startup. Equipment manufacturer shall provide placement and startup performed by equipment manufacturer's full time factory employees trained in the operation of the mixer who have completed OSHA safety trainings applicable to this type of equipment placement and startup.

END OF SECTION 331220

SECTION 331619 – MULTI-COLUMN ELEVATED WATER STORAGE TANK (BID OPTION NO. 1)

PART 1 -GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services in connection with the design, fabrication, erection, painting, disinfection and testing of an all welded steel multi-column elevated water storage tank, as described on the Drawings and in the Specifications. The tank shall have a capacity of 500,000 gallons.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A.	Cast-In-Place Concrete:	Section 033100
B.	Earthwork:	Section 312000
C.	Steel Water Storage Tank Coatings:	Section 099713.24
D.	Water Distribution Piping:	Section 331113
E.	Geotechnical Exploration Report:	Appendix A

1.3 GENERAL DESIGN

A. The tank shall be furnished and erected in strict conformity with the current requirements of American Water Works Association "AWWA Standard for Welded Steel Tanks for Water Storage" AWWA D 100 (latest edition) and the American Welding Society Standard D5 where applicable and unless otherwise set out herein. The tank shall be of welded construction.

B. The tank shall be a steel cylindrical tank of the oblatoid type supported by round tubular columns on a concrete foundation to which it is securely anchored, commonly referred to as "multi-column".

1.4 QUALIFICATIONS OF THE TANK MANUFACTURER

A. The design and construction of the multi-column elevated water storage tank shall only be undertaken by a Contractor with a minimum of five years' experience with elevated tank construction. The Contractor must be able to demonstrate experience through the design and construction of at least five multi-column elevated water storage tanks. The Contractor shall not subcontract the design and/or erection of the steel tank and supporting tower.

B. As providing a safe work environment is critical for this project, other contractors, and the community, all tank contractors shall have an Experience Modification Rate (EMR) below 0.75 and a Total Recordable Incident Rate (TRIR) below 2.5 for the last three (3) years. Bidders are

required to verify the above requirement by providing with their proposal a statement from their insurance carrier confirming the EMR requirement, and their last three (3) years of OSHA 300 Logs to confirm the TRIR requirement.

1.5 FOUNDATIONS

A. A log of the soils exploration borings taken and copies of the Foundation Investigation are attached to these Specifications in Appendix A.

B. Foundation details on the Drawings are representative only. The actual foundation to be constructed under this Contract shall be designed by the tank manufacturer in accordance with AWWA D-100 based on recommendations in the Geotechnical report and detailed calculations and shop drawings prepared by a registered Professional Engineer in the State of Kentucky shall be submitted to the Engineer for review.

C. The foundation design shall be based on a concrete compressive strength (fc') = 4,000 psi with maximum allowable compressive stress (fc) = 1800 psi (working stress design). Maximum allowable reinforcing steel tensile stress (fs) shall be 24,000 psi.

D. The top of the foundations shall be established at 6 inches above high point of finished grade at the pier or foundation location.

E. The following design parameters shall apply and the structures shall safely withstand the following loads acting separately or in the combinations noted.

1. Weight of the Structure

2. Weight of the Water in the Tank filled to the overflow elevation

3. Wind Stresses Incurred by Blowing at a Minimum Rate of 100 MPH from any Direction

4. Earthquake Zone one (1) per AWWA D100

5. Snow Load Minimum of 25 PSF as Specified in AWWA D100

6. Combination of 1 and 3 above

7. Combination of 1, 2, and 4 above

8. Combination of 1, 2 and 5 above

F. The AWWA D100 (Latest Edition), Part 3.1 Design Loads shall apply to this Contract.

1.6 SUBMITTALS

A. Each bidder shall submit **with their bid** separate Drawings showing in detail the following:

1. The general design of the proposed tank indicating thickness of plate, overall elevations and dimensions and accessories.

2. The proposed design of the foundations for the tank.

3. A list of five multi-column elevated water storage tanks constructed with the last five years, including the name of the Owner, tank capacity and consulting engineer.

B. Shop Drawings:

1. After the award, the Contractor shall furnish detailed plans of the elevated water storage tanks, including detailed Drawings for foundations, showing the thickness of plate and other data in connection with the work, for review by the Engineer, and the Engineer's review must be secured before any work is commenced.

C. Structural drawings and design computations certified by a Professional Engineer registered in Kentucky shall be submitted with shop drawings. These shall include all design assumptions, loading conditions (including ladders), details, dimensions, plate thickness, welds, and foundation design. The design coefficients and resultant loads for snow, wind and seismic forces and methods of analysis shall be documented.

D. The Contractor shall be required to submit qualifications of welding operators in writing to the Engineer for review prior to use of the operator on the job.

E. Comply with the requirements of Section 013323.

1.7 GUARANTEE

A. The tank Contractor shall guarantee its work for a period of one year from the substantial completion date to the extent they will repair any defects caused by faulty design, workmanship or material furnished under the contract documents.

B. All guarantees obtained by the tank Contractor from the manufacturer or installer of paint, equipment or accessories not manufactured by the tank Contractor shall be obtained for the benefit of the Owner.

1.8 STANDARD SPECIFICATIONS AND REFERENCES

All work on the water storage tank shall fully conform to the requirements of the latest published editions of the following standard specifications and references as described herein.

A. American Concrete Institute (ACI) 318 - Building Code Requirements for Reinforced Concrete

B. American Concrete Institute (ACI) 301 –Specifications for Structural Concrete

C. American Society for Testing and Materials (ASTM)

D. AWWA (American Water Works Association) D100 - Standard for Welded Carbon Steel Tanks for Water Storage

E. AWWA D102 - Standard for Painting Steel Water Storage Tanks

F. AWWA C652 - Standard for Disinfection of Water Storage Facilities

G. American Welding Society (AWS) D1.1 – Structural Welding Code - Steel

H. National Fire Protection Association (NFPA)

I. National Sanitation Foundation (NSF) 61 - Materials in contact with Potable Water

J. Occupational Safety and Health Administration (OSHA)

K. Steel Structures Painting Council Manual - Volume 1 - Good Painting Practice

L. Steel Structures Painting Council Manual - Volume 2 - Systems and Specifications

M. Steel Structures Painting Council / Society of Protective Coatings (SSPC)

N. ASCE 7 - Minimum Design Loads for Buildings and Other Structures

PART 2 - PRODUCTS

2.1 GENERAL

A. Materials in every case shall conform with the requirements set out in Section 2 of the AWWA D100 (latest edition) Standard. ASTM Specification numbers and grade of material shall be shown on proposal Drawings.

B. The minimum thickness for any part of the structure shall be 3/16 inch for parts not in contact with water and ¼ inch for parts in contact with water. All portions of the tank including the roof shall be of watertight construction.

2.2 OVERFLOW

A. The tank shall be provided with a 16" overflow pipe as shown on the Drawings. The steel overflow pipe shall be provided with a weir or funnel at the elevation of the high water line. The overflow shall be routed from the weir to closely match the roof contour and extend down the outside of the tan as indicated on the drawings. At the lower end of the overflow pipe shall be a flanged cast iron flap valve with stainless steel pins; between the pipe and the valve shall be a 316L Stainless Steel 24 mesh insect/rodent screen. Overflow pipe shall discharge onto a concrete splash block as shown on the Drawings. Overflow pipe shall be ASTM A 53, Standard weight (Schedule 40), and welded steel pipe. Paint exterior in field same system and color as exterior of tank.

2.3 INLET / OUTLET PIPING

A. The vertical combined inlet/outlet pipe through the riser and into the tank bowl shall be a 16 inch standard weight carbon steel pipe with appropriate transition to a ductile iron cross of the same diameter. The vertical pipe shall extend up into the tank bowl as shown on the drawings.

Exterior of pipes exposed to stored water shall be coated with tank interior wet coating system specified.

B. Removable silt stops shall be provided near the base of the riser to prevent flow of sediment into the outlet piping and into the distribution system. Silt stop shall be 6 inches above the riser floor.

2.4 LADDERS AND SAFETY DEVICES

The following ladders and/or appurtenances shall be provided on the tanks. All ladders systems shall conform to current OSHA standards. All ladders shall be supplied with anchor points at the top.

A. A fixed tower ladder equipped with both a safety cage and a fall prevention device equal to DBI/Sala, 3/8" stainless steel, Lad-Saf X2 Model stainless steel system, or approved equal, shall be mounted on the outside of the tank. The ladder shall extend from 2 feet above the foundation to the balcony. The ladder cage shall extend from 8 feet above the foundation to the balcony and shall have a hinged and locking access cover at the bottom of the cage as shown on the Drawings. The fall prevention device rail shall extend 4'-6" above the balcony floor at the top of the ladder. Provide a sleeve stop at the top of the rail.

B. A fixed ladder equipped with a fall prevention device indicated above, extending down inside the tank from the manhole in the roof to within 1 foot of the bottom.

C. A fixed ladder equipped with a fall prevention device indicated above, extending down inside the tank from the balcony access manhole to within 1 foot of the bottom.

D. A fixed ladder on the outside of the roof extending from the balcony to the top of the roof. Ladder shall be equipped with a fall prevention device indicated above.

E. A fixed ladder inside the riser extending from the man way up into the bowl of the tank. Ladder shall be equipped with a fall prevention device indicated above.

F. A locked cabinet or utility box made of 1/4-inch steel plate shall be mounted or constructed at the base of the tank for storing a minimum of two safety climbing sleeves and belts for emergency use. Lock shall be dead bolt padlock, file proof, cutter proof, saw proof and shock proof, with shackle of 61-65 Rockwell "C" hardness, Catalog No. 1174A2 as available from McMaster-Carr Supply Company, P.O. Box 4355, Chicago, Illinois 60690. Warning signs shall be posted to the effect that no one is to climb tank without safety climbing belt and sleeve on person.

G. Ladders shall be equipped with a fall arrest system meeting OSHA regulations.

H. Ladder side rails shall be a minimum of 3/8-inch by 2-inches with a16-inch clear spacing. Rungs shall be not less than 3/4-inch, round or square, spaced at 12-inch centers. The surface of the rungs shall be knurled, dimpled or otherwise treated to minimize slipping. Ladders shall be secured to adjacent structures by brackets located at intervals not exceeding 10 feet. Brackets shall be of sufficient length to provide a minimum distance of 7 inches from the center of the rung to the nearest permanent object behind the ladder.

2.5 BALCONY

A. The tank shall be equipped with a balcony including a handrail not less than 42 inches high. The handrail shall include a top rail, mid rail and toe bar. The floor shall be perforated for drainage. The railing shall meet OSHA requirements for loading and structure.

2.6 ROOF HANDRAIL

A. The tank shall be equipped with a roof handrail not less them 42 inches high. The handrail shall include a top rail, mid rail and toe bar. The handrail shall encompass the access manholes, vent and finial on the tank roof. There shall be a cutout in the handrail at the location of the tank ladder. Posts shall be installed on each side of the handrail cutout with two lengths of detachable chain (one at the top rail position and one at the mid rail position) spanning the distance between the two posts. Handrail shall comply with OSHA requirements. Handrail shall be supplied with anchor points around the railing.

2.7 MANHOLES, VENT AND FINIAL

A. The tank shall be furnished with manholes, vent and finial as shown and specified. The manholes shall provide access to the inside of the tank and shall be located as shown on the drawings. The roof manhole door shall be solid, watertight and shall overlap the frame opening and extend down around the frame at least 2 inches and shall be provided with hinges and a hasp for locking. Minimum opening dimension shall be 24 inches and a curb at least 4 inches high shall be provided.

B. The frost free roof vent and finial (minimum 20-inch) shall be located near the center of the tank. The roof vent shall be capable of reducing the dangerous air pressures that could develop by the maximum flow of water either entering or leaving the tanks. Maximum flow rate shall be based on a break in the inlet/outlet pipe when the tank is full. The tank vent shall be sized by the tank manufacturer and shall have an intake and relief capacity sufficiently large that excessive pressure or vacuum will not develop during maximum flow rate. The overflow pipe shall not be considered as a tank vent. The vent shall be provided with a 316L Stainless Steel 24 mesh insect/rodent screen to prevent the ingress of birds and animals. Roof vent shall be designed in accordance with AWWA D100 (latest edition) standards to insure fail-safe clog and frost-over resistant ventilation.

C. Manholes, Vent Listing

1. (1) - 36-inch watertight manhole on riser.
2. (1) - 24-inch watertight manhole at tank balcony.
3. (1) - 24-inch exhaust manhole on tank roof.
4. (1) - 30-inch hinged access manhole on tank roof.
5. Vent and finial (minimum size 20 inches).

2.8 GROUNDING

A. Grounding and lightning protection for the tank shall be provided in accordance with the latest edition of NFPA 780, Standard for the Installation of Lighting Protection Systems, except as amended herein.

2.9 IDENTIFICATION PLATE

A. A tank identification plate shall be mounted on the tank riser pipe above the access manhole. The identification plate shall be corrosion resistant and contain the following information:

1. Tank Contractor
2. Contractor's project or file number
3. Tank capacity
4. Height and elevation to overflow
5. Date erected

PART 3 - EXECUTION

3.1 PERMITS

A. The Contractor shall apply and pay to obtain the following permits:

1. FAA permit for any temporary construction, cranes, hoists, etc. during the construction period.

2. Electrical permit.

3. Kentucky surface water permits (as needed).

3.2 SHOP FABRICATION

A. Shop fabrication and shop assembly shall conform to the requirements set out in Section 9 of the AWWA D100 (latest edition) Standard.

3.3 WELDING

A. All welding shall conform to the requirements of AWS and those set out in Section 8 and Section 10 of the AWWA D100 (latest edition) Standard.

B. The Contractor shall be required to submit qualifications of welding operators in writing to the Engineer for review prior to use of the operator on the job.

C. All interior roof lap seams shall be seal-welded.

3.4 ERECTION

A. Field erection shall conform to the requirements set out in Section 10 of the AWWA D100 (latest edition) Standard.

B. Plates subjected to stress by the weight or pressure of the contained liquid shall be assembled and welded in such a manner that the proper curvature of the plates in both directions is maintained. Plates shall be assembled and welded together by a procedure that will result in a minimum of distortion from weld shrinkage.

3.5 INSPECTION

A. Inspection shall conform to the requirements set out in Section 11 of the AWWA D100 (latest edition) Standard and shall be procured by the Owner. All work, whether performed in the shop or field, shall be inspected in accordance with this standard. All inspectiona shall be performed prior to interior and exterior field painting.

3.6 ROOF LAP JOINTS

A. All interior lap joints shall be sealed by means of caulking or continuous seal welding. This shall include penetrations of roof accessories.

3.7 TESTING

A. After the structures have been erected and all seams have been welded, the tank shall be filled with water (furnished by the Owner) and shall be tested for water-tightness in accordance with Section 11.10 of AWWA D 100 (latest edition).

B. Defective seams found in each tank shall be repaired in accordance with requirements of AWWA D 100 (latest edition), Section 11. Tests of water-tightness shall be repeated until each tank is perfectly tight and acceptable to the Engineer.

C. The Contractor shall guarantee the water-tightness of the elevated tank. After the initial filling, the Contractor shall pay for all additional water needed for testing or retesting of the tanks.

3.8 DISINFECTION OF THE TANK (KY Requirements)

A. Upon completion of construction, once application of coating systems is complete, coatings have fully cured in accordance with manufacturer's instructions, field quality control inspection is complete, and prior to placing the water storage tank into service, the tank shall be thoroughly sprayed down and disinfected according to the following in accordance with AWWA C652 (latest edition):

1. Water and chlorine shall be added to the storage facility in amounts such that the solution will initially contain 50 mg/L available chlorine and will fill approximately 5 percent of the total storage volume. This solution shall be sprayed directly onto all surfaces of the water storage facility that would be in contact with water when the water storage facility

is full to the overflow elevation. This solution shall be held in the storage facility for a period of not less than 6 hours. The storage facility shall then be filled to the overflow level by flowing potable water into the highly chlorinated water. It shall be held full for a period of not less than 24 hours.

2. Chlorine shall be added to the storage facility by the method described in Section 4.3.1.1, Section 4.3.1.2, or Section 4.3.1.3 of AWWA Standard C652 (latest edition), such that a uniform chlorine concentration is obtained during the entire filling operation. The actual volume of the 50-mg/L chlorine solution shall be such that, after the solution is mixed with filling water and the storage facility is held full for 24 hours, there will be a free-chlorine residual of not less than 2 mg/L.

3. After the chlorination procedure is completed, all highly chlorinated water shall be purged from the drain piping in accordance with all local and state regulations and bacteriological sampling and testing shall be performed to ensure that no coliform bacteria are present. Two consecutive samples must show negative results, or the disinfection method must be repeated.

4. Upon completion of successful bacteriological testing, the remaining water may be delivered to the distribution system.

B. Disinfection of the tank shall meet all current requirements of the Kentucky State Division of Water, shall conform to AWWA C652 (latest edition) and shall be accomplished to the satisfaction of the Engineer. The Contractor shall furnish the chlorine and accomplish the procedures as specified herein. All necessary water will be furnished by the Owner. Additional water needed for repeated disinfection shall be paid for by the Contractor.

3.9 CLEANUP

A. Upon completion of the work, all construction material and debris shall be removed from the site.

END OF SECTION 331619

SECTION 331620 – PEDESPHERE ELEVATED WATER STORAGE TANK (BID OPTION NO. 2)

PART 1 -GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services in connection with the design, fabrication, erection, painting, disinfection and testing of an all welded steel pedesphere elevated water storage tank, as described on the Drawings and in the Specifications. The tank shall have a capacity of 500,000 gallons.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A.	Cast-In-Place Concrete:	Section 033100
B.	Earthwork:	Section 312000
C.	Steel Water Storage Tank Coatings:	Section 099713.24
D.	Water Distribution Piping:	Section 331113
E.	Geotechnical Exploration Report:	Appendix A

1.3 GENERAL DESIGN

A. The tank shall be furnished and erected in strict conformity with the current requirements of American Water Works Association "AWWA Standard for Welded Steel Tanks for Water Storage" AWWA D 100 (latest edition) and the American Welding Society Standard D5 where applicable and unless otherwise set out herein. The tank shall be of welded construction.

B. The tank shall be an elevated, welded carbon steel water storage tank supported by a steel support pedestal, commonly referred to as a "Pedesphere".

1.4 QUALIFICATIONS OF THE TANK MANUFACTURER

A. The design and construction of the "Pedesphere" style elevated water storage tank shall only be undertaken by a Contractor with a minimum of five years' experience with elevated tank construction. The Contractor must be able to demonstrate experience through the design and construction of at least five "Pedesphere" style elevated water storage tanks. The Contractor shall not subcontract the design and/or erection of the steel tank, pedestal and base cone support structure.

B. As providing a safe work environment is critical for this project, other contractors, and the community, all tank contractors shall have an Experience Modification Rate (EMR) below 0.75 and a Total Recordable Incident Rate (TRIR) below 2.5 for the last three (3) years. Bidders are required to verify the above requirement by providing with their proposal a statement from their

insurance carrier confirming the EMR requirement, and their last three (3) years of OSHA 300 Logs to confirm the TRIR requirement.

1.5 FOUNDATIONS

A. A log of the soils exploration borings taken and copies of the Foundation Investigation are attached to these Specifications in Appendix A.

B. Foundation details on the Drawings are representative only. The actual foundation to be constructed under this Contract shall be designed by the tank manufacturer in accordance with AWWA D-100 based on recommendations from the Geotechnical report and detailed calculations and shop drawings prepared by a registered Professional Engineer in the State of Kentucky shall be submitted to the Engineer for review.

C. The foundation design shall be based on a concrete compressive strength (fc') = 4,000 psi with maximum allowable compressive stress (fc) = 1800 psi (working stress design). Maximum allowable reinforcing steel tensile stress (fs) shall be 24,000 psi.

D. The top of the foundations shall be established at 6 inches above high point of finished grade at the pier or foundation location.

E. The following design parameters shall apply and the structures shall safely withstand the following loads acting separately or in the combinations noted.

1. Weight of the Structure

2. Weight of the Water in the Tank filled to the overflow elevation

3. Wind Stresses Incurred by Blowing at a Minimum Rate of 100 MPH from any Direction

4. Earthquake Zone one (1) per AWWA D100

5. Snow Load Minimum of 25 PSF as Specified in AWWA D100

6. Combination of 1 and 3 above

7. Combination of 1, 2, and 4 above

8. Combination of 1, 2 and 5 above

F. The AWWA D100 (Latest Edition), Part 3.1 Design Loads shall apply to this Contract.

1.6 SUBMITTALS

A. Each bidder shall submit **with their bid** separate Drawings showing in detail the following:

1. The general design of the proposed tank indicating thickness of plate, overall elevations and dimensions and accessories.

2. The proposed design of the foundations for the tank.

3. A list of five "Pedesphere" style elevated water storage tanks constructed with the last five years, including the name of the Owner, tank capacity and consulting engineer.

B. Shop Drawings:

1. After the award, the Contractor shall furnish detailed plans of the elevated water storage tanks, including detailed Drawings for foundations, showing the thickness of plate and other data in connection with the work, for review by the Engineer, and the Engineer's review must be secured before any work is commenced.

C. Structural drawings and design computations certified by a Professional Engineer registered in Kentucky shall be submitted with shop drawings. These shall include all design assumptions, loading conditions (including ladders), details, dimensions, plate thickness, welds, and foundation design. The design coefficients and resultant loads for snow, wind and seismic forces and methods of analysis shall be documented.

D. The Contractor shall be required to submit qualifications of welding operators in writing to the Engineer for review prior to use of the operator on the job.

E. Comply with the requirements of Section 013323.

1.7 GUARANTEE

A. The tank Contractor shall guarantee its work for a period of one year from the substantial completion date to the extent they will repair any defects caused by faulty design, workmanship or material furnished under the contract documents.

B. All guarantees obtained by the tank Contractor from the manufacturer or installer of paint, equipment or accessories not manufactured by the tank Contractor shall be obtained for the benefit of the Owner.

1.8 STANDARD SPECIFICATIONS AND REFERENCES

All work on the water storage tank shall fully conform to the requirements of the latest published editions of the following standard specifications and references as described herein.

A. American Concrete Institute (ACI) 318 - Building Code Requirements for Reinforced Concrete

B. American Concrete Institute (ACI) 301 - Specifications for Structural Concrete

C. American Society for Testing and Materials (ASTM)

D. AWWA (American Water Works Association) D100 - Standard for Welded Carbon Steel Tanks for Water Storage

E. AWWA D102 - Standard for Painting Steel Water Storage Tanks

F. AWWA C652 - Standard for Disinfection of Water Storage Facilities

G. American Welding Society (AWS) D1.1 - Structural Welding Code - Steel

H. National Fire Protection Association (NFPA)

I. National Sanitation Foundation (NSF) 61 - Materials in contact with Potable Water

J. Occupational Safety and Health Administration (OSHA)

K. Steel Structures Painting Council Manual - Volume 1 - Good Painting Practice

L. Steel Structures Painting Council Manual - Volume 2 - Systems and Specifications

M. Steel Structures Painting Council / Society of Protective Coatings (SSPC)

N. ASCE 7 - Minimum Design Loads for Buildings and Other Structures

PART 2 - PRODUCTS

2.1 GENERAL

A. The tank and supporting structure shall be all-welded steel design and construction. All materials, design, fabrication, erection, welding, testing and inspection of the steel tank shall be in accordance with the applicable section of AWWA D100 (latest edition) except as modified herein. The tank shall have a spheroidal shape for capacities of 200,000 gallons and greater.

B. The supporting structure shall be a butt-welded single pedestal having a minimum shaft diameter adequate for the capacity and height of the tower. Transition sections at the top and bottom of the pedestal shall be in accordance with the manufacturer's standard. The transition from the base to the pedestal shall be a truncated cone with a compression ring. The transition from pedestal to tank shall be a double-curved smooth knuckle for tank capacities of more than 150,000 gallons.

2.2 MINIMUM PLATE THICKNESS

A. The minimum thickness for any part of the structure shall be 3/16 inch for parts not in contact with water and 1/4 inch for parts in contact with water. At junctions in plates where meridional forces are discontinuous such as cone to cylinder junctions or cone to base plate junctions, a tension or compression ring may be required to resist radial forces generated by the discontinuous membrane forces. In these regions, allowable stresses shall not exceed the following stress:

1. Tension ring stress shall not exceed the lesser of 15,000 PSI or one half of the minimum specified yield of the plate material.

2. Compression ring stresses shall not exceed 15,000 PSI.

3. The overturning moment used in designing the pedestal and foundation shall include the moment due to eccentricity of the gravity loads caused by deflection of the structure under wind or seismic conditions (i.e. P-delta effect).

2.3 OVERFLOW

A. The tank shall be provided with a 16-inch overflow pipe as shown on the Drawings. The steel overflow pipe shall be provided with a weir or funnel at the elevation of the high water line. The overflow pipe shall extend down from the weir box through the tank, pedestal, and base cone, as indicated on the Drawings. The overflow pipe shall penetrate the base cone wall approximately 1 to 2 feet above grade. At the lower end of the overflow pipe shall be a flanged cast iron flap valve with stainless steel pins; between the pipe and the valve shall be a 316L Stainless Steel 24 mesh insect/rodent screen. Overflow pipe shall discharge onto a concrete splash block as shown on the Drawings. Overflow pipe shall be ASTM A 53, Standard weight (Schedule 40), and welded steel pipe. Paint exterior in field same system and color as exterior of tank.

2.4 INLET / OUTLET PIPING

A. Provide a 16 inch diameter standard weight carbon steel inlet/outlet pipe that extends vertically from the base of the pedestal into the tank bowl. An expansion joint shall be provided in the vertical section of pipe. The expansion joint should be constructed to accommodate any differential movement caused by settlement or thermal expansion and contraction.

B. Exterior of pipes exposed to stored water shall be coated with tank interior wet coating system specified. Exterior of pipes in the pedestal and base cone not exposed to stored water shall be coated with tank interior dry system.

C. Removable silt stops shall be provided at the bottom of the tank to prevent flow of sediment into the outlet piping and into the distribution system. Silt stop shall be 6 inches above the tank floor.

2.5 LADDERS AND SAFETY DEVICES

The following ladders and/or appurtenances shall be provided on the tank. All ladders systems shall conform to current OSHA standards. All ladders shall be supplied with anchor points at the top.

A. A fixed pedestal ladder equipped with a fall prevention device equal to DBI/Sala, 3/8-inch stainless steel, Lad-Saf X2 Model stainless steel system, or approved equal, shall be mounted to the tank pedestal and run from grade to the upper platform. The fall prevention device rail shall extend 4'-6" above the platform floor at the top of the ladder. Provide a sleeve stop at the top of the rail.

B. A fixed ladder equipped with a fall prevention device indicated above, extending from the upper platform to the tank floor access manhole.

C. A fixed access tube ladder equipped with a fall prevention device indicated above, extending from the upper platform to the tank roof mounted on the access tube interior.

D. A fixed inside tank ladder equipped with a fall prevention device indicated above, mounted on the exterior of the access tube to provide access from the roof manhole to the tank floor.

E. A locked cabinet or utility box made of 1/4-inch steel plate shall be mounted or constructed at the base of the tank for storing a minimum of two safety climbing sleeves and belts for emergency use. Lock shall be dead bolt padlock, file proof, cutter proof, saw proof and shock proof, with shackle of 61-65 Rockwell "C" hardness, Catalog No. 1174A2 as available from McMaster-Carr Supply Company, P.O. Box 4355, Chicago, Illinois 60690. Warning signs shall be posted to the effect that no one is to climb tank without safety climbing belt and sleeve on person.

F. Ladders shall be equipped with a fall arrest system meeting OSHA regulations.

G. Ladder side rails shall be a minimum of 3/8-inch by 2-inches with a16-inchh clear spacing. Rungs shall be not less than 3/4-inch, round or square, spaced at 12-inch centers. The surface of the rungs shall be knurled, dimpled or otherwise treated to minimize slipping. Ladders shall be secured to adjacent structures by brackets located at intervals not exceeding 10 feet. Brackets shall be of sufficient length to provide a minimum distance of 7 inches from the center of the rung to the nearest permanent object behind the ladder.

2.6 UPPER PLATFORM

A. An upper platform shall be located at the top of the support pedestal to provide access from the pedestal ladder to the roof access ladder located on the interior of the access tube. Platform shall include a 24 inches by 36 inches access hatch with opening to allow ladder and safety device to continue 48-inch minimum above the platform floor.

2.7 ROOF HANDRAIL

A. The tank shall be equipped with a roof handrail not less them 42 inches high. The handrail shall include a top rail, mid rail and toe bar. The handrail shall encompass the access manholes, vent and finial on the tank roof. Handrail shall comply with OSHA requirements. Handrail shall be supplied with anchor points around the railing.

2.8 CONDENSATE CEILING

A. A steel condensate ceiling shall be located at the junction of the pedestal shaft and base cone. It shall be complete with drain and 24 inches by 36 inches access hatch with opening to allow ladder and safety device to continue 48-inch minimum above the platform floor.

2.9 MANHOLES, VENT AND FINIAL

A. The tank shall be furnished with manholes, vent and finial as shown and specified. The manholes shall provide access to the inside of the tank and shall be located as shown on the drawings. The roof manhole door shall be solid, watertight and shall overlap the frame opening and extend down around the frame at least 2 inches and shall be provided with hinges and a hasp for locking. Minimum opening dimension shall be 24 inches and a curb at least 4 inches high shall be provided.

B. The frost free roof vent and finial (minimum 20-inch) shall be located near the center of the tank. The roof vent shall be capable of reducing the dangerous air pressures that could develop by the maximum flow of water either entering or leaving the tanks. Maximum flow rate shall be based on a break in the inlet/outlet pipe when the tank is full. The tank vent shall be sized by the tank manufacturer and shall have an intake and relief capacity sufficiently large that excessive pressure or vacuum will not develop during maximum flow rate. The overflow pipe shall not be considered as a tank vent. The vent shall be provided with a 316L Stainless Steel 24 mesh insect/rodent screen to prevent the ingress of birds and animals. Roof vent shall be designed in accordance with AWWA D100 (latest edition) standards to insure fail-safe clog and frost-over resistant ventilation.

C. Manholes, Vent Listing

1. (1) - 24-inch tank floor access manhole in tank bottom accessible from the upper platform or from a ladder that extends from the platform opening.
2. (1) - 24-inch pedestal manhole near the top of the pedestal for access to the exterior. Opening shall be accessible from the upper platform.
3. (1) - 24-inch exhaust manhole on tank roof.
4. (1) - 30-inch hinged access manhole on tank roof.
5. (1) - 30-inch hinged roof access manhole on access tube roof.
6. Vent and finial (minimum size 20 inches).

2.10 ACCESS TUBE

A. A minimum 42-inch diameter access tube shall be provided. The access tube shall be provided from the top of the pedestal to the tank roof.

2.11 RIGGING

A. Interior and exterior rigging devices shall be provided for painting, inspecting and maintaining the structure and accessories. A continuous bar or tee rail near the top of the exterior support structure shall be provided. The rail may be attached to the support column or steel tank. A painter's rail attached to the roof, pipe couplings with plugs in the roof or other attachments that provide complete access for painting of tank interior shall be furnished.

2.12 INTERIOR FLOOR

A. A concrete slab-on-grade floor shall be provided inside the base cone. The floor shall be a minimum of 6 inches thick, and reinforced with 6x6/W2.9 x W2.9 WWF. Isolation joints shall be provided at junctions with walls, columns, equipment or piping foundations.

2.13 PERSONNEL DOOR

A. A 72 inches by 80 inches access door with a flush threshold shall be located in the base of the pedestal cone. A step over threshold is not acceptable. The door shall be fabricated from steel plate with adequate stiffening and specifically designed for use with the tank. The access door

shall be equipped with handle, drip cover and dead bolt lock. Commercial hollow metal doors and frames are not acceptable.

2.14 GROUNDING

A. Grounding and lightning protection for the tank shall be provided in accordance with the latest edition of NFPA 780, Standard for the Installation of Lighting Protection Systems, except as amended herein.

2.15 IDENTIFICATION PLATE

A. A tank identification plate shall be mounted near the personnel door. The identification plate shall be corrosion resistant and contain the following information:

1. Tank Contractor
2. Contractor's project or file number
3. Tank capacity
4. Height and elevation to overflow
5. Date erected

2.16 DROP CEILING

A. A steel drop ceiling shall be installed 12 feet from the top of the base cone concrete floor. It shall be complete with drain and 24 inches by 36 inches access hatch with opening to allow ladder and safety device to continue above the drop ceiling.

2.17 BASE CONE INSULATION

A. Polyurethane foam insulation shall be installed on interior of tank base cone and drop ceiling. Installation shall be per manufacturer requirements.

B. Foamed-In-Place Insulation shall be medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas and shall have the following requirements:

1. Aged Thermal Resistance (R-value): 5 (degrees F hr s.f.)/Btu (0.9 (K sqm)/W), minimum, when tested at 1 inch (25.4 mm) thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F (23 degrees C).
2. Water Vapor Permeance: Vapor retarder; 1 perm (57 ng/(Pa s sqm)), maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
3. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
4. Air Permeance: 0.004 cfm/sq ft (0.2 L/second sq meter), maximum, when tested at
5. intended thickness in accordance with ASTM E2178 at 1.5 psf (75 Pa).
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

C. Thermal Barrier: Sprayed cellulose thermal barrier insulation with the following requirements:

1. Thermal Resistance (R-value): 3.6 (deg F hr sq ft)/Btu (0.6 (K sqm)/W), minimum, when tested at 1 inch (25.4 mm) thickness in accordance with ASTM C518.
2. Bond strength shall be greater than 100 psf.
3. Product shall be Class 1, Class A per ASTM E84/UL 723.

D. Application:

1. Apply insulation over top of tank's final coating system.
2. Apply insulation in accordance with manufacturer's instructions.
3. Apply insulation by spray method, to a uniform monolithic density without voids.
4. Apply to a minimum cured thickness of 2 inch (50 mm) for insulation and 1.25 inch (32 mm) for thermal barrier.
5. Apply overcoat monolithically, without voids to fully cover foam insulation, to achieve fire rating required.
6. Patch damaged areas.
7. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
8. Trim excess away for applied trim or remove as required for continuous sealant bead.

PART 3 - EXECUTION

3.1 PERMITS

A. The Contractor shall apply and pay to obtain the following permits:

1. FAA permits for any temporary construction, cranes, hoists, etc. during the construction period.

2. Electrical permit.

3. Kentucky surface water permits (as needed).

3.2 SHOP FABRICATION

A. Shop fabrication and shop assembly shall conform to the requirements set out in Section 9 of the AWWA D100 (latest edition) Standard.

3.3 WELDING

A. All welding shall conform to the requirements of AWS and those set out in Section 8 and Section 10 of the AWWA D100 (latest edition) Standard.

B. The Contractor shall be required to submit qualifications of welding operators in writing to the Engineer for review prior to use of the operator on the job.

C. All interior roof lap seams shall be seal-welded.

3.4 ERECTION

A. Field erection shall conform to the requirements set out in Section 10 of the AWWA D100 (latest edition) Standard.

B. Plates subjected to stress by the weight or pressure of the contained liquid shall be assembled and welded in such a manner that the proper curvature of the plates in both directions is maintained. Plates shall be assembled and welded together by a procedure that will result in a minimum of distortion from weld shrinkage.

3.5 INSPECTION

A. Inspection shall conform to the requirements set out in Section 11 of the AWWA D100 (latest edition) Standard and shall be procured by the Owner. All work, whether performed in the shop or field, shall be inspected in accordance with this standard. All inspections shall be performed prior to interior and exterior field painting.

3.6 ROOF LAP JOINTS

A. All interior lap joints shall be sealed by means of caulking or continuous seal welding. This shall include penetrations of roof accessories.

3.7 TESTING

A. After the structures have been erected and all seams have been welded, the tank shall be filled with water (furnished by the Owner) and shall be tested for water-tightness in accordance with Section 11.10 of AWWA D 100 (latest edition).

B. Defective seams found in each tank shall be repaired in accordance with requirements of AWWA D 100 (latest edition), Section 11. Tests of water-tightness shall be repeated until each tank is perfectly tight and acceptable to the Engineer.

C. The Contractor shall guarantee the water-tightness of the elevated tank. After the initial filling, the Contractor shall pay for all additional water needed for testing or retesting of the tanks.

3.8 DISINFECTION OF THE TANK (KY Requirements)

A. Upon completion of construction, once application of coating systems is complete, coatings have fully cured in accordance with manufacturer's instructions, field quality control inspection is complete, and prior to placing the water storage tank into service, the tank shall be thoroughly sprayed down and disinfected according to the following in accordance with AWWA C652 (latest edition):

1. Water and chlorine shall be added to the storage facility in amounts such that the solution will initially contain 50 mg/L available chlorine and will fill approximately 5 percent of the total storage volume. This solution shall be sprayed directly onto all surfaces of the water storage facility that would be in contact with water when the water storage facility

is full to the overflow elevation. This solution shall be held in the storage facility for a period of not less than 6 hours. The storage facility shall then be filled to the overflow level by flowing potable water into the highly chlorinated water. It shall be held full for a period of not less than 24 hours.

2. Chlorine shall be added to the storage facility by the method described in Section 4.3.1.1, Section 4.3.1.2, or Section 4.3.1.3 of AWWA Standard C652 (latest edition), such that a uniform chlorine concentration is obtained during the entire filling operation. The actual volume of the 50-mg/L chlorine solution shall be such that, after the solution is mixed with filling water and the storage facility is held full for 24 hours, there will be a free-chlorine residual of not less than 2 mg/L.
3. After the chlorination procedure is completed, all highly chlorinated water shall be purged from the drain piping and bacteriological sampling and testing shall be performed to ensure that no coliform bacteria are present. Two consecutive samples must show negative results, or the disinfection method must be repeated.

4. Upon completion of successful bacteriological testing, the remaining water may be delivered to the distribution system.

B. Disinfection of the tank shall meet all current requirements of the Kentucky State Division of Water, shall conform to AWWA C652 (latest edition) and shall be accomplished to the satisfaction of the Engineer. The Contractor shall furnish the chlorine and accomplish the procedures as specified herein. All necessary water will be furnished by the Owner. Additional water needed for repeated disinfection shall be paid for by the Contractor.

3.9 CLEANUP

A. Upon completion of the work, all construction material and debris shall be removed from the site.

END OF SECTION 331619

Northern Kentucky Water District

67 PAGES EXCERPTED AND SUBMITTED FOR CONFIDENTIAL TREATMENT PURSUANT TO 807 KAR 5:001, SECTION 13

DIVISION 46

WATER AND WASTEWATER TREATMENT EQUIPMENT

SECTION 462010 – INTERIOR PROCESS PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all plant process piping as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Northern Kentucky Water District (NKWD) Standard Specifications, Drawings and Details.

B. Process Valves: Section 462012

C. Piping furnished with equipment is included in the specific equipment item.

1.3 SUBMITTALS

A. The Contractor shall comply with the requirements of Section 013323 of these specifications.

B. A notarized certification shall be furnished for all pipe and fittings which verifies compliance with all applicable specifications.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE/DUCTILE IRON FITTINGS

A. See Section 2.01 on NKWD Standard Drawings 100-C and 100-D for product specifications.

B. Unless otherwise noted or required, all inside ductile iron piping shall be flanged pipe with threaded flanges in accordance with AWWA C 115. All piping flanges shall have ring gaskets, 1/8-inch thick.

C. All exposed iron pipe to be field painted shall be furnished with an external coating of rust inhibitive primer, such as Tnemec Series 1 OmniThane, or equal. Pipe manufacturer shall be responsible for compatibility of shop applied coatings with the field paint systems and products specified in Division 09, Section 099600. Do not apply asphalt or bituminous coatings on pipe to be painted.

2.5 WALL PIPE AND SLEEVES

A. All wall pipe shall be furnished with cast or welded collar water stops in the positions shown on the Drawings. Welding of water stop collars on pipe shall be accomplished by the wall pipe manufacturer in their shop. All centrifugally cast wall pipe shall be ductile iron meeting the

requirements of AWWA C151 for the pipe barrel, conforming to the pressure rating of the pipeline in which installed, and in no case be lighter than Class 53.

B. All statically cast wall pipe shall be ductile iron meeting the requirements of AWWA C110 for fittings. Mechanical joint end and cast-on flange end wall pipe shall conform to AWWA C110 and threaded flange wall pipe shall conform to AWWA C115. Where flanged or mechanical joint bell ends are flush with the wall, they shall be drilled and tapped for stud bolts which are to be of 300 Series stainless steel.

C. The length of all wall pipe shall be not less than the thickness of the wall in which installed. Wall pipe shall have the same pressure rating as connecting pipe. All wall pipe shall be cement-mortar lined per AWWA C104. The outside of wall pipes shall be left uncoated and shall be field primed for painting on the portion exposed, uncoated where embedded and field coated with standard bituminous coated where buried.

D. Contractor may have the option to install wall pipe flush face-to-face of wall in lieu of the dimensioned length wall pipe shown on the Drawings, in order to eliminate form penetrations. This option will be subject to Engineer`s review at each wall pipe location and covers both flanged and mechanical-joint bell-end wall pipe. Embedded flanged and M.J. bell-end bolt holes shall be tapped for stud bolts; tapped bolt holes in embedded flanges shall be plugged for protection during concrete pouring.

E. All pipe wall sleeves shall be plain end galvanized steel pipe of diameter noted on Drawings and length to fit flush face-to-face of wall.

2.6 INTERLOCKING LINK PIPE SEALS

A. In all locations indicated on the Drawings, interlocking link pipe seals shall be used in lieu of lead packing a pipe wall sleeve. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. Seals shall be "Link-Seal" as manufactured by Thunderline Corporation, Wayne, Michigan, or approved equal.

B. The Contractor shall determine the required diameter of each individual wall opening according to the manufacturer's recommendations before ordering and installing the seal. Pipe shall be accurately centered in the sleeve and the link seals shall be sized, installed and tightened in accordance with the manufacturer's instructions.

2.7 COUPLINGS AND ADAPTERS

A. Flexible couplings shall be of the sleeve type with a middle ring, two round-wedge shaped rubber gaskets at each end, two following rings together and compress the gasket against the pipe. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to

10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

1. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Smith-Blair
Style 253 (2"-15")	411
Style 38/138 (18" & above)	

2. Transition couplings for joining pipe of different outside diameters-

Dresser	Smith-Blair
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

3. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Smith-Blair
Style 227 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" D.I. Pipe)	913 steel (3"-24" D.I. Pipe)
Style 128 steel (2"-96" steel pipe)	

2.8 FLANGED JOINTS

A. Flange bolts and nuts shall be ASTM A 307, Grade B and shall have hexagonal heads. All bolts, nuts and studs for flanged pipe in submerged locations shall be of 300 Series stainless steel. The flanges shall be drawn together until the joint is perfectly tight, with bolts of a length such that they will not project greater than 1/4-inch from the nut nor fall short of the end of the nut when drawn up. No washers shall be used. Gaskets shall be carefully fabricated prior to installation and must be suitable for pressure rating for the pipe for which it is used.

B. All flanges (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 125-pound for ductile iron and ANSI B16.5 150-pound for steel.

C. At the Contractor's option, and at no additional expense to the Owner, the following patented SBR flange gaskets or approved equal may be substituted for standard sheet packing ring gaskets in ductile iron flanged pipe:

1. TORUSEAL by American Cast Iron Pipe Company
2. FLANGE-TYTE by United States Pipe & Foundry Company

When using such gaskets, flange bolts shall be torqued to manufacturer's recommended torque values.

2.9 DISMANTLING JOINT

A. The dismantling joint shall be a double-ended flanged adapter that allows for longitudinal adjustment in a flanged piping system. It shall be made up with a flanged telescoping slip pipe piece inside a flanged adapter with integral control rods passing through both flanges. The telescoping pipe piece and flanged adapter shall be made from carbon steel and be factory primed. Tie rods shall be steel ASTM A193 grade B1 and the nuts shall be steel ASTM A194 grade H2. The rubber pipe gasket between the telescoping pipe and the flange adapter shall be Buna-S rubber. Flanges shall conform to either ANSI B16.5 class 150 or class 300 to match the ANSI B16.1 class 125 or class 250 pipe flanges as indicated on the drawings, and as defined hereinafter in paragraph 2.08. The dismantling joint shall have a maximum working pressure equal to the working pressure of the associated mating flange, being 250 psi or 300 psi respectively.

B. The dismantling joint shall be Style 131 as manufactured by Dresser, or approved equal.

2.10 METAL PIPE SUPPORTS AND HANGERS

A. The Contractor shall furnish and install all pipe hangers, inserts, brackets, plates, anchors, and other supports not specifically included under other items. Generally pipe supports are not shown on the Drawings, but shall be supplied as specified herein. However, any bracing or support details shown on the Drawings shall be followed.

B. Prior to installation, the Contractor shall submit to the Engineer for review, manufacturer's data sheets on all catalogued items to be used and sketches covering all specially designed hanger and support assemblies and fabrications.

C. Supports and hangers shall be as manufactured by Grinnell, Elcen, or Fee & Mason, or equal or fabricated by the Contractor. Field fabricated supports may be used only for special conditions where manufactured items may not be suitable. In such cases, details of proposed supports shall be submitted to the Engineer for review. All such supports shall be galvanized.

D. Except as shown on the Drawings or as directed by the Engineer, supports and hangers shall be as follows:

1. Pipes with centerlines less than 24 inches from a wall shall be supported by a typical wall support bracket. Pipes with centerlines less than 6 feet above a floor shall be supported from below. All other pipes shall be hung from above. Piping shall be supported at no greater than 10 feet 0 inches on centers.

2. Pipe supported from underneath shall have adjustable pipe saddle supports on properly sized pipe stanchions. The saddle assembly shall be of cast iron. Standard pipe stanchions with hold-down "U" bolts shall be Grinnell Fig. 259, Elcen Fig. 49, Fee & Mason Fig. 2595, or equal.
3. Hangers are to be suspended from concrete work. Hangers shall be supported from approved metal inserts placed in concrete before the concrete is placed. Standard concrete inserts shall be Grinnell Fig. 28l or 282, Elcen Fig. 86 or 65, Fee & Mason Fig. 186 or 2570, or equal. If special support from overhead concrete is necessary due to unusually heavy loads, support shall be as detailed on the Drawings. In no case shall standard concrete inserts be used where pipe load exceeds the manufacturer's recommended load for the insert, or where the hanger rod exceeds 7/8" diameter.
4. All pipe hangers, inserts, clamps, supports and other like items shall be submitted for review by the Engineer prior to installation.
5. All inside horizontal flanged piping shall be supported with approved split ring type adjustable hangers of malleable iron with suitable hanger rods unless shown otherwise on the Drawings. Special supports shall be constructed in accordance with details shown on the Drawings. Wall supports and/or hangers shall be placed not over 10 feet apart. All piping shall be rigidly supported to prevent loosening under vibration.
6. Pipe, valve operating stems, fixtures and conduits shall be bracketed or suspended from walls, ceilings, and beams at or near valves and fittings and where needed for firm support, by standard brackets, rods, turnbuckles, and rings made especially for pipe of sizes supported. Perforated strap iron and/or copper will not be acceptable.
7. Clevis hangers for "iron pipe size" O.D. pipe shall be Grinnell Figure 65, Elcen Figure l2, Fee & Mason Figure 239, or equal. Clevis hangers for Cast Iron O.D. pipe shall be Grinnell Figure 260, Elcen Figure 12C, Fee & Mason Figure 104, or equal. All clevis hangers shall be galvanized.
8. Turnbuckles shall be forged steel. Rods shall be of black steel, machine threaded of following sizes:

Pipe Size	Rod Diameter
1/2" - 2"	3/8"
2 1/2" - 3"	1/2"
4" - 5"	5/8"
6"	3/4"
8" - 12"	7/8"
14" - 16"	1"
18"	1 - 1/8"
20" - 24"	1 - 1/4"

9. Brackets shall be of standard castings of fabricated steel and shall be reviewed by the Engineer. Standard catalogued bracket shall be medium duty Grinnell Fig. 195, Elcen Fig. 57, Fee & Mason Fig. 151, or equal, galvanized, size as noted on Drawings. Provide light or heavy duty brackets if specifically noted on Drawings. "U" bolts shall be Grinnell Fig. 137, Elcen Fig. 68 or 68A, Fee & Mason Fig. 176, or equal.
10. Column type pipe supports shall consist of pipe columns of size required to carry the full pipe and standard cast iron bases and saddles as required. Saddles shall be of proper size to fit the pipe being supported.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Materials shall be new and of the best grade and quality; workmanship shall be first class in every respect.

B. Each piece of iron pipe and each fitting shall be plainly marked at the foundry with class number and weight.

C. Where indicated on the Drawings, plain-end pipe shall be joined by means of flanged adapters or flexible couplings which shall be Rockwell, Dresser, or equal.

D. All pipe couplings shall be designed to safely withstand the operating pressure of the lines in which they are installed. All couplings shall be shop primed with an approved rust inhibitive primer.

E. Taps and connections to piping shall be made as required to connect equipment, sample lines, etc., and where otherwise shown on the Drawings.

F. Piping shall be installed straight and true, parallel or perpendicular to walls, with approved offsets around obstructions. Standard pipe fittings shall be used for changing direction of piping. No mitered joints or field fabricated pipe bends are permitted unless accepted by the Engineer.

G. All piping, fittings, valves and other accessories shall be thoroughly cleaned of dirt, chips and foreign matter before joint connections are made.

H. All plastic pipe shall be adequately supported and braced. Support spacing shall not exceed the recommendations of the Plastics Pipe Institute.

I. Teflon tape shall be used on all plastic pipe threaded connections.

J. Field cut male threads on plastic pipe shall be made with plastic pipe threading dies.

K. The annular space of plain wall sleeves shall be packed tight with lead wool to within 3/4 inches of wall face and then patch grouted flush to wall face with non-staining nonshrink grout, Masterflow 713 by Master Builders, Sonogrout by Sonneborn-Contech, or equal.

L. All pipe sleeves passing through walls or floors of chlorine feed and storage areas shall be provided with gas tight seals.

M. All pipe threads shall conform to ANSI B2.1.

N. Piping shall be erected to provide for expansion and contraction.

O. Screwed or soldered unions shall be provided in all small piping as required to permit convenient removal of equipment, valves and piping accessories from the piping system.

P. Dielectric insulating couplings or brass adapters shall be used whenever the adjoining materials being connected are of dissimilar material such as connections between copper tubing and steel pipe.

Q. All inside piping shall be color coded, stenciled and label-tagged for identification as specified in Section 099600.

END OF SECTION 462010

SECTION 462012 – INTERIOR PROCESS VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all new valves as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Northern Kentucky Water District (NKWD) Standard Specifications, Drawings and Details.

B. Valves: Section 331216

C. Interior Process Piping: Section 462010

D. Electrical: Division 26

E. Valves furnished with equipment are included with equipment specifications.

1.3 SUBMITTALS

A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the Engineer for review before ordering. Comply with provisions of Section 013323.

B. At the time of submission, the Contractor shall, in writing, call Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

PART 2 - PRODUCTS

2.2 GATE VALVES

A. See Section 2.03.A Gate Valves on NKWD Standard Drawing 100-D for product specifications.

B. Valves ends shall be flanged and shall conform to ANSI B16.1 class 125 and be handwheel operated, unless otherwise shown on the Drawings or specified hereinafter.

C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.

C. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

2.3 CHECK VALVES

A. The valve shall be a counterweighted, rubber seated check valve with attached cushion chamber whose function is to permit flow in only one direction, close tightly when its discharge side pressure exceeds its inlet pressure, and to close without a slam or bang.

B. The swing check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel seat ring, a non-corrosive shaft for attachment of weight and lever, and complete non-corrosive shockless chamber.

C. It shall absolutely prevent the return of water, oil or gas back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating and must be shockless in operation. The seat ring must be renewable.

D. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.

E. The valve disc shall be of cast iron or cast steel and shall be suspended from a non-corrosive shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.

F. All material and workmanship shall be first class throughout and the purchaser reserves the right to inspect this valve before shipment.

G. Internal and external of valve shall be NSF 61 approved fusion bonded epoxy coated in accordance with AWWA C550.

G. The valves shall be Golden-Anderson Industries, Inc. Fig. No. 250-D, 125# or equal.

2.4 SOLENOID CONTROL VALVE (ALTITUDE VALVE)

A. The solenoid control valve shall be a self-contained unit consisting of a diaphragm-operated packless main valve, a diaphragm-operated high capacity auxiliary valve and a packless three-way solenoid pilot valve. Valve shall be designed for on/off service.

B. Main Valve

1. The valve shall be hydraulically operated, single diaphragm-actuated, globe pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

Valve body & cover shall be cast and manufactured in North America and shall meet NSF 61 approvals for drinking water service.

2. No separate chambers shall be allowed between the main valve cover and body. No fabrication or welding shall be used in the manufacturing process. The valve shall contain a resilient, synthetic rubber disc, with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.

3. The diaphragm assembly containing a non-magnetic 303 stainless steel stem of sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one-piece design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary.

4. The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The diaphragm shall not be used as the seating surface.

5. The main valve seat and the stem bearing in the valve cover shall be removable. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline.

6. The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment, provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.

7. A direct factory representative shall be made available for start-up service, inspection, and necessary adjustments.

8. Materials Specification for Main Valve:

    a. Valve Size: 12"
    b. Main Valve Body and Cover: ASTM A-536
    c. Main Valve Trim: 303 SS Trim
    d. End Detail: ANSI Standard B16.42
    e. Pressure Rating: 150 lb. Flg. Rated for 250psi working pressure
    f. Temperature Range: -40 to +180 degrees F
    g. Rubber Material: Buna "N"
    h. Coating: FDA/NSF approved Epoxy Resin Coating by the baked on fusion process method 5 to 7 mils thick
    i. Desired Options: X105LCW Limit Switch
    j. Solenoid Voltage: 120/60v Manual Operator on Solenoid

k. Enclosure Type: Nema IV
l. Options: Stainless Steel Liquid Filled Pressure Gauges installed on inlet & outlet of valve with 4" face.

C. Pilot Control System

1. The three-way solenoid pilot alternately applies pressure to or exhausts pressure from the diaphragm chamber of the high capacity auxiliary valve which in turn causes the same action in the main valve. The pilot system shall include strainers, shut-off cocks and manual operator. Opening and closing speed control needle valves shall be utilized so as to prevent surging of the system. Solenoid shall have a NEMA IV enclosure. Valves located on bypass lines shall incorporate a check valve feature designed to close the valve should outlet pressure exceed inlet pressure.

2. Material Specification for Pilot Control:

a. Body & Cover: Bronze QQ-B-626
b. Pilot Trim: 303 Stainless Steel
c. Pressure Rating: 300psi
d. Rubber Material: Buna "N"
e. Tubing and Fittings: Bronze & Copper
f. Desired Options: Normally closed/Energized to open

D. Solenoid Control Valve shall be Model No. 136-03 Solenoid Control Valve, as manufactured by Cla-Val Co., Newport Beach, CA 92659-0325 or Engineer approved equal.

2.4 OUTLET CHECK VALVE

A. The outlet flow valves shall be perforated disc type with elastomeric membrane. Valve shall be Waterflex WF-3 as manufactured by Tideflex, or Engineer approved equal.

B. The valves shall be NSF61 Certified. NSF61 approved/Certified materials will not be accepted in lieu of valve certification.

C. The perforated disc shall be fabricated of stainless steel plate with welded support gussets. The disc shall be flanged and drilled to mate with ANSI B16.1, Class 125/ANSI B16.5 Class 150 flanges. The disc shall have three (3) tapped holes used for fastening the membrane and support rod to the disc with stainless steel bolts, nuts, and lock washers. The top of the disc shall be tapped and supplied with lifting eyebolt for installation.

D. The membrane shall be circular, one piece rubber construction with fabric reinforcement. The diameter of the membrane shall allow adequate clearance between the membrane O.D. and the pipe I.D. The membrane shall be vulcanized with a specified convex radius to produce a compression set to allow the membrane to seal against the perforated disc at low reverse differential pressure.

E. The support rod shall be stainless steel and drilled with three (3) longitudinal holes to allow fastening of rod to membrane and perforated disc.

F. When line pressure inside the valve exceeds the backpressure outside the valve, the line pressure shall force the membrane to open, allowing flow to pass through the perforations in the disc. When backpressure exceeds the line pressure, the membrane shall seat on the perforated disc preventing backflow.

G. The valve shall allow flow out of the reservoir during draw cycles and prevents flow into the reservoir during fill cycles.

H. The elastomer used in construction of the membrane shall have been tested by an accredited independent laboratory that confirmed there is no degradation in the elastomer when exposed to chlorine and chloramine per the ASTM D471-98 "Standard Test Method for Rubber Property – Effect of Liquids."

I. The manufacturer's name, plant location, serial number and product part number which designates membrane size, material and construction specifications shall be bonded onto the surface of the membrane.

2.5 DUCKBILL CHECK VALVE

A The duckbill elastomeric check valve shall be Buna-N rubber, flow operated check type with an integral flanged end connection. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The flange and flexible duckbill sleeve shall be one-piece rubber construction with nylon reinforcement. The top of the valve shall rise to form the duckbill shape. The bill portion shall be thinner and more flexible than the valve body and formed into a curve of 180 degrees.

B The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards. The valve shall be furnished with stainless steel back-up rings for installation.

C The function of the valve shall be as follows: when line pressure inside the valve exceeds the backpressure outside the valve, the line pressure forces the bill of the valve open, allowing flow to pass. When backpressure exceeds the line pressure, the bill of the valve is forced closed preventing backflow. The check valve shall be able to function properly while being submerged with up to 10 feet of head backpressure.

D Manufacturer must have available flow test data from an accredited hydraulics laboratory to confirm pressure drop data. Company name, plant location, valve size and serial number shall be bonded to the check valve.

E The duckbill check valve shall be Series 35 as manufactured by Tideflex Technologies, or equal.

2.6 VALVE OPERATORS

A. Valve operators shall be as shown on the plans and specified herein. Valves shall be positioned to provide for the most convenient position of the actuator possible.

B. Valves located six (6) feet or more from floor level shall be furnished with chain wheel operators or chainlevel operators. Chains shall extend to within four (4) feet off the floor. All NRS floor stands and geared operators shall be indicating type.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in accordance with the manufacturer's recommendations and NKWD Standard Drawings.

END OF SECTION 462012

APPENDIX A

GEOTECHNICAL EXPLORATION REPORT

GEOTECHNOLOGY

A Universal Engineering Sciences Company

GEOTECHNICAL EXPLORATION
NKWD TAYLOR MILL TANK
TAYLOR MILL, KENTUCKY

Prepared for:

GRW ENGINEERS, INC.
LOUISVILLE, KENTUCKY

Prepared by:

GEOTECHNOLOGY, LLC
ERLANGER, KENTUCKY

Date:

NOVEMBER 14, 2022

Geotechnology Project No.:

J040822.01

SAFETY
QUALITY
INTEGRITY
PARTNERSHIP
OPPORTUNITY
RESPONSIVENESS

GEOTECHNOLOGY
A Universal Engineering Sciences Company

November 14, 2022

Mr. Joseph Pavoni, PE
GRW Engineers, Inc.
9710 Bunsen Way
Louisville, Kentucky 40299

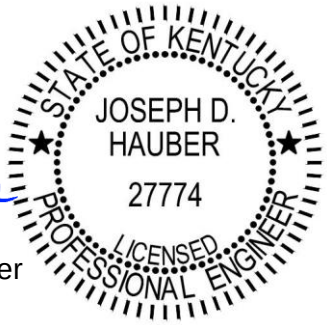
Re: Geotechnical Exploration
NKWD Taylor Mill Tank
Taylor Mill, Kentucky
Geotechnology Project No. J040822.01

Dear Mr. Pavoni:

Presented in this report are the results of our geotechnical exploration completed for the Northern Kentucky Water District (NKWD) Taylor Mill Tank in Taylor Mill, Kentucky. Our services were performed in general accordance with the Standard Subcontract Agreement for Professional Consultant Services, Project Number: 5059, which was dated October 4, 2022.

We appreciate the opportunity to provide the geotechnical services for this project. If you have any questions regarding this report, or if we may be of any additional service to you, please do not hesitate to contact us.

Respectfully submitted,
GEOTECHNOLOGY, LLC



Joseph D. Hauber, PE
Principal Geotechnical Engineer

Daniel A. Furgason
Senior Project Manager

CAK/JDH/DAF:cak/jdh/daf

Copies submitted: GRW Engineers, Inc. (email)

TABLE OF CONTENTS

Appendices

LIST OF TABLES

GEOTECHNICAL EXPLORATION
NKWD TAYLOR MILL TANK
TAYLOR MILL, KENTUCKY
November 14, 2022 | Geotechnology Project No. J040822.01

1.0 INTRODUCTION

Geotechnology, LLC (Geotechnology) prepared this geotechnical exploration report for GRW Engineers, Inc. (GRW) for the Northern Kentucky Water District (NKWD) Taylor Mill Tank that will be located at 5421 Pride Parkway (KY 16) in Taylor Mill, Kentucky.

The purposes of the geotechnical exploration were: to evaluate the general subsurface profile at the site and the engineering properties of the soils and bedrock; and to develop recommendations for the geotechnical aspects of the design and construction of the project, as defined in our proposal. Our scope of services included a site reconnaissance, geotechnical borings, laboratory testing, engineering analyses, and preparation of this report.

2.0 PROJECT INFORMATION

The following project information was derived from:

- The Site Plan, titled “Tank Site Plan”, which was prepared by GRW and dated September 2022, and received electronically on October 7, 2022;
- The water tank foundation loads provided by Caldwell Tanks, Inc. (Caldwell), which were received on November 3, 2022; and
- Correspondence with GRW.

The project will involve a 0.9-acre site that is located at 5421 Pride Parkway[1] and will include the construction of a 500,000-gallon water tank, vault valve, instruments building, and a 15-foot-wide entrance driveway off of an existing bus/truck turnaround on the east side of Pride Parkway.

Two options are being considered for the tank, which include a multi-column-style and a pedesphere-style tank. For the multi-column-style tank, six columns are proposed on a 50-foot-diameter circle with a 60-inch-diameter center riser. Foundation loads at each column are indicated as follows:

- Vertical loads:

[1] For the purposes of this report, Pride Parkway is assumed to be oriented in a north-south direction with the project site on the east side of Pride Parkway.

  - Approximately 555 kips for water and superstructure
  - 6.7 kips for snow
  - Up to 114.4 kips for wind
  - Up to 165.2 kips for seismic
- Horizontal loads:
  - 29.9 kips for wind
  - 21.4 kips for seismic

The axial load for the center riser is indicated to be approximately 1,374 kips.

For the pedesphere-style tank, the tank at the top of the foundation will be approximately 30 feet in diameter. Foundation loads at the top of foundation are indicated as follows:

- Vertical loads:
  - Approximately 4,628 kips for water and superstructure
  - 21 kips for snow
- Wind loads:
  - 62 kips of shear
  - 7,515 kip-feet of moment
- Seismic loads:
  - 64 kips of shear
  - 12,500 kip-feet of moment

The valve vault is anticipated to be a buried concrete structure, bearing a few feet below existing grades. The instruments building will be approximately 15 feet by 12 feet, and is anticipated to have foundation wall loads of 2 kips per foot or less.

A grading plan has not been established for the site yet; however, site grading is anticipated to involve cuts and fills up to 5 feet and 6 feet, respectively.

3.0 SITE CONDITIONS

The site location and topography of the area are shown on the Exploration Plans included in Appendix B. The Exploration Plans overlay the referenced Site Plan prepared by GRW on topography and aerial imagery downloaded from the LINKGIS website. Sheet 1A also illustrates the 1963 topographic map published by the Northern Kentucky Planning Commission to illustrate how the site has topographically changed since 1963.

The water tank is proposed to be constructed on an east-west aligned ridgetop bounded by two eastwardly draining valleys. The ridge generally consists of grassy level terrain from the east edge of Pride Parkway to approximately 85 feet east of roadway; beyond this, the ridge is wooded with strongly sloping to moderately steep terrain with grades that are 5 horizontal to 1 vertical (5H:1V) or gentler.

Based on a comparison of the 1963 topography on Sheet 1A with the existing LINKGIS topography, the drainage valley on the south side of the ridge has been modified and shifted away from Pride Parkway for the construction of aforementioned bus/truck turnaround. Additionally, the valley to the north appears to have been modified, possibly due to the widening of Pride Parkway and/or nearby development.

4.0 SUBSURFACE EXPLORATION

The subsurface exploration consisted of four borings (numbered B-1 through B-4). The boring locations were selected by us and were staked in the field by us using a handheld Trimble Geo7X GPS unit. The locations of the borings are shown on our Exploration Plans, which are included in Appendix B.

The borings were drilled on October 14, 2022, with a CME-55LC drill rig advancing hollow-stem augers, as indicated on the boring logs presented in Appendix C. Sampling of the overburden soils and bedrock was accomplished ahead of the augers at the depths indicated on the boring logs, with either a 2-inch-outside-diameter (O.D.) split-barrel sampler or 3-inch-O.D., thin-walled Shelby tube sampler in general accordance with the procedures outlined by ASTM D1586 and ASTM D1587, respectively. Standard Penetration Tests (SPTs) were performed with the split-barrel sampler to obtain the standard penetration resistance or N-value[2] of the sampled material. Boring B-2 was extended into the bedrock by rock coring with an NQ rock core bit affixed to a double-tube core barrel in general accordance with the procedures outlined by ASTM D2113. A photograph of the recovered rock core samples is included in Section 6.1.5.

Observations for groundwater were made in the borings during drilling, before introducing drilling fluid (e.g., core water for rock coring), and at the completion of drilling before backfilling the boring holes.

As each boring was advanced, a geologist from Geotechnology provided technical direction during field exploration, observed drilling and sampling, assisted in obtaining samples, and prepared field logs of the material encountered.

Representative portions of the split-barrel samples were placed in glass jars with lids to preserve the in-situ moisture contents of the samples. The Shelby tubes were capped and taped at their ends to preserve the in-situ moisture contents and densities of the samples, and the tubes were transported and stored in an upright position. The recovered rock core samples were placed in a

[2] The standard penetration resistance, or N-value, is defined as the number of blows required to drive the split-barrel sampler 12 inches with a 140-pound hammer falling 30 inches. Since the split-barrel sampler is driven 18 inches or until refusal, the blows for the first 6 inches are for seating the sampler, and the number of blows for the final 12 inches is the N-value, which is reported as blows per foot (or bpf). Additionally, “refusal” of the split-barrel sampler occurs when the sampler is driven less than 6 inches with 50 blows of the hammer.

waxed cardboard core box. The glass jars, Shelby tubes, and core box were marked and labeled in the field for identification when returned to our laboratory.

5.0 LABORATORY REVIEW AND TESTING

Upon completion of the fieldwork, the samples recovered from the borings were transported to our Soil Mechanics Laboratory, where they were visually reviewed and classified by the Project Geotechnical Engineer.

Laboratory testing was performed on selected soil and rock samples to estimate engineering and index properties. Laboratory testing of the selected soil samples included various combinations of the following tests: moisture content, Atterberg limits, and gradation (particle-size) analyses. Moisture content testing and uniaxial compression testing were also performed on selected rock core samples. The results of these tests are summarized in the Tabulation of Laboratory Tests in Appendix D, along with the corresponding laboratory test forms.

The boring logs, which are included in Appendix C, were prepared by the Project Geotechnical Engineer on the basis of the field logs, the visual classification of the soil and bedrock samples in the laboratory, and the laboratory test results. Soil and Rock Classification Sheets are also included in Appendix C, which describe the terms and symbols used on the boring logs. The dashed lines on the boring logs indicate an approximate change in strata as estimated between samples, whereas a solid line indicates that the change in strata occurred within a sample where a more precise measurement could be made. Furthermore, the transition between strata can be abrupt or gradual.

6.0 SUBSURFACE CONDITIONS

6.1 Stratification

Generally, the existing pavement or ground surface was underlain by native glacial and residual soils followed by bedrock, consisting of interbedded shale and limestone. Occasionally, fill soils were encountered over the native soils. More specific descriptions of the subsurface strata are provided below, and the boring logs containing detailed material descriptions are located in Appendix C.

6.1.1 Topsoil

Topsoil was encountered at the ground surface in each of the borings. The thickness of the topsoil in these borings varied from 1 to 5 inches.

6.1.2 Fill

Existing fill was encountered beneath the topsoil in Boring B-2. The fill in this boring was 1.8 feet thick, and was described as orangish brown, trace gray, slightly moist, very stiff to hard lean clay with traces of sand, brick fragments, roots, and oxide stains.

6.1.3 Glacial Soils

Glacial soils (or glacial till) are soils that have been deposited, transported, or reworked in place by the advancement or retreat of a glacier across the area. Glacial gouge is a type of glacial till that typically refers to till that involves the glacier "gouging" into the underlying bedrock and mixing the "gouged" bedrock with the other soils and debris that are being transported by the advancement of the glacier. In general, glacial gouge includes a mixture of shale and limestone fragments, which may be sub-angular or sub-rounded by the gouging process, with clays, silty clays, sands, and gravels.

Glacial soils were encountered beneath the topsoil or fill at depths of 0.1 to 2.0 feet in each of the borings. The glacial soils in these borings were described as orange brown to brown, trace gray, slightly moist to moist, very stiff to hard fat and lean clay with occasional shale fragments and traces of sand, gravel, roots, and oxide stains.

Moisture contents of three samples of glacial soils varied from 20.7 to 29.0 percent. Table 1 summarizes the results of Atterberg limits and particle-size analysis tests on a sample of the glacial soils.

Table 1. Atterberg limits and particle-size analysis results of a glacial soil sample.

Boring No.	Sample No.	Depth (ft.)	LL-PL-PI[a]	Gravel-sized (%)	Sand-sized (%)	Silt-sized (%)	Clay-sized (%)	USCS Classification
B-2	ST-12	2.0-4.0	81-35-46	0.0	3.6	15.4	81.0	CH

Note:
[a] LL-PL-PI are the liquid limit, plastic limit, and plasticity index in units of percent.

6.1.4 Residuum

Residual soils (or residuum) are soils that have formed by the in-situ weathering of the underlying bedrock into a soil. Occasionally, layers of the bedrock (i.e., shale or limestone layers) may be encountered within the residual soils. Residual soils were encountered beneath the glacial soils at a depth of 4.5 feet in Borings B-2 and B-3. The residuum in these borings was described as brown, olive brown, and trace gray, moist, very stiff to hard fat clay with trace oxide stains and trace remnant bedding.

Moisture contents of two samples of residual soils varied from 21.2 to 21.8 percent. Table 2 summarizes the results of Atterberg limits and particle-size analysis tests on a sample of the residual soils.

Table 2. Atterberg limits and particle-size analysis results of a glacial soil sample.

Boring No.	Sample No.	Depth (ft.)	LL-PL-PI[a]	Gravel-sized (%)	Sand-sized (%)	Silt-sized (%)	Clay-sized (%)	USCS Classification
B-3	ST-3	5.0-7.0	53-25-28	0.0	3.2	32.4	64.4	CH

Note:
[a] LL-PL-PI are the liquid limit, plastic limit, and plasticity index in units of percent.

6.1.5 Bedrock

The overburden soils at the site are underlain by bedrock consisting of interbedded shale and limestone layers. Bedrock was encountered at depths of 2.0 to 7.5 feet below the ground surface in each of the borings.

According to the 1969 United States Geological Survey (USGS) Geologic Map of the Independence Quadrangle, Kenton and Boone Counties, Kentucky (Luft 1969), the bedrock underlying the overburden soils belongs to the Bull Fork Formation.

The referenced USGS map describes the bedrock formations as follows:

- The Bull Fork Formation consists of interbedded limestone and shale, with the limestone comprising more than 50 percent of the formation. The limestone is irregularly to evenly bedded and is generally thinly bedded; locally beds are more than 6 inches thick. The shale is commonly calcareous and less fossiliferous than the limestone and contains siltstone interbeds.

Bedrock in the Northern Kentucky Area is typically categorized as highly weathered, weathered, or unweathered, based on the degree of weathering of the shale component. The highly weathered zone is typically the uppermost zone, wherein the shale is brown to olive brown in color and has almost weathered to a clay. In the intermediate weathered zone, the shale is typically olive brown with occasional gray and is stronger than the shale in the highly weathered zone. In the unweathered parent zone, the shale is gray and is stronger than the shale in the weathered zones. Each zone is interbedded with limestone. It is not uncommon for one or both of the weathered bedrock zones to be absent due to differential weathering, erosion, or prior excavation. The Rock Classification Sheet, which is included in Appendix C, describes the varying degrees of weathering along with the rock strength descriptions that are used on the appended boring logs.

Regarding the limestone, these layers are predominantly unweathered, and their strengths are estimated to range from medium strong to very strong (i.e., uniaxial compressive strengths ranging from 4,000 psi to upwards of 30,000 psi). Occasionally, layers are encountered within the bedrock profile where groundwater seepage is concentrated, and weathering of the limestone layers is more advanced.

Interbedded highly weathered shale and limestone bedrock was encountered in each of the borings. The depth to the top of the highly weathered bedrock, where encountered, ranged from 2.0 to 7.0 feet from the ground surface, and the thickness, where penetrated, varied from 2.5 to 7.5 feet. The strength of the highly weathered shale was described as extremely weak. The moisture content of one sample of the highly weathered shale was 17.7 percent.

Interbedded weathered to slightly weathered shale and limestone bedrock was encountered in each of the borings. The depth to the top of the weathered bedrock, where encountered, ranged from 7.0 to 14.5 feet from the ground surface, and the thickness, where penetrated, varied from 5.0 to 9.5 feet. The strength of the weathered shale was described as extremely weak. Moisture contents of 3 samples of the weathered shale varied from 15.9 to 21.8 percent.

Interbedded unweathered shale and limestone bedrock was encountered in each of the borings, except Boring B-3. The depth to the top of the unweathered bedrock, where encountered, ranged from 12.5 to 21.5 feet from the ground surface. The strength of the unweathered shale was described as extremely weak to weak.

The Bull Fork Formation bedrock was cored in Boring B-2. The rock quality designation (RQD)[3] values ranged from 0 to 65 percent in this boring and increased with depth. The percent limestone in the rock core was approximately 52 percent in the lower 5.5 feet of the rock core. Two samples of the rock core were subjected to uniaxial compression tests. One sample was a weak calcareous shale with a dry unit weight of 155.2 pounds per cubic foot (pcf), a moisture content of 2.3 percent, and a uniaxial compressive strength of 2,050 pounds per square inch (psi). The other sample consisted of medium strong fossiliferous limestone with shale partings, which had a dry unit weight of 164.4 pcf and a uniaxial compressive strength of 5,830 psi. A photograph of the rock core is provided in Rock Core Photograph 1.

Rock Core Photograph 1. Boring B-2, Samples RC-10 and RC-11 from 21.5 to 31.5 feet.

[3] The rock quality designation (RQD) is defined as the percentage of rock core pieces recovered in lengths longer than 4 inches for the specified interval.

6.2 Groundwater Conditions

As mentioned in Section 4.0, groundwater observations were made in the borings during drilling, before introducing drilling fluid (e.g., core water for rock coring), and at the completion of drilling before backfilling the boring holes.

In general, groundwater was not encountered in the borings; however, core water was at a depth of 14.0 in Boring B-2 before backfilling.

Based on the groundwater observations and our local experience, groundwater seepage is anticipated along the overburden soil/bedrock interface and along limestone layers within the bedrock. Locally concentrated flow may occur due to saturated layers of fill or native soils or along fractures in the bedrock. Additionally, groundwater levels, seepage amounts, and flow rates are expected to vary with time, location, season of the year, and amounts of precipitation.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our engineering reconnaissance of the site, the borings, the visual examination of the recovered samples, the laboratory test results, our understanding of the proposed project, our engineering analyses, and our experience as Geotechnical Engineers in the Northern Kentucky Area, the following conclusions and recommendations are presented.

7.1 Excavation Support

Excavation support should be the responsibility of the Contractor. Excavation support should be designed and implemented such that excavations are adequately ventilated and braced, shored, and/or sloped in order to protect and ensure the safety of workers within and near the excavations and to protect adjacent ground, slopes, structures, and infrastructure. Federal, state, and local safety regulations should be satisfied. The analyses, discussions, conclusions, and recommendations throughout this report are not to be interpreted as pre-engineering compliance with any safety regulation.

7.2 Site Preparation and Earthwork

As stated in Section 2.0, earthwork for this project is anticipated to involve cuts and fills up to 5 and 6 feet, respectively.

7.2.1 Site Preparation

The initial preparation of the site for grading should include the removal of vegetation, heavy root systems, and topsoil from the proposed cut, fill, pavement, and structure areas. The topsoil may be stockpiled for future use on the completed cut and fill slopes or in landscaped areas, if permitted by specification, whereas the vegetation, including the heavy root systems, should be disposed of off site in accordance with applicable regulations.

While not anticipated, buried structures and/or pavements within the grading and proposed structure limits should be demolished, and the foundations removed. Concrete, asphalt, rubble, and debris associated with those structures and pavements should be disposed of off site, unless

there are provisions in the specifications for on-site reclamation of these materials. We should be retained to review these provisions to evaluate their impact on the recommendations of this report.

7.2.2 Undercutting and Subgrade Preparation

Following clearing the site of the existing vegetation and topsoil, we recommend that undocumented fill, sediments, and surficial low-density, very soft to medium stiff soils that exist within the structure, pavement, and proposed fill areas and along the transitions between cut and fill be undercut to expose stiff to very stiff native clayey soils or the interbedded shale and limestone bedrock.

After the above operations and making the required excavations in the cut areas, the exposed subgrade should be thoroughly proofrolled using a heavily loaded piece of equipment under the review of the Project Geotechnical Engineer, or a representative thereof. Soft or yielding soils observed during the proofrolling should be undercut to stiff, non-yielding, cohesive soils.

Where undercuts are performed, the excavations should be backfilled with new compacted fill satisfying the material and compaction requirements presented in Section 7.2.4. The undercut soils may be reused provided that they conform to the recommendations contained in this report regarding acceptable fill materials. We recommend that the Contract Documents include a bid item for the recommended undercutting, as deemed necessary, and the replacement with new compacted and tested fill on a “per cubic yard of in-place compacted fill” basis.

7.2.3 Excavatability

Experience indicates that the overburden soils and the highly weathered and weathered zones of the bedrock can be excavated with conventional earthwork construction equipment (i.e., dozers, hoes, loaders, scrapers, etc.), although ripping is necessary to loosen the bedrock so that it can be picked up. Excavations that extend into the unweathered gray shale and limestone bedrock become more difficult with depth, and more ripping may be required to loosen the bedrock. Thick layers of limestone from the Bull Fork Formation may be difficult to rip and will require rock breakers/hoe rams for removal in the highly weathered and unweathered zones of bedrock.

7.2.4 Fill Materials, Placement, and Compaction

Fill materials should consist of approved on-site, non-organic, clayey soils, bedrock, or approved borrow material that are relatively free of topsoil, vegetation, trash, construction or demolition debris, frozen materials, particles over 6 inches in maximum dimension, or other deleterious materials.

The shale and limestone bedrock may be incorporated into the fill provided that the shale is pulverized to a soil-like consistency and moisture-conditioned, and provided that the limestone is broken up and dispersed so as not to cause nesting or retard compaction. The maximum dimension of the broken-up limestone floaters in the fills should be limited to 30 inches with a maximum thickness of 6 inches. Thicker layers or larger pieces of limestone, if not capable of being broken up, should be wasted off site. Additionally, limestone floaters should be restricted from the fill from subgrade elevation to 2 feet below bearing elevations within the footprints of the

proposed structures and 10-foot buffer areas around these structures. In pavement areas, we recommend that the limestone floaters be restricted within 1 foot of subgrade elevations.

The fill should be placed in shallow level lifts (or layers), 6 to 8 inches in loose thickness. Each lift should be moisture-conditioned to within the acceptable moisture content range provided in Table 3, and compacted with a sheepsfoot roller or self-propelled compactor to at least the minimum percent compaction indicated in the same table. Moisture-conditioning may include: aeration and drying of wetter soils; wetting of drier soils; and/or thoroughly mixing wetter and drier soils into a uniform mixture. Additionally, if shale is used in the fill, water will likely need to be mixed in with the shale to moisture-condition the shale.

Table 3. Percent compaction and moisture-conditioning requirements for fill and backfill.

Area	Minimum Percent Compaction[a,b]	Acceptable Moisture Content Range[c]
Structural[d]	98% of SPMDD	-2% to +3% of OMC
Non-structural	95% of SPMDD	-2% to +3% of OMC
Floor slab subgrade	98% of SPMDD	0% to +3% of OMC
Pavement subgrade: ≤ 12 inches below subgrade	98% of SPMDD	±2% of OMC

Notes:

[a] SPMDD = standard Proctor maximum dry density determined from ASTM D698.

[b] For granular soils that do not exhibit a well-defined moisture-density relationship, refer to Table 6 for minimum relative density requirements.

[c] OMC = optimum moisture content determined from ASTM D698.

[d] Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint of the structure and 2H:1V outward and downward projections from the bearing elevation of the structure.

Where fill is placed on sloping terrain that is steeper than 6H:1V, the fill should be placed on continuous horizontal benches up the sloping terrain with the initial bench having a minimum width of 15 feet and each subsequent bench being at least 5 feet wide. The initial 15-foot-wide bench should be located at the toe of the proposed fill, unless noted otherwise. The benching operations should remove surficial medium stiff or softer soils and expose stiff native soils or undisturbed, intact bedrock on the surfaces of the benches. The benches should not be made until the fill is ready to be placed. If groundwater seepage is noted on the benches, the Project Geotechnical Engineer should be contacted for underdrainage recommendations before the soils are replaced and compacted.

7.2.5 Earthwork Design and Construction Considerations

We recommend that the permanent cut and fill slopes for this project be designed not steeper than 3H:1V. Gentler slopes should be used whenever possible for ease of maintenance. Additionally, we recommend that the fill slopes be slightly overbuilt and then trimmed back to the design slope angle to achieve a well-compacted surface.

Topsoil should be track-compacted on the proposed cut and fill slopes. We recommend that a maximum of 6 inches of topsoil be placed on the slopes. It should be noted that bedrock exposures at proposed grades may not consistently hold the topsoil layer, and small pop-outs may occur, especially at points of seepage.

Groundwater is not expected to have a significant adverse effect on the proposed earthwork construction; however, the Contractor must be prepared to remove seepage that accumulates in excavations, on fill surfaces, or at subgrade levels.

Due to the plastic fat clays encountered on site, maintaining the moisture content of bearing and subgrade soils within the acceptable ranges provided in Table 3 is very important during and after construction for the proposed structures. The clayey bearing and subgrade soils should not be allowed to become excessively wet or dried during or after construction, and measures should be taken to prevent water from ponding on these soils and to prevent these soils from desiccating during dry weather.

Positive drainage should be established to promote the rapid drainage of surface water away from the proposed structures and to prevent the ponding of water adjacent to these structures. Finish grading in grass and landscaped areas should be sloped down and away from the structures at 10 percent for at least 10 feet, and then at a gradient of at least 2 percent beyond the initial 10 feet from the structures. Proposed pavements should drain away from the structures at a minimum of 2 percent. The final grades should direct the surface water to storm water collection systems.

Deep-rooted vegetation should not be planted within 1.5 times their projected mature foliage radius from foundations, as the roots of such vegetation can seasonally extract moisture from plastic and low-plastic soils alike, causing them to seasonally shrink, which can potentially create foundation settlement issues. Additionally, smaller bushes or flowerbeds adjacent to proposed structures should not be watered by ponding water in the beds where the bushes or flowers may be growing, which could lead to swelling of the foundation soils and subsequent heave.

Due to the moisture-sensitivity of placing clay soils and shale bedrock as fill, we recommend that the earthwork operations be carried out during the drier season of the year and that a sufficient gradient be maintained at the ground surface to prevent ponding of surface water. In our experience, the weather conditions are historically more favorable for earthwork during the months of May through October in the Northern Kentucky Area. Regardless of the time of year, asphalt, concrete, or fill should not be placed over frozen or saturated soils, and frozen or saturated soils should not be used as compacted fill or backfill.

Best management practices (BMPs) should be implemented to reduce the effects of erosion and the siltation of adjacent properties. Upon completion of earthwork, disturbed areas should be stabilized.

7.3 Seismic Site Classification

Based on the borings and our interpretation of the 2018 Edition of the Kentucky Building Code (2018 KBC), it is our opinion that Site Class C is applicable for this project site.

7.4 Foundation Design and Construction

7.4.1 Water Tank Foundations

As mentioned in Section 2.0, two different styles of tanks are being considered: a multi-column-style tank supported by six columns with individual foundations; and a pedesphere-style supported by a circular foundation beneath a 30-foot-diameter wall that supports the tank.

Based on the column loads, we recommend that the foundations consist of either: (1) spread footings or mat foundations bearing on bedrock; or (2) drilled shafts socketed into the underlying bedrock.

For the spread footing or mat foundation option, the following allowable bearing pressures may be considered, which are based on full dead and full live load:

- 6,000 psf for bearing in the highly weathered shale and limestone bedrock;
- 10,000 psf for bearing in the weathered shale and limestone bedrock; or
- 20,000 psf for bearing in the unweathered shale and limestone bedrock

However, it is anticipated that dropping the foundations deep enough into the unweathered shale and limestone bedrock will be uneconomical as this stratum was approximately 21.5 feet deep in Boring B-2.

Sections 7.4.3 and 7.4.4 provide additional design and construction recommendations for shallow foundations and drilled shaft foundations, respectively.

7.4.2 Instruments Building Foundations

Based on the anticipated foundation loads, we recommend that the proposed instruments building be supported on shallow foundations, i.e., continuous wall footings and isolated column pads, bearing in new compacted and tested fill, stiff to very stiff native soils, or undisturbed, intact bedrock. The footings may be proportioned for a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf), full dead and full live load.

Due to the prevalence of fat clay on the site, exterior footings and footings in unheated interior areas should bear at least 42 inches below the lowest adjacent exterior/unheated grade, which is 12 inches deeper than the frost depth of 30 inches for Kenton County, Kentucky. In lieu of dropping the structural footings to a depth of 42 inches below grade, the footing excavation may be backfilled with lean concrete that has a compressive strength of at least 1,500 pounds per square inch (psi) between frost depth and the bottom of the footing excavation that is at least 42 inches below grade.

Section 7.4.3 provides additional design and construction recommendations for shallow foundations.

7.4.3 Shallow Foundations

7.4.3.1 Shallow Foundation Design Recommendation

Footing scheduled for bedrock bearing should bear at least 30 inches below exterior grade for protection from frost. Soil-bearing footings should bear at least 42 inches below exterior grades as previously mentioned due to the fat clays on site. Additionally, the foundation bearing elevations should not be located higher than a relationship of 2H:1V above proposed adjacent foundations or the inverts of nearby existing or proposed utilities that parallel or nearly parallel the foundations, without a site-specific evaluation of the conditions by the Project Geotechnical Engineer.

Where shallow foundations will be subjected to lateral loads, resistance to overturning and sliding may be evaluated using the parameters provided in Table 4. Furthermore, lateral resistance to sliding may be provided by a combination of friction and passive resistance; however, passive resistance should be ignored above the frost penetration depth of 30 inches. It also should be noted that the passive resistance parameters assume a level ground surface. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific parameters. The frictional force should be based on dead normal loads only, and an appropriate factor of safety should be applied to the sliding resistance.

Table 4. Design parameters for laterally loaded shallow foundations.

Soil unit weight, γ (pcf)	125
Internal angle of friction, ϕ (°)	26
Cohesion, c (psf)	0
Ultimate coefficient of static friction, μ_{ult}	0.35 for concrete cast on stiff in-situ clayey soils
Ultimate passive resistance, σ_p[a]	See passive lateral earth pressure parameters in Table 5 for passive resistance against soil
	9,000 psf for intact bedrock

Note:

[a] Passive resistance may be considered where concrete is cast against free-standing vertical faces of the indicated soil or bedrock type; however, passive resistance should be ignored in the upper 30 inches below proposed grade due to seasonal variations in moisture and frost penetration. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific recommendations.

Refer to Section 7.5 for lateral earth pressures.

7.4.3.2 General Shallow Foundation Construction Recommendations

We recommend that foundation excavations be cut to neat lines and grades so that concrete may be placed directly against the banks of the excavations without forming. Loose, soft, wet, frozen, or otherwise disturbed materials should be removed from the bearing surfaces of the foundations prior to the placement of reinforcing steel and concrete. If a limestone layer is exposed in the bottom of the footing excavation, we recommend that the excavation be deepened to penetrate the limestone layer, unless it can be determined that there is no softening of the shale beneath the limestone. Additionally, disturbed or loosened beds of limestone should be removed from the bearing surface. If a crusted or saturated surface develops at the bearing surface for a foundation, we recommend that it be skimmed to expose a fresh surface before reinforcing steel and concrete are placed. Foundation concrete should be placed the same day as the excavation is made to prevent saturation or desiccation of the bearing surfaces.

Concrete mud mats may be placed over the bearing surfaces to protect the bearing materials from desiccation or softening via saturation. If concrete mud mats are utilized, the concrete should have a minimum compressive strength of 1,500 psi and a minimum thickness of 3 inches. The excavated bearing surface should be lowered at least the thickness of the mud mat, and the top of the mud mat should be at or below the design bearing elevation of the foundation. Prior to the placement of the concrete mud mat, the bearing surfaces should be cleaned of loose, soft, wet, frozen, or otherwise disturbed material.

Water should not be allowed to pond on top of either bearing soils or bedrock within footing excavations, or on or around completed footings, in order to reduce potential softening or swelling of the bearing materials.

We recommend that foundation steps have a maximum height of 2 feet and a corresponding minimum length of 4 feet. Reinforcing steel and concrete should remain continuous through the foundation steps.

We recommend that foundation excavations be reviewed by the Project Geotechnical Engineer, or a representative thereof, prior to placing concrete in order to confirm that the bearing materials and surfaces are consistent with the design recommendations of this report.

7.4.4 Drilled Shaft Foundations

7.4.4.1 Drilled Shaft Design Recommendations

The drilled shaft foundations should penetrate through the overburden soils and be socketed into the underlying bedrock. Axial resistance for the drilled shaft foundations may be provided by a combination of end resistance and side resistance. The idealized soil and bedrock profile included in Appendix E provides the recommended values for allowable end and side resistance for the different subsurface layers. We recommend that drilled shafts bear at least 3 times the shaft diameter below the ground surface, but no less than at least 12 inches into the underlying bedrock.

For resistance to lateral and moment loads, the drilled shafts should be designed using a p-y approach. The idealized soil and bedrock profile included in Appendix E provides the p-y parameters for LPile for the different subsurface layers.

Similar to the discussion in Section 7.4.3.1 on passive resistance for shallow foundations, lateral resistance for deep foundations should be ignored above the frost line (i.e., above a depth of 30 inches from the ground surface).

Where the spacing of laterally loaded deep foundations will be close enough that their areas of resistance overlap (i.e., less than 6 times their shaft diameter), we recommend that an appropriate p-multiplier be applied in the analyses to account for the overlap and reduction in lateral resistance. We recommend that the p-multiplier be estimated per Section 10.7.2.4 from the *AASHTO LRFD Bridge Design Specifications, 9th Edition* (AASHTO 2020).

7.4.4.2 Drilled Shaft Construction Recommendations

The drilled shaft excavations should be made straight and plumb with level bottoms, using dry construction methods. Loose, soft, wet, or otherwise disturbed materials should be removed from the bearing surfaces to expose undisturbed bedrock before the reinforcing steel and concrete are placed. Concrete should not be placed through more than 3 inches of water in the bottom of any shaft, and the rate of inflow of groundwater should be less than 12 inches per hour, unless wet construction methods are implemented. Concrete should also be placed the same day that the bedrock sockets of the shafts are drilled to prevent softening/slaking of the soils and/or bedrock in the drilled shafts. We recommend that each drilled shaft excavation be reviewed by the Project Geotechnical Engineer, or a representative thereof, to confirm that the soil and bedrock conditions encountered within the drilled shaft are consistent with those encountered in the borings and with the design recommendations of this report.

While not anticipated based on the boring information, full-depth temporary casing from the ground surface to the top of bedrock may be needed to control groundwater and/or caving overburden soils. We recommend that the Contract Documents include a bid item for casing shafts as recommended by the Project Geotechnical Engineer, or the representative thereof, on a “cost per cased shaft” basis.

Bottoms of grade beams should extend at least 42 inches below proposed exterior grades. Similar to the shallow foundations, grade beams between drilled shafts should be excavated to neat lines and grades so that concrete may be placed directly against the banks of the excavations without forming. If the excavation becomes desiccated prior to placement of concrete, the sides and bottoms of the excavation should be trimmed to expose fresh, moist soils to reduce the potential of the desiccated soils absorbing water and swelling, resulting in uplift pressures on the grade beams.

7.5 Lateral Earth Pressures

Where foundation walls and below-grade structures (e.g., valve vault) will be subjected to unbalanced lateral earth pressures, we recommend that the lateral earth pressures be computed

on the basis of equivalent fluid weights of the backfill, plus surcharges for foundation loads, pavement loads, sloping backfill, etc. Table 5 provides the recommended equivalent fluid weights for soil for both drained and undrained conditions, and also the recommended earth pressure coefficients for proposed surcharges. Unless a site-specific analysis is performed, we recommend that surcharges be modeled as a uniform horizontal pressure equal to the vertical intensity of the surcharge multiplied by the recommended lateral earth pressure coefficient.

Table 5. Lateral earth pressures for level (horizontal) ground surfaces.

	Active[a]	At-Rest[a]	Passive[a,b]
Lateral earth pressure coefficient, K	0.42	0.59	2.37
Drained equivalent fluid weight, EFW (pcf)	53	74	296
Undrained equivalent fluid weight, EFW_u (pcf)[c]	89	100	210

Notes:

[a] Parameters are based on level ground surfaces, a soil unit weight (γ) of 125 pcf, and a soil internal angle of friction (ϕ) of 24 degrees.

[b] Passive resistance may be considered where concrete is cast against free-standing vertical faces of soil or bedrock; however, passive resistance should be ignored in the upper 30 inches below proposed grade due to seasonal variations in moisture and frost penetration. If the ground is sloping down and away from the foundation in the area of passive resistance, we should be contacted to provide site-specific recommendations. Refer to Table 4 for passive resistance against bedrock for shallow foundations.

[c] Includes hydrostatic pressure of 62.4 pcf.

The values provided in Table 5 assume that the ground surface adjacent to the wall is level and not sloping toward the wall. For ground sloping toward the wall on its active or at-rest side, we recommend that it be accounted for as a surcharge on the wall, as discussed above, unless site-specific equivalent fluid weights are computed on the basis of the backfill slope.

The decision to use active or at-rest earth pressures should be based upon the ability of the wall or structure to deflect as a result of the lateral earth pressures. In cohesionless granular backfill, active earth pressures are assumed to be applicable if the top of the wall is able to deflect a minimum of 0.002 times the height of the wall. In cohesive clayey backfill, the minimum deflection at the top of the wall for active earth pressures to develop is 0.02 times the height of the wall. If these minimum horizontal deflections at the top of the wall are restrained from occurring or unacceptable to the structure, at-rest earth pressures are applicable.

Undrained equivalent fluid weights should be used in computing the lateral loads on the wall wherever the backfill is unable to be drained by a drainage system (discussed below). For the drained equivalent fluid weights to be applicable, a drainage system should be incorporated along the backfilled face of the wall (i.e., the high side of the wall) consisting of either a prefabricated drainage board or an approximately 18-inch width of free-draining gravel with less than 5 percent fines wrapped with a non-woven drainage geotextile. At the base of the drainage board or free-draining gravel should be a minimum 12-inch-thick by 12-inch-wide, free-draining gravel zone

wrapped with a non-woven drainage geotextile. Within the wrapped gravel at its base should be a 4-inch-diameter rigid perforated plastic pipe. The plastic pipe should be connected to a suitable gravity outlet (e.g., the proposed storm sewer system). The granular backfill should be compacted to at least 75 percent relative density per ASTM D4253 and D4254. We recommend that the drainage system extend to subgrade elevation beneath pavements or floor slabs; otherwise, the drainage system should extend to within 2 feet of finished grade and be capped with at least 2 feet of compacted clayey soils to reduce the infiltration of surface water behind the wall. Clayey backfill should be compacted per the requirements presented in Table 3. The drainage system should not connect to interior drainage systems below floor slabs. These interior drainage systems should have separate, independent outlets.

If a pre-fabricated drainage board is used in the drainage system and the wall will be subjected to freezing temperatures, rigid, polystyrene foam board insulation at least 1 inch thick should be placed between the wall face and the drainage board to protect the moist, cohesive wall backfill from freezing, which could otherwise exert frost-induced lateral pressures against the wall.

In general, we anticipate that the valve vault should be designed on the basis of undrained at-rest lateral earth pressures acting on the walls.

7.6 Utility Construction

Excavation difficulty in utility trenches will vary with location, depth of utility, and depth of cuts made to development grades on the ridgetops and slopes. The combined depths of bulk grading cuts and utility trenches may extend into the highly weathered and weathered bedrock, in certain areas of the site. Because of the anticipated limestone percentages that will be encountered in the bedrock (cf. descriptions of bedrock formations from Section 6.1.5), there will be excavation difficulties within the utility trenches. The difficulty of making the trench excavations in the highly weathered to weathered bedrock arises because of the need to shear limestone layers from the bottoms and sides of the trenches. In the Bull Fork Formation, the thicker limestone layers may necessitate the use of rock saws or rock breakers/hoe rams in even the highly weathered and weathered bedrock zones.

We anticipate that select granular backfill will be used as pipe bedding and pipe zone backfill for the utilities. We recommend that the granular backfill be limited to the pipe bedding and minimum required pipe/utility cover. The remainder of the utility trenches should be backfilled with flowable fill or compacted clayey soils up to design subgrade elevation to reduce the potential for water collecting in these trenches and being absorbed by the surrounding clays, causing heave of foundations, slabs, pavement, etc.

Granular bedding and backfill that exhibits a well-defined moisture-density relationship should be compacted and moisture-conditioned per the requirements presented in Table 3; otherwise, the granular material should be compacted to at least the minimum relative densities indicated in Table 6.

Table 6. Relative density compaction requirements for granular fill and backfill.

Area	Minimum Relative Density[a,b]
Structural[c]	80%
Non-structural	75%
Floor slab and pavement subbase	80%

Notes:

[a] Relative density evaluated on the basis of the maximum and minimum index densities determined from ASTM D4253 and D4254, respectively.

[b] For granular soils that exhibit a well-defined moisture-density relationship, refer to Table 3 on page 10 for minimum percent compaction and moisture-conditioning requirements.

[c] Structural fill and backfill for foundations are defined as fill and backfill located within the zones of influence of structures. The zone of influence of a structure is defined as the area below the footprint of the structure and 2H:1V outward and downward projections from the bearing elevation of the structure.

Utility trench backfill should be placed in 6- to 8-inch-thick lifts with each lift compacted to at least the specified degree of compaction. Under no circumstances should the backfill be flushed in an attempt to obtain compaction.

If flowable fill is used, it should have a design strength of at least 30 psi for stability and not greater than 100 psi for future excavatability.

Due to the high plastic soils on-site, which are susceptible to shrinkage and swelling, and the relatively lightly loaded instruments building, the granular bedding and pipe zone backfill should be eliminated around the proposed utility pipes within the perimeter of this building and replaced with flowable fill. Provisions will need to be implemented during construction to prevent the pipes from floating in the flowable fill until the flowable fill sets.

Prior to placing the bedding and utilities within the utility trench, soft, saturated, and compressible material should be removed from the bottom of the trench, exposing moist stiff soils or undisturbed bedrock.

7.7 Floor Slab

We anticipate that the floor slab for the instruments building will be designed as slab-on-grade concrete. The concrete floor slab thicknesses should be designed based on the native or compacted and tested, stiff soils at this site providing a modulus of subgrade reaction (k) of 75 pounds per cubic inch (pci) for point loads.

Due to the fat clays on site, we recommend that the subgrade for this building be sloped to drain at a minimum of 2 percent to an internal underdrain system. The underdrain system should be located along the interior face of the footing and consist of a minimum 12-inch-thick by 12-inch-wide, free-draining gravel zone wrapped with a non-woven drainage geotextile. Within the wrapped gravel at its base should be a 4-inch-diameter rigid perforated plastic pipe. The bottom of the underdrain excavation and the perforated pipe should also slope to drain at 2 percent to a

solid outlet pipe. The outlet pipe should be connected to a suitable gravity outlet (e.g., the nearby storm sewer system or a prefabricated headwall).

We recommend that the floor slab be underlain by a minimum 4-inch-thick subbase layer of dense-graded aggregate (DGA) to serve as a capillary break and reduce the potential for groundwater rising beneath and into the floor slab from the clayey subgrade via capillary action. The DGA subbase should be compacted per the requirements presented in Table 3. Immediately prior to placement of the granular base, we recommend that the top 8 inches of clayey floor slab subgrade be compacted and moisture-conditioned per the requirements presented in Table 3.

Additionally, we recommend that a vapor retarder/barrier be provided between the floor slab and the subbase where moisture-sensitive floor coverings will be applied to the floors, where moisture-sensitive products/packaging will be stored in direct contact with the floors, and where the humidity of the enclosed space is a concern. The effects of the vapor barrier on curling of the concrete floor slab should be considered in the mix design and placement of the concrete floor slab.

Care should be taken during slab-on-grade construction to not allow the subgrade to become desiccated or saturated. Additionally, consideration should be given to the timing of construction relative to the time of year and weather.

We recommend that control joints be provided within the concrete slab-on-grade floors. These joints should be sealed to reduce surface water infiltration until the building is enclosed. The floor slab should be structurally separated from walls, columns, footings, and penetrations to allow independent movement of the floor. Alternatively, floor slabs that are not structurally independent should be designed to allow for differential movements that normally occur between the floor slabs, columns, and foundation walls.

7.8 Pavement Recommendations

The entrance driveway pavement should be designed in accordance with expected axle loads, frequency of loading, and the properties of the subgrade. A California Bearing Ratio (CBR) value of 2 should be assumed in the pavement design for subgrade prepared per the recommendations in this report.

Proposed pavement subgrades should be proofrolled with a loaded tandem-axle dump truck weighing at least 40,000 pounds under the review of the Project Geotechnical Engineer, or representative thereof. Soft or yielding soils observed during the proofroll should be undercut to stiff, non-yielding soils; however, the depth of undercut below subgrade may be limited to 4 feet. The undercut should be backfilled with new compacted fill satisfying the material and compaction requirements presented in Section 7.2. We recommend that the Contract Documents include an item for undercutting unsuitable soils and replacing them with new compacted and tested fill on a “per cubic yard of compacted replacement fill” basis.

If soft or yielding soils are encountered at the maximum undercut depths specified above and the compaction requirements of the undercut backfill cannot be achieved at the bottom of the undercut, the subgrade may be stabilized at those depths using a biaxial or triaxial geogrid (e.g., Tensar BX-1200 or TriAx TX160 or equivalent) and an 8-inch lift of compacted crushed stone. The remainder of the undercut should be backfilled with dense-graded aggregate or clayey soils satisfying the material and compaction requirements presented in Section 7.2. If clayey soils are used, a separation geotextile should be provided at the interface between the crushed stone and the clayey soils.

In lieu of undercutting soft or yielding soils to the maximum undercut depths specified above, the subgrade may be stabilized using a biaxial or triaxial geogrid (e.g., Tensar BX-1200 or TriAx TX160 or equivalent) and at least 12 inches of compacted crushed stone. We recommend that the thickness of undercut and compacted crushed stone be field-evaluated based on the conditions encountered during construction and using a test section. This alternative should also be considered if weather, other site conditions, or the project schedule make earthwork activities with clayey soils impractical.

Prior to the placement of pavement or aggregate base, where provided, we recommend that the top 8 inches of clayey subgrade be scarified and recompacted per the requirements presented in Table 3.

If the proposed pavement section includes an aggregate base, we recommend that caution be exercised so that the proposed aggregate base does not become saturated during or after construction. Water trapped in the aggregate base is capable of freezing, causing it to expand within the voids it occupies. Consequently, ice lenses may form and potentially heave the pavement. Furthermore, the thawing process can soften underlying cohesive subgrades, which reduces the pavement support provided by the subgrade, giving rise to “pumping” of the pavements under loads. Preferably, the aggregate base should be a free-draining material with provisions for draining the base through a system of underdrains. Regardless, we recommend that a transverse underdrain at subgrade elevation be installed at the transition from existing pavement to the new driveway.

Surface drainage should be directed away from the edges of proposed and existing pavements so that water does not pond next to pavements or flow onto pavements from unpaved areas. Such ponding or flow can cause deterioration of pavement subgrades and premature failure of pavements. If drainage ditches are used to intercept surface water before it reaches the pavements, the ditches should have an invert at least 6 inches below the pavement subgrade, and have a sufficient longitudinal gradient to rapidly drain the ditches and prevent ponding of water. In those areas where exterior grades do not fully slope away from the edges of the proposed pavement, we recommend that edge drains be installed along the perimeter of the pavement.

8.0 RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on: Geotechnology's understanding of the proposed design and construction, as outlined in this report; site observations; interpretation of the exploration data; and our experience. Since the intent of the design recommendations is best understood by Geotechnology, we recommend that Geotechnology be included in the final design and construction process, and be retained to review the project plans and specifications to confirm that the recommendations given in this report have been correctly implemented. We recommend that Geotechnology be retained to participate in prebid and preconstruction conferences to reduce the risk of misinterpretation of the conclusions and recommendations in this report relative to the proposed construction of the subject project.

Since actual subsurface conditions between boring locations may vary from those encountered in the borings, our design recommendations are subject to adjustment in the field based on the subsurface conditions encountered during construction. Therefore, we recommend that Geotechnology be retained to provide construction observation services as a continuation of the design process to confirm the recommendations in this report and to revise them accordingly to accommodate differing subsurface conditions. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. Regardless of construction observation, contractors, suppliers, and others are solely responsible for the quality of their work and for adhering to plans and specifications.

9.0 LIMITATIONS

This report has been prepared on behalf of, and for the exclusive use of, GRW Engineers, Inc. for specific application to the named project as described herein. If this report is provided to other parties, it should be provided in its entirety with all supplementary information. In addition, GRW Engineers, Inc. should make it clear that the information is provided for factual data only, and not as a warranty of subsurface conditions presented in this report.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

Our scope for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include an assessment of the effects of flooding and erosion of creeks or rivers adjacent to or on the project site.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Consequently, subsurface conditions may vary gradually, abruptly, and/or nonlinearly between sample locations and/or intervals.

The conclusions or recommendations presented in this report should not be used without Geotechnology's review and assessment if the nature, design, or location of the facilities is changed, if there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, Geotechnology must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. Geotechnology will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or with reuse of the subsurface data or engineering analyses in this report.

The recommendations included in this report have been based in part on assumptions about variations in site stratigraphy that may be evaluated further during earthwork and foundation construction. Geotechnology should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. Geotechnology cannot assume liability for the adequacy of its recommendations when they are used in the field without Geotechnology being retained to observe construction.

A copy of "Important Information about This Geotechnical-Engineering Report" that is published by the Geotechnical Business Council (GBC) of the Geoprofessional Business Association (GBA) is included in Appendix A for your review. The publication discusses some other limitations, as well as ways to manage risk associated with subsurface conditions.

REFERENCES

American Association of State Highway and Transportation Officials (2020). *AASHTO LRFD*

Luft, S.J. (1969). “Geologic Map of the Independence Quadrangle, Kenton and Boone Counties, Kentucky,” United States Geological Survey.

APPENDIX A – IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

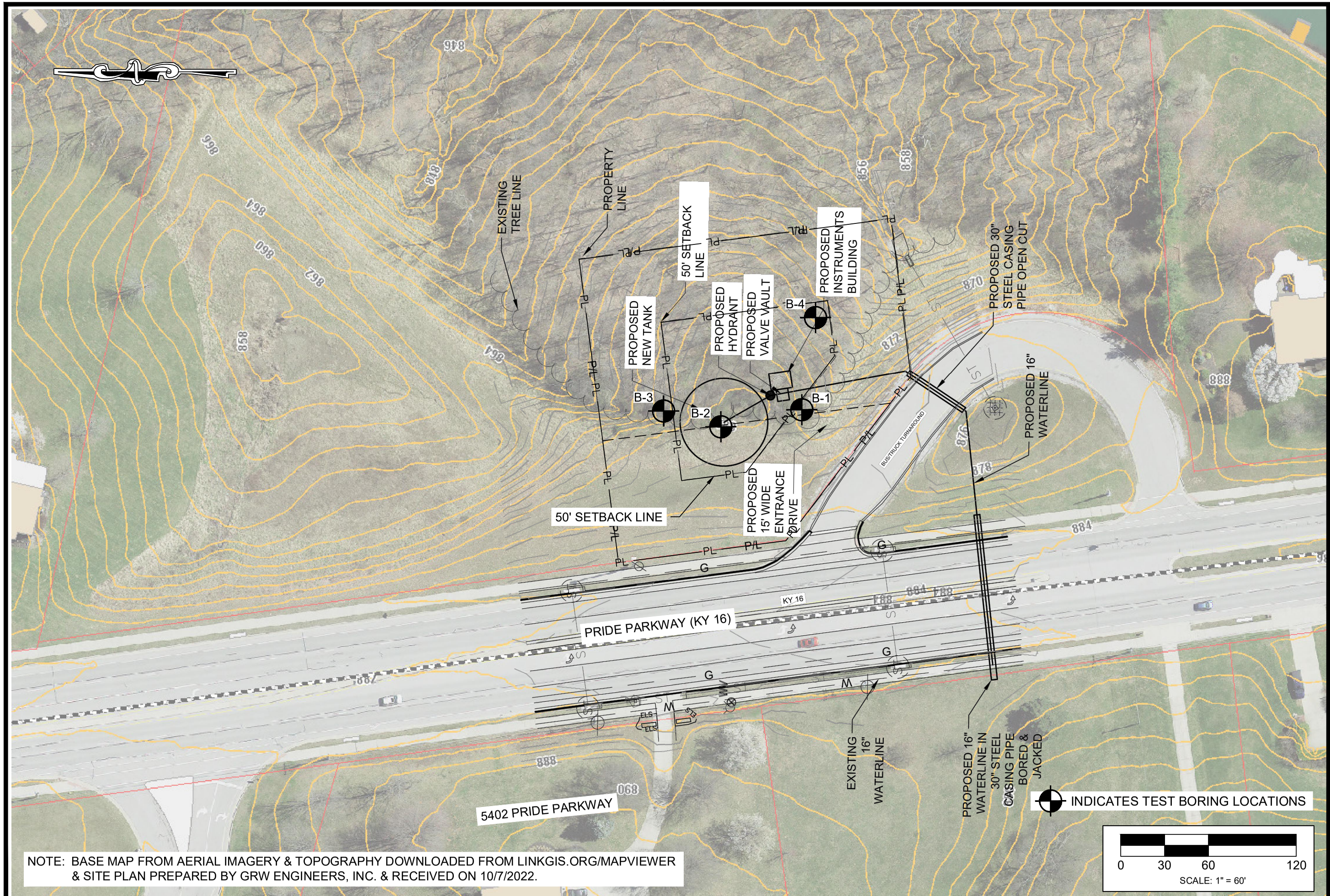
8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B – PLANS

Exploration Plan, Sheet No. 1

Exploration Plan with 1963 Topographic Contours, Sheet No. 1A

Date Printed: 11/10/2022 4:43 PM Path: \\10.0.12.42\erl\data\projects\J040\J040822.01-NKWD Taylor Mill Tank\Draw\Exploration Plan-J040822.01.dwg



NOTE: BASE MAP FROM AERIAL IMAGERY & TOPOGRAPHY DOWNLOADED FROM LINKGIS.ORG/MAPVIEWER & SITE PLAN PREPARED BY GRW ENGINEERS, INC. & RECEIVED ON 10/7/2022.

GEOTECHNOLOGY

Project: NKWD TAYLOR MILL TANK

Location: 5421 PRIDE PARKWAY TAYLOR MILL, KENTUCKY

Title: EXPLORATION PLAN

Client: GRW ENGINEERS, INC.

Date: 11/11/2022

Project No.: J040822.01

Sheet No.: 1

PROPOSED NEW TANK
50' SETBACK LINE
PROPOSED HYDRANT
PROPOSED VALVE VAULT
PROPOSED INSTRUMENTS BUILDING
PROPOSED 30" STEEL CASING PIPE, OPEN CUT
PROPOSED 16" WATERLINE
EXISTING TREE LINE
PROPERTY LINE
B-1
B-2
B-3
B-4
50' SETBACK LINE
PROPOSED 15' WIDE ENTRANCE DRIVE
PRIDE PARKWAY (KY 16)
KY 16
5402 PRIDE PARKWAY
EXISTING 16" WATERLINE
PROPOSED 16" WATERLINE IN 30" STEEL CASING PIPE BORED & JACKED
INDICATES TEST BORING LOCATIONS
0 30 60 120
SCALE: 1" = 60'

NOTE: BASE MAP FROM AERIAL IMAGERY & TOPOGRAPHY DOWNLOADED FROM LINKGIS.ORG/MAPVIEWER, FROM SITE PLAN PREPARED BY GRW ENGINEERS, INC. & RECEIVED ON 10/7/2022, & FROM 1963 TOPOGRAPHIC MAP PREPARED BY NORTHERN KENTUCKY AREA PLANNING COMMISSION (NKAPC).

GEOTECHNOLOGY

Project: NKWD TAYLOR MILL TANK

Location: 5421 PRIDE PARKWAY TAYLOR MILL, KENTUCKY

Title: EXPLORATION PLAN WITH 1963 TOPOGRAPHIC CONTOURS

Client: GRW ENGINEERS, INC.

Date: 11/11/2022

Project No.: J040822.01

Sheet No.: 1A

APPENDIX C – BORING INFORMATION

Boring Logs

Soil Classification Sheet

Rock Classification Sheet

GEOTECHNOLOGY
A Universal Engineering Sciences Company

LOG OF TEST BORING

CLIENT: GRW Engineers, Inc.
PROJECT: NKWD Taylor Mill Tank
Taylor Mill, Kentucky
LOCATION OF BORING: As shown on Exploration Plan

BORING #: B-1
PROJECT #: J040822.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)	HP (tsf)
877.5	Ground Surface	0.0	0							
877.0	TOPSOIL (5 inches)	0.5		I	1A 1B	SS	3-3-7	12	67	4.5
	Orangish brown, trace gray slightly moist very stiff to hard FAT CLAY, trace oxide stains, trace gravel (glacial).			I	2	SS	5-6-8	18	100	4.5
873.0		4.5								
	Interbedded brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE with very stiff clay seams, trace roots (bedrock).		5	I	3	SS	5-7-11	18	100	
				I	4	SS	9-12-16	18	100	4.25
868.0		9.5								
	Interbedded brown moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).		10	I	5	SS	11-14-24	18	100	
				I	6	SS	12-25-14	18	100	
			15	I	7	SS	19-22-19	18	100	
				I	8	SS	50/5"	0	0	
858.5		19.0								
857.2	Interbedded gray, slightly moist extremely weak to very weak fissile unweathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	20.3	20	I	9	SS	50/3"	2	67	
	Bottom of test boring at 20.3 feet.		25							
			30							

Datum: NAVD 88
Surface Elevation: 877.5 ft. +/-
Date Started: 10/14/2022
Date Completed: 10/14/2022

Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.

Hole Diameter: 8 in.
Rock Core Diameter: --
Boring Method: HSA-3.25

Drill Rig: T-6 CME-55LC
Foreman: T. Gilbert
Engineer: Joseph D. Hauber

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
SS = Split-Spoon Sample
ST = Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After:
Backfilled: Immediately

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY
A Universal Engineering Sciences Company

LOG OF TEST BORING

CLIENT: GRW Engineers, Inc.
PROJECT: NKWD Taylor Mill Tank
Taylor Mill, Kentucky
LOCATION OF BORING: As shown on Exploration Plan

BORING #: B-2
PROJECT #: J040822.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)	HP (tsf)
879.8	Ground Surface	0.0	0							
879.6	TOPSOIL (2 inches)	0.2		I	1A	SS	4-7-8	7	39	
877.8	Orangish brown, trace gray slightly moist very stiff to hard LEAN CLAY, trace sand, trace oxide stains, trace brick fragments, trace roots (fill)	2.0			1B					4.5
875.3	Brown slightly moist very stiff to hard FAT CLAY with sand, trace oxide stains (glacial) (CH).	4.5		I	2	SS	5-8-8	4	22	4.5
872.8	Brown, trace gray moist very stiff to hard FAT CLAY, trace oxide stains (residuum).	7.0	5	I	3	SS	8-7-7	12	67	4.5
	Interbedded olive brown to brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).			I	4	SS	7-9-11	13	72	
			10	I	5	SS	5-9-11	18	100	
865.3		14.5		I	6A 6B	SS	5-10-12	16	89	
	Interbedded olive brown, little gray slightly moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).		15	I	7	SS	5-9-28	16	89	
				I	8	SS	12-9-50/6"	18	100	
858.3		21.5	20	I	9	SS	10-50/3"	6	67	
853.8	Interbedded gray slightly moist extremely weak to very weak fissile unweathered SHALE and gray medium strong to very strong crystalline LIMESTONE. The shale is thin to medium bedded and the limestone is thin bedded. (Bull Fork Formation).	26.0	25	I	10	RC	RQD = 0%	7	12	
848.3	Interbedded gray strong to very strong fossiliferous LIMESTONE and gray slightly moist extremely weak to weak calcareous unweathered SHALE. The limestone comprises approximately 52 percent of this interval and is thin to medium thick-bedded with beds up to 5 inches thick. The shale comprises 48 percent of this interval and is thin to medium bedded with beds up to 4 inches thick. (Bull Fork Formation).	31.5	30	I	11	RC	RQD = 65%	58	97	
	Bottom of test boring at 31.5 feet.		35							
	Note: A Shelby tube (Sample ST-12) was pushed in an offset hole from 2-4 feet deep with 24 inches of recovery.		40							

Datum: NAVD 88
Surface Elevation: 879.8 ft. +/-
Date Started: 10/14/2022
Date Completed: 10/14/2022
Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.
Hole Diameter: 8 in.
Rock Core Diameter: 1.875 in.
Boring Method: HSA-3.25
Drill Rig: T-6 CME-55LC
Foreman: T. Gilbert
Engineer: Joseph D. Hauber

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
SS = Split-Spoon Sample
ST = Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Corewater at 14.0 ft.
After:
Backfilled: Immediately

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY
A Universal Engineering Sciences Company

LOG OF TEST BORING

CLIENT: GRW Engineers, Inc.
PROJECT: NKWD Taylor Mill Tank
Taylor Mill, Kentucky
LOCATION OF BORING: As shown on Exploration Plan

BORING #: B-3
PROJECT #: J040822.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)	HP (tsf)
874.5	Ground Surface	0.0							
874.2	TOPSOIL (3 inches)	0.3							
872.5	Orangish brown, trace gray slightly moist very stiff to hard FAT CLAY, trace sand, trace roots (glacial).	2.0	I	1A 1B	SS	2-3-5	9	50	4.5
870.0	Brown, trace gray moist very stiff to hard LEAN CLAY with shale fragments and oxide stains (glacial gouge).	4.5	I	2	SS	8-6-7	8	44	4.5
867.5	Light brown, gray and olive brown moist very stiff to hard FAT CLAY with oxide stains, trace remnant bedding (residual) (CH).	7.0	U	3	ST		24	100	4.5
865.0	Interbedded brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	9.5	I	4	SS	8-8-14	12	67	
860.0	Interbedded gray, olive brown moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	14.5	I	5	SS	10-14-24	18	100	
			I	6	SS	13-50/3"	1	11	
858.3	Interbedded gray, little olive brown slightly moist extremely weak slightly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	16.2	I	7	SS	5-29-50/3"	13	87	
	Bottom of test boring at 16.2 feet.								

Depth Scale (feet): 0, 5, 10, 15, 20, 25, 30

Datum: NAVD 88
Surface Elevation: 874.5 ft. +/-
Date Started: 10/14/2022
Date Completed: 10/14/2022

Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.

Hole Diameter: 8 in.
Rock Core Diameter: --
Boring Method: HSA-3.25

Drill Rig: T-6 CME-55LC
Foreman: T. Gilbert
Engineer: Joseph D. Hauber

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
SS = Split-Spoon Sample
ST = Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After:
Backfilled: Immediately

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY
A Universal Engineering Sciences Company

LOG OF TEST BORING

CLIENT: GRW Engineers, Inc.
PROJECT: NKWD Taylor Mill Tank
Taylor Mill, Kentucky
LOCATION OF BORING: As shown on Exploration Plan

BORING #: B-4
PROJECT #: J040822.01
PAGE #: 1 of 1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6" / Rock Core RQD (%)	Recovery (in.)	Recovery (%)	HP (tsf)
871.5	Ground Surface	0.0	0							
871.4	TOPSOIL (1 inch)	0.1		I	1A	SS	3-5-6	7	39	4.5
869.5	Brown slightly moist very stiff to hard FAT CLAY, trace oxide stains, trace roots (glacial).	2.0			1B					
	Interbedded brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).			I	2	SS	8-11-15	12	67	
			5	I	3	SS	11-12-15	18	100	
864.5		7.0								
	Interbedded olive brown moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).			I	4	SS	9-36-50/3"	8	53	
			10	I	5	SS	6-16-50/4"	12	75	
859.0		12.5		I	6	SS	50/5"	2	40	
	Interbedded gray slightly moist extremely weak to very weak unweathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).									
856.0		15.5	15	I	7	SS	50/3"	3	100	
	Bottom of test boring at 15.5 feet.		20							
			25							
			30							

Datum: NAVD 88
Surface Elevation: 871.5 ft. +/-
Date Started: 10/14/2022
Date Completed: 10/14/2022

Hammer Weight: 140 lb.
Hammer Drop: 30 in.
Pipe Size: 2 in. O.D.

Hole Diameter: 8 in.
Rock Core Diameter: --
Boring Method: HSA-3.25

Drill Rig: T-6 CME-55LC
Foreman: T. Gilbert
Engineer: Joseph D. Hauber

BORING METHOD
HSA = Hollow Stem Augers
CFA = Continuous Flight Augers
DC = Driving Casing
MD = Mud Drilling

SAMPLE TYPE
PC = Pavement Core
CA = Continuous Flight Auger
SS = Split-Spoon Sample
ST = Shelby Tube
RC = Rock Core

SAMPLE CONDITIONS
D = Disintegrated
I = Intact
U = Undisturbed
L = Lost

GROUNDWATER DEPTH
First Noted: None
At Completion: Dry
After:
Backfilled: Immediately

* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals

GEOTECHNOLOGY
A Universal Engineering Sciences Company

SOIL CLASSIFICATION SHEET

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density

Very Loose	- 4 blows/ft. or less
Loose	- 5 to 10 blows/ft.
Medium Dense	- 11 to 30 blows/ft.
Dense	- 31 to 50 blows/ft.
Very Dense	- 51 blows/ft. or more

Relative Properties

Descriptive Term	Percent
Trace	1 – 10
Little	11 – 20
Some	21 – 35
And	36 – 50

Particle Size Identification

Boulders	- 8 inch diameter or more	
Cobbles	- 3 to 8 inch diameter	
Gravel	- Coarse	- 3/4 to 3 inches
	- Fine	- 3/16 to 3/4 inches
Sand	- Coarse	- 2mm to 5mm (dia. of pencil lead)
	- Medium	- 0.45mm to 2mm (dia. of broom straw)
	- Fine	- 0.075mm to 0.45mm (dia. of human hair)
Silt		- 0.005mm to 0.075mm (Cannot see particles)

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Field Identification	Unconfined Compressive Strength (tons/sq. ft.)
Very Soft	Easily penetrated several inches by fist	Less than 0.25
Soft	Easily penetrated several inches by thumb	0.25 – 0.5
Medium Stiff	Can be penetrated several inches by thumb with moderate effort	0.5 – 1.0
Stiff	Readily indented by thumb but penetrated only with great effort	1.0 – 2.0
Very Stiff	Readily indented by thumbnail	2.0 – 4.0
Hard	Indented with difficulty by thumbnail	Over 4.0

Classification on logs are made by visual inspection.

Standard Penetration Test – Driving a 2.0" O.D., 1 3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary to drive the spoon 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6 inches of penetration on the drill log (Example – 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8+9=17 blows/ft.). Refusal is defined as greater than 50 blows for 6 inches or less penetration.

Strata Changes – In the column "Soil Descriptions" on the drill log, the horizontal lines represent strata changes. A solid line (————) represents an actually observed change; a dashed line (— — — —) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

GEOTECHNOLOGY
A Universal Engineering Sciences Company

ROCK CLASSIFICATION SHEET

ROCK WEATHERING

Descriptions	Field Identification
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than it its fresh condition.
Highly Weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Residual Soil	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact with bedding planes visible, and the soil has not been significantly transported.

ROCK STRENGTH

Descriptions	Field Identification	Uniaxial Compressive Strength (psi)
Extremely Weak	Indented by thumbnail	40-150
Very Weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife.	150-700
Weak	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer.	700-4,000
Medium Strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single blow of a geological hammer.	4,000-7,000
Strong	Specimen requires more than one blow of a geological hammer to fracture.	7,000-15,000
Very Strong	Specimen requires many blows with a geological hammer to fracture.	15,000-36,000
Extremely Strong	Specimen can only be chipped with geological hammer.	>36,000

BEDDING

Descriptive Term	Bed Thickness
Massive	> 4 ft.
Thick	2 to 4 ft.
Medium	2 in. to 2 ft.
Thin	< 2 in.

APPENDIX D – LABORATORY TEST DATA

Tabulation of Laboratory Tests

Particle-Size Analysis Test Forms

Rock Uniaxial Compressive Strength Test Forms

GEOTECHNOLOGY
A Universal Engineering Sciences Company

NKWD TAYLOR MILL WATER TANK
TAYLOR MILL, KENTUCKY
J040822.01

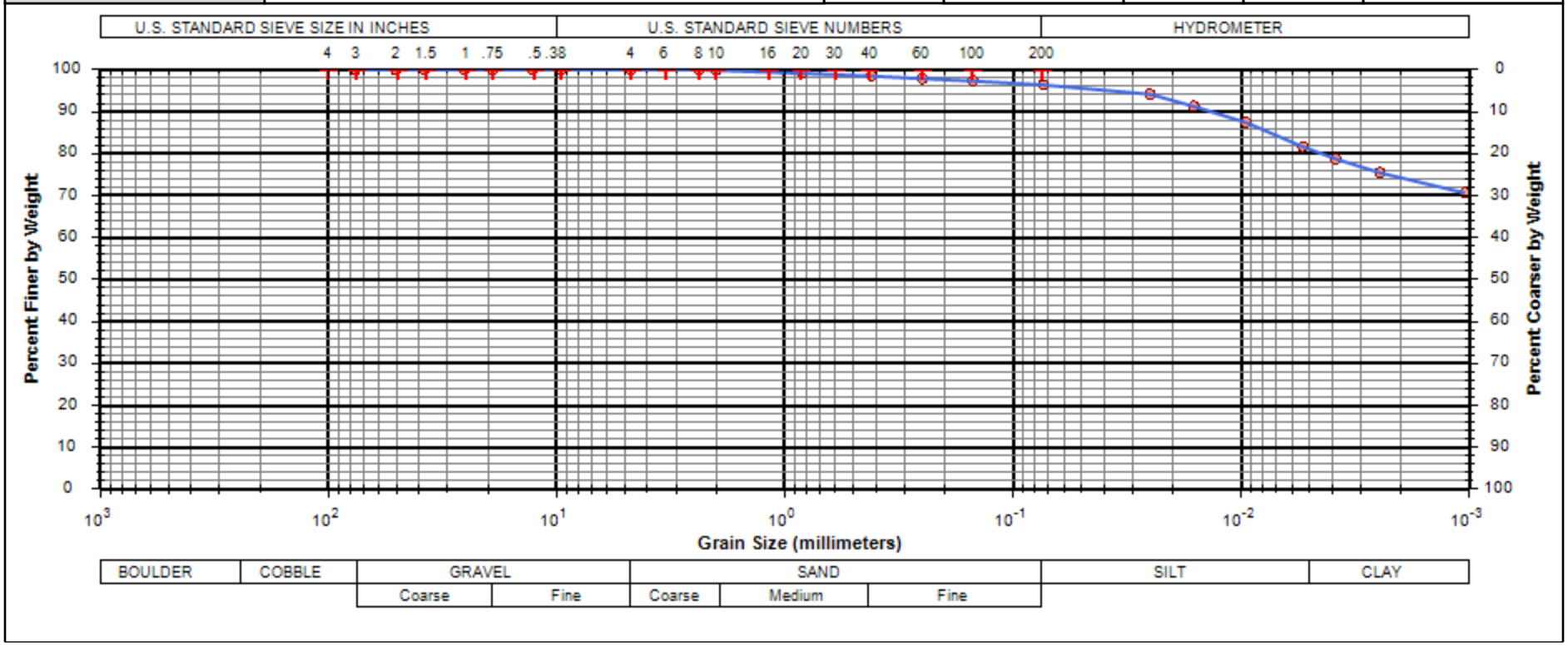
TABULATION OF LABORATORY TESTS

Boring No.	Sample No.	Depth (ft.)		Moisture Content (%)	Dry Unit Weight (pcf)	Atterberg Limits (%)			Gradation Analysis (%)				USCS Classification	Uniaxial Compressive Strength (psi)
		From	To			LL	PL	PI	Gravel	Sand	Silt	Clay		
B-1	SS-2	2.5	4.0	24.4										
B-1	SS-6	12.5	14.0	21.8										
B-2	ST-12	2.0	4.0	29.0		81	35	46	0.0	3.6	15.4	81.0	CH	
B-2	SS-3	5.0	6.5	21.8										
B-2	SS-5	10.0	11.5	20.2										
B-2	RC-11A	26.9	27.3	2.3	155.2									2,050
B-2	RC-11B	29.9	30.4	0.3	164.4									5,830
B-3	SS-2	2.5	4.0	20.7										
B-3	ST-3	5.0	7.0	21.2		53	25	28	0.0	3.2	32.4	64.4	CH	
B-3	SS-5	10.0	11.5	15.9										
B-4	SS-2	2.5	4.0	17.7										
B-4	SS-5	10.0	11.5	16.5										

GEOTECHNOLOGY
A Universal Engineering Sciences Company

PARTICLE-SIZE ANALYSIS OF SOILS ASTM D-422

Client:	GRW Engineers, Inc.								**Project No.:**	J040822.01
Project:	Geotechnical Exploration, NKWD Taylor Mill Tank, Taylor Mill, KY								**Date:**	10/25/2022
Boring No.:	B-2	**Sample No.:**	ST-12	**Depth (ft.):**	2	**Gravel (%)**	**Sand (%)**	**Silt (%)**	**Clay (%)**	**USCS**
Sample Description:	Orangish brown, trace gray FAT CLAY, trace sand and organics (glacial).					0.0	3.6	15.4	81.0	CH
						LL	**PL**	**PI**	**Group Index**	**WC (%)**
						81	35	46		29.0

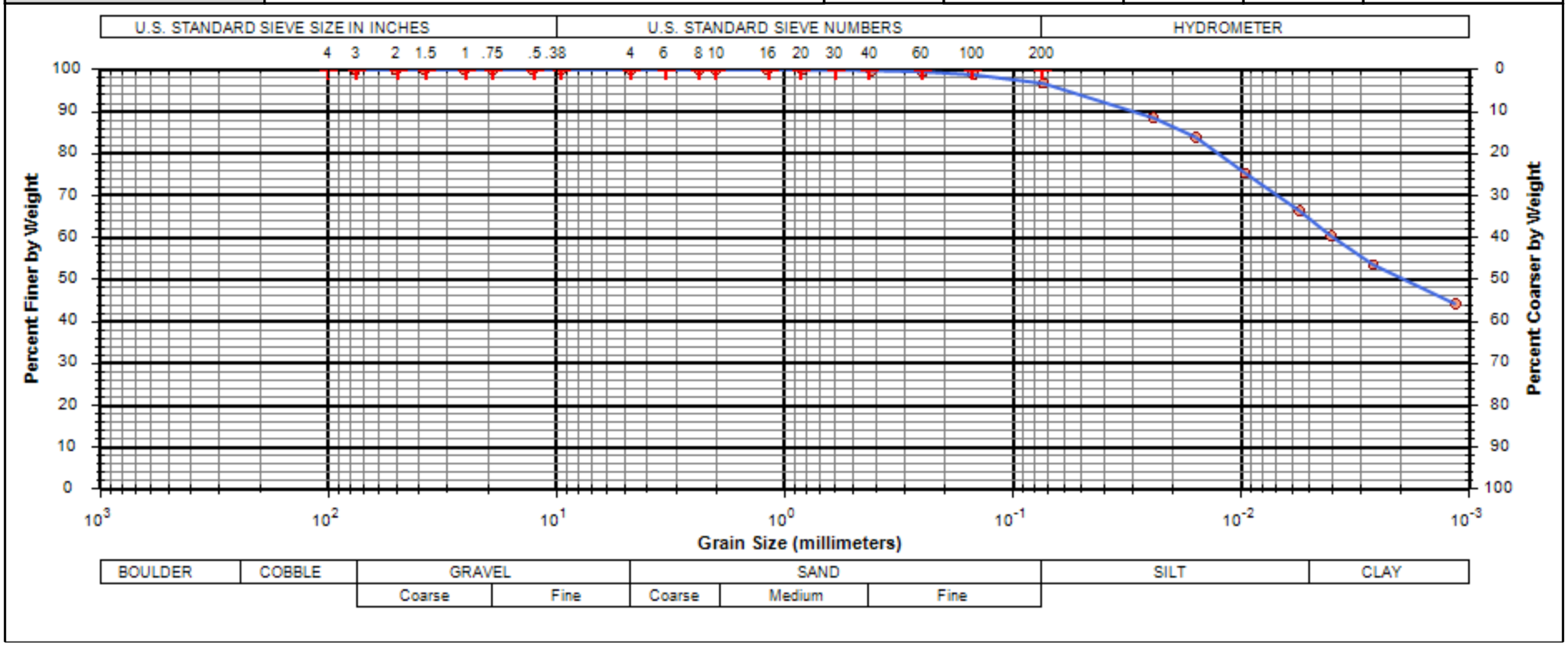


1398 Cox Avenue, Erlanger | Kentucky 41018
(859) 746-9400 | Fax: (859) 746-9408 | geotechnology.com

GEOTECHNOLOGY
A Universal Engineering Sciences Company

PARTICLE-SIZE ANALYSIS OF SOILS ASTM D-422

Client:	GRW Engineers, Inc.								**Project No.:**	J040822.01
Project:	Geotechnical Exploration, NKWD Taylor Mill Tank, Taylor Mill, KY								**Date:**	10/25/2022
Boring No.:	B-3	**Sample No.:**	ST-3	**Depth (ft.):**	5	**Gravel (%)**	**Sand (%)**	**Silt (%)**	**Clay (%)**	**USCS**
Sample Description:	Light brown, gray, and olive brown FAT CLAY with oxide stains, trace remnant bedding (residuum).					0.0	3.2	32.4	64.4	CH
						LL	**PL**	**PI**	**Group Index**	**WC (%)**
						53	25	28		21.2



1398 Cox Avenue, Erlanger | Kentucky 41018
(859) 746-9400 | Fax: (859) 746-9408 | geotechnology.com

GEOTECHNOLOGY
A Universal Engineering Sciences Company

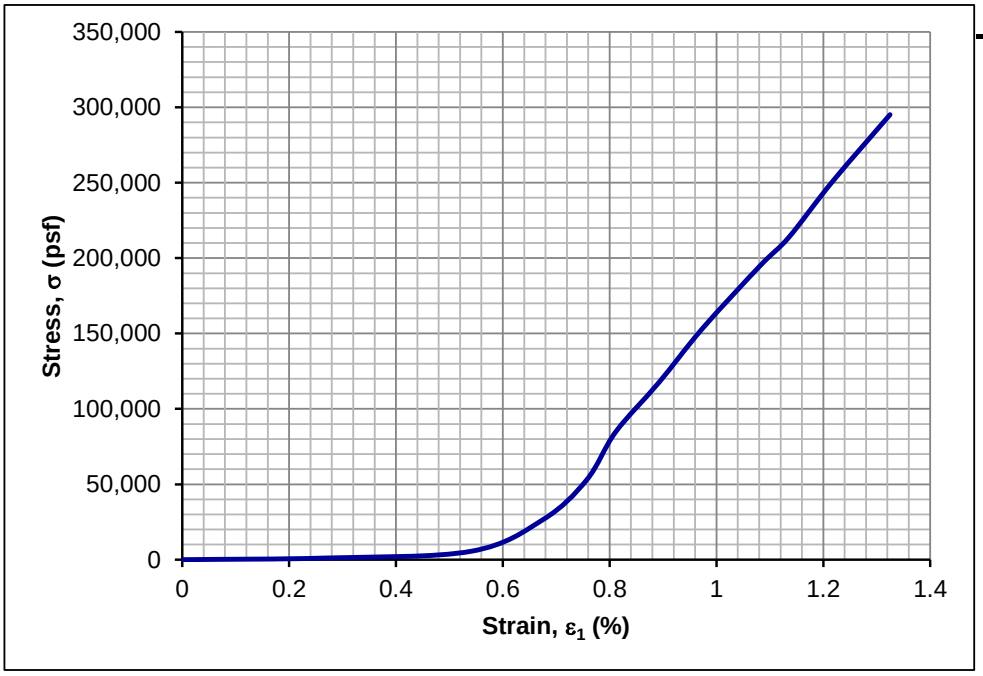
UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE
ASTM D7012 - METHOD C

CLIENT : GRW Engineers, Inc. DATE: 10/25/2022
PROJECT NO.: J040822.01
PROJECT: NKWD Taylor Mill Tank
LOCATION: Taylor Mill, Kentucky

BORING NO.: B-2 SAMPLE NO.: RC-11A DEPTH (ft.): 26.9-27.3
SAMPLE DESCRIPTION: Gray weak calcareous SHALE.
BEDROCK FORMATION: Bull Fork Formation
LOAD DIRECTION: 90° to Lithology TEST TEMPERATURE (°F):
COMPRESSION APPARATUS.: Forney QC-200-08

SAMPLE DATA	
DIAMETER (in.):	1.81
HEIGHT (in.):	3.70
HEIGHT TO DIAMETER RATIO:	2.0
WET UNIT WEIGHT (pcf):	158.7
DRY UNIT WEIGHT (pcf):	155.2
MOISTURE CONTENT (%):	2.3

FAILURE DATA	
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**0.5**
TIME TO FAILURE (min.):	**2.8**
AXIAL STRAIN AT FAILURE (%):	**1.3**
UNIAXIAL COMPRESSIVE STRENGTH, q_u (ksf):	**295.0**
UNIAXIAL COMPRESSIVE STRENGTH, q_u (psi):	**2,050.0**



FAILURE SHAPES

FRONT VIEW

SIDE VIEW

REMARKS :

GEOTECHNOLOGY
A Universal Engineering Sciences Company

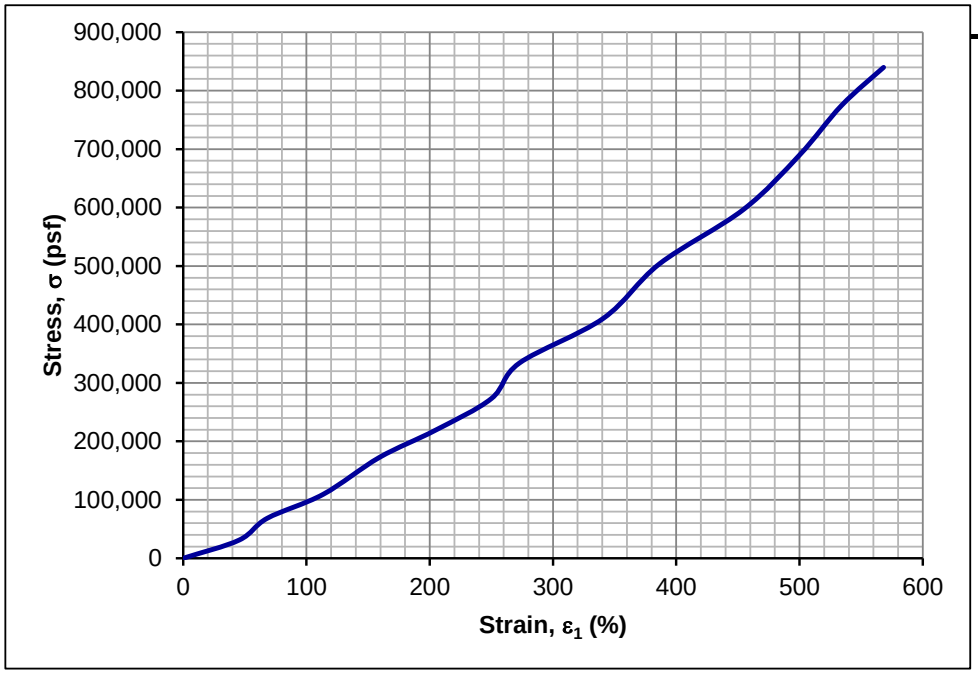
UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE
ASTM D7012 - METHOD C

CLIENT : GRW Engineers, Inc. DATE: 10/25/2022
PROJECT NO.: J040822.01
PROJECT: NKWD Taylor Mill Tank
LOCATION: Taylor Mill, Kentucky

BORING NO.: B-2 SAMPLE NO.: RC-11B DEPTH (ft.): 29.9-30.4
SAMPLE DESCRIPTION: Gray medium strong fossiliferous LIMESTONE with shale partings/seams.
BEDROCK FORMATION: Bull Fork Formation
LOAD DIRECTION: 90° to Lithology TEST TEMPERATURE (°F):
COMPRESSION APPARATUS.: Forney QC-200-08

SAMPLE DATA	
DIAMETER (in.):	1.83
HEIGHT (in.):	4.40
HEIGHT TO DIAMETER RATIO:	2.4
WET UNIT WEIGHT (pcf):	164.9
DRY UNIT WEIGHT (pcf):	164.4
MOISTURE CONTENT (%):	0.3

FAILURE DATA	
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	**174.8**
TIME TO FAILURE (min.):	**3.2**
AXIAL STRAIN AT FAILURE (%):	**568.2**
UNIAXIAL COMPRESSIVE STRENGTH, q_u (ksf):	**840.0**
UNIAXIAL COMPRESSIVE STRENGTH, q_u (psi):	**5,830.0**



FAILURE SHAPES


FRONT VIEW


SIDE VIEW

REMARKS :

APPENDIX E – IDEALIZED SOIL & BEDROCK PROFILE

CLIENT: GRW Engineers, Inc.
PROJECT NO.: J040822.01
PROJECT: NKWD Taylor Mill Tank
PROJECT LOCATION: Taylor Mill, Kentucky

IDEALIZED SOIL & BEDROCK PROFILE
PARAMETERS FOR AXIAL/LATERAL LOAD ANALYSES

Depth (ft.)	
	Proposed Ground Surface
Thickness (TBD)	New Fill above Existing Grades – Stiff cohesive soils (stiff clay model): *Lateral Parameters* γ = 125 pcf; γ' = 67.6 pcf c = 1,500 psf; ε_{50} = 0.007 *Axial Parameters* $q_{s,all}$ = 275 psf; $q_{p,all}$ = N/A
0.0	Existing Ground Surface
7.0	Very stiff cohesive soils (stiff clay model): *Lateral Parameters* γ = 130 pcf; γ' = 72.6 pcf c = 3,000 psf; ε_{50} = 0.005 *Axial Parameters* $q_{s,all}$ = 600 psf; $q_{p,all}$ = N/A
15.0	Highly weathered shale bedrock (stiff clay model): *Lateral Parameters* γ = 140 pcf c = 4,500 psf; ε_{50} = 0.002 *Axial Parameters* $q_{s,all}$ = 500 psf; $q_{p,all}$ = 6,000 psf (12-inch min. bedrock embedment)
22.0	Weathered shale bedrock (weak rock model): *Lateral Parameters* γ = 140 pcf q_u = 100 psi; E_m = 5,000 psi RQD = 50%; k_{rm} = 0.0005 *Axial Parameters* $q_{s,all}$ = 1,000 psf; $q_{p,all}$ = 10,000 psf (12-inch min. bedrock embedment)
#	Unweathered shale bedrock (weak rock model): *Lateral Parameters* γ = 140 pcf q_u = 200 psi; E_m = 10,000 psi RQD = 50%; k_{rm} = 0.0005 *Axial Parameters* $q_{s,all}$ = 1,500 psf; $q_{p,all}$ = 20,000 psf (12-inch min. unweathered bedrock embedment) or $q_{p,all}$ = 60,000 psf (min. embedment of at least 2 shaft diameters, but no less than 6 feet into unweathered bedrock embedment)

γ = Unit weight
γ' = Effective unit weight
c = Cohesion
ε_{50} = Strain at 50% of unconfined compressive strength
q_u = Uniaxial compressive strength
E_m = Initial modulus of rock mass
RQD = Rock quality designation
k_{rm} = Bedrock strain factor
$q_{s,all}$ = Allowable side resistance
$q_{p,all}$ = Allowable end/tip resistance

Notes (continued on following page):

- Depths measured from existing grade. Thickness of new fill to be determined from proposed grading.
- Axial side resistance should be ignored in the upper 5 feet of the profile.

CLIENT: GRW Engineers, Inc.
PROJECT NO.: J040822.01
PROJECT: NKWD Taylor Mill Tank
PROJECT LOCATION: Taylor Mill, Kentucky

- Laterally loaded deep foundations should be designed using the p-y approach using the above-provided parameters.
- Lateral resistance should be ignored in the upper 2.5 feet of the profile due to frost.
- Appropriate reduction factors (p-multipliers) should be included in the analyses that account for pile width/diameter and pile spacing.

APPENDIX B
PROJECT PERMITS

Andy Beshear
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
300 Sower Boulevard
Frankfort, Kentucky 40601
Phone: (502) 564-2150
Fax: 502-564-4245

Rebecca W. Goodman
SECRETARY

Anthony R. Hatton
COMMISSIONER

August 28, 2023

Kyle Ryan, P.E.
Northern KY Water District
2835 Crescent Springs Rd
Erlanger, KY 41018

RE: New Taylor Mill Tank
Campbell County, KY
Northern KY Water District
AI #: 2485, APE20230009
PWSID #: 0590220-23-009

Dear Mr. Ryan:

We have reviewed the plans and specifications for the above referenced project. The plans include the construction of a 500,000 gallon elevated water storage tank with approximately 230 linear feet of 16 inch DI water line. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit with the following stipulation:

- Record drawings shall be included with the construction certification due within 30 days of construction completion to identify the alternative chosen for the tank.

If you have any questions concerning this project, please contact Daniel Kulik at 502-782-6998.

Sincerely,

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH:DK
Enclosures
c: GRW Engineers Inc
Campbell County Health Department
Division of Plumbing

Distribution-Major Construction

Northern KY Water District

Facility Requirements

Activity ID No.:APE20230009

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-1	Construction of this project shall not result in the water system's inability to supply consistent water service in compliance with 401 KAR 8:010 through 8:600. [401 KAR 8:100 Section 5]
T-2	The public water system shall not implement a change to the approved plans without the prior written approval of the cabinet. [401 KAR 8:100 Section 4(3)]
T-3	A proposed change to the approved plans affecting sanitary features of design shall be submitted to the cabinet for approval in accordance with Section 2 of this administrative regulation. [401 KAR 8:100 Section 4(2)]
T-4	During construction, a set of approved plans and specifications shall be available at the job site. Construction shall be performed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 3(1)]
T-5	Unless construction begins within two (2) years from the date of approval of the final plans and specifications, the approval shall expire. [401 KAR 8:100 Section 3(3)]
T-6	Upon completion of construction, a professional engineer shall certify in writing that the project has been completed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 4(1)]
T-7	The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. [Recommended Standards for Water Works 8.2.1, Drinking Water General Design Criteria IV.1.a]
T-8	Water lines should be hydraulically capable of a flow velocity of 2.5 ft/s while maintaining a pressure of at least 20 psi. [Drinking Water General Design Criteria IV.1.b]
T-9	The normal working pressure in the distribution system at the service connection shall not be less than 30 psi under peak demand flow conditions. Peak demand is defined as the maximum customer water usage rate, expressed in gallons per minute (gpm), in the pressure zone of interest during a 24 hour (diurnal) time period. [Drinking Water General Design Criteria IV.1.d]
T-10	When static pressure exceeds 150 psi, pressure reducing devices shall be provided on mains or as part of the meter setting on individual service lines in the distribution system. [Drinking Water General Design Criteria IV.1.c]
T-11	The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three (3) inch diameter. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and can be considered only in special circumstances. [Recommended Standards for Water Works 8.2.2, Drinking Water General Design Criteria IV.2.b]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-12	Water mains not designed to carry fire-flows shall not have fire hydrants connected to them. [Recommended Standards for Water Works 8.4.1.b]
T-13	Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-14	No flushing device shall be directly connected to any sewer. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-15	Pipe shall be constructed to a depth providing a minimum cover of 30 inches to top of pipe. [Drinking Water General Design Criteria IV.3.a]
T-16	Water mains shall be covered with sufficient earth or other insulation to prevent freezing. [Recommended Standards for Water Works 8.7]
T-17	A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones found in the trench shall be removed for a depth of at least six inches below the bottom of the pipe. [Recommended Standards for Water Works 8.7]
T-18	Water line installation shall incorporate the provisions of the AWWA standards and/or manufacturer's recommended installation procedures. [Recommended Standards for Water Works 8.7]
T-19	All materials used for the rehabilitation of water mains shall meet ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-20	Packing and jointing materials used in the joints of pipe shall meet the standards of AWWA and the reviewing authority. [Recommended Standards for Water Works 8.1]
T-21	All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement. [Recommended Standards for Water Works 8.7]
T-22	All materials including pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the ASTM, AWWA and ANSI/NSF, where such standards exist, and be acceptable to the Division of Water. [Recommended Standards for Water Works 8.1]
T-23	Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been restored practically to their original condition. [Recommended Standards for Water Works 8.1]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-24	Manufacturer approved transition joints shall be used between dissimilar piping materials. [Recommended Standards for Water Works 8.1]
T-25	The minimum size of water main which provides for fire protection and serving fire hydrants shall be six?inch diameter. [Recommended Standards for Water Works 8.2, Drinking Water General Design Criteria IV.2.a]
T-26	Pipes and pipe fittings containing more than 8% lead shall not be used. All products shall comply with ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-27	Gaskets containing lead shall not be used. Repairs to lead?joint pipe shall be made using alternative methods. [Recommended Standards for Water Works 8.1]
T-28	Pipe materials shall be selected to protect against both internal and external pipe corrosion. [Recommended Standards for Water Works 8.1]
T-29	Dead end mains shall be equipped with a means to provide adequate flushing. [Recommended Standards for Water Works 8.2]
T-30	The hydrant lead shall be a minimum of six inches in diameter. Auxiliary valves shall be installed on all hydrant leads. [Recommended Standards for Water Works 8.4.3]
T-31	A sufficient number of valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs. [Recommended Standards for Water Works 8.3]
T-32	Wherever possible, chambers, pits or manholes containing valves, blow?offs, meters, or other such appurtenances to a distribution system, shall not be located in areas subject to flooding or in areas of high groundwater. Such chambers or pits should drain to the ground surface, or to absorption pits underground. The chambers, pits and manholes shall not connect directly to any storm drain or sanitary sewer. Blow?offs shall not connect directly to any storm drain or sanitary sewer. [Recommended Standards for Water Works 8.6]
T-33	At high points in water mains where air can accumulate provisions shall be made to remove the air by means of air relief valves. [Recommended Standards for Water Works 8.5.1]
T-34	Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. [Recommended Standards for Water Works 8.5.1]
T-35	The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, downward?facing elbow. [Recommended Standards for Water Works 8.5.2.c]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-36	Discharge piping from air relief valves shall not connect directly to any storm drain, storm sewer, or sanitary sewer. [Recommended Standards for Water Works 8.5.2.d]
T-37	Water pipe shall be constructed with a lateral separation of 10 feet or more from any gravity sanitary or combined sewer measured edge to edge where practical. If not practical a variance may be requested to allow the water pipe to be installed closer to the gravity sanitary or combined sewer provided the water pipe is laid in a separate trench or undisturbed shelf located on one side of the sewer with the bottom of the pipe at least 18 inches above the top of the gravity sanitary or combined sewer pipe. [Drinking Water General Design Criteria IV.3.b]
T-38	Water lines crossing sanitary, combined or storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sanitary, combined or storm sewer with preference to the water main located above the sanitary, combined or storm sewer. [Drinking Water General Design Criteria IV.3.c]
T-39	At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. [Recommended Standards for Water Works 8.8.3.b]
T-40	There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. [Recommended Standards for Water Works 8.10.1]
T-41	Water utilities shall have a cross connection program conforming to 401 KAR 8. [Recommended Standards for Water Works 8.10.1]
T-42	Installed pipe shall be pressure tested and leakage tested in accordance with the appropriate AWWA Standards. [Recommended Standards for Water Works 8.7.6]
T-43	New, cleaned and repaired water mains shall be disinfected in accordance with AWWA Standard C651. The specifications shall include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all water mains. In an emergency or unusual situation, the disinfection procedure shall be discussed with the Division of Water. [Recommended Standards for Water Works 8.7.7]
T-44	A minimum cover of five feet shall be provided over pipe crossing underwater. [Recommended Standards for Water Works 8.9.2]
T-45	Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding for pipes crossing underwater. [Recommended Standards for Water Works 8.9.2.b]
T-46	Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source for pipes crossing. [Recommended Standards for Water Works 8.9.2.c]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-47	Water storage tanks shall have a minimum 100% turnover rate of once per 72 hours. [Drinking Water General Design Criteria IV.6.a]
T-48	Minimum water level for all gravity storage tanks shall maintain a minimum design pressure of 30 psi for all potential points of use supplied by the tank. [Drinking Water General Design Criteria IV.6.b]
T-49	Separate inlet and outlet is required on storage tanks; and the inlet has to be in the upper half of the tank (unless there is a separate mixing system). [Drinking Water General Design Criteria IV.6.c]
T-50	The maximum variation between high and low levels in storage structures providing pressure to a distribution system should not exceed 30 feet. [Recommended Standards for Water Works 7.3.1]
T-51	Finished water storage structures which provide pressure directly to the distribution system shall be designed so they can be isolated from the distribution system and drained for cleaning or maintenance without causing a loss of pressure in the distribution system. [Recommended Standards for Water Works 7.3.2]
T-52	The storage structure drain shall discharge to the ground surface with no direct connection to a sewer or storm drain. [Recommended Standards for Water Works 7.3.2]
T-53	Adequate controls shall be provided to maintain levels in distribution system storage structures. Level indicating devices should be provided at a central location. [Recommended Standards for Water Works 7.3.3]
T-54	The minimum storage capacity (or equivalent capacity) for systems not providing fire protection shall be equal to the average daily consumption. [Recommended Standards for Water Works 7.0.1.b]
T-55	The system should be designed to facilitate turnover of water in the reservoir. [Recommended Standards for Water Works 7.0.6]
T-56	Excessive storage capacity should be avoided to prevent potential water quality deterioration problems. [Recommended Standards for Water Works 7.0.1.c]
T-57	The overflow pipe shall be of sufficient diameter to permit waste of water in excess of the filling rate. [Recommended Standards for Water Works 7.0.7.d]
T-58	Finished water storage structures shall be designed with reasonably convenient access to the interior for cleaning and maintenance. [Recommended Standards for Water Works 7.0.8]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-59	Finished water storage structures shall be vented. Vents shall prevent the entrance of surface water, rainwater, bird, and animals. The overflow pipe shall not be considered a vent. Open construction between the sidewall and roof is not permissible. [Recommended Standards for Water Works 7.0.9]
T-60	Finished water storage structures and their appurtenances, especially the riser pipes, overflows, and vents, shall be designed to prevent freezing. Equipment used for freeze protection that will come into contact with the potable water shall meet ANSI/NSF Standard 61. [Recommended Standards for Water Works 7.0.13]
T-61	If a flapper valve is utilized, a screen shall be provide inside the valve. Provisions must be included to prevent the flapper from freezing shut. [Recommended Standards for Water Works 7.0.7.e]
T-62	The roof and sidewalls of all water storage structures must be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow. [Recommended Standards for Water Works 7.0.10]
T-63	Any pipes running through the roof or sidewall of a metal storage structure must be welded, or properly gasketed. In concrete tanks, these pipes shall be connected to standard wall castings which were poured in place during the forming of the concrete. [Recommended Standards for Water Works 7.0.10.a]
T-64	Openings in the roof of a storage structure designed to accommodate control apparatus or pump columns, shall be curbed and sleeved with proper additional shielding to prevent contamination from surface or floor drainage. [Recommended Standards for Water Works 7.0.10.b]
T-65	Valves and controls should be located outside the storage structure so that the valve stems and similar projections will not pass through the roof or top of the reservoir. [Recommended Standards for Water Works 7.0.10.c]
T-66	Every catwalk over finished water in a storage structure shall have a solid floor with sealed raised edges, designed to prevent contamination from shoe scrapings and dirt. [Recommended Standards for Water Works 7.0.14]
T-67	The discharge pipes from water storage structures shall be located in a manner that will prevent the flow of sediment into the distribution system. [Recommended Standards for Water Works 7.0.15]
T-68	Smooth-nosed sampling tap(s) shall be provided to facilitate collection of water samples for both bacteriological and chemical analyses. The sample tap(s) shall be easily accessible. [Recommended Standards for Water Works 7.0.19]
T-69	Sewers, drains, standing water, and similar sources of possible contamination must be kept at least 50 feet from water storage facilities. Gravity sewers constructed of water main quality pipe, pressure tested in place without leakage, may be used at distances greater than 20 feet but less than 50 feet. [Recommended Standards for Water Works 7.0.2.c]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-70	The roof of the storage structure shall be well drained. Downspout pipes shall not enter or pass through the reservoir. [Recommended Standards for Water Works 7.0.10.d]
T-71	Porous material, including wood and concrete block shall not be used for potable water contact applications. [Recommended Standards for Water Works 7.0.11]
T-72	All finished water storage structures shall have suitable watertight roofs which exclude birds, animals, insects, and excessive dust. [Recommended Standards for Water Works 7.0.3]
T-73	Fencing, locks on access manholes, and other necessary precautions shall be provided to prevent trespassing, vandalism, and sabotage. [Recommended Standards for Water Works 7.0.4]
T-74	Ladders, ladder guards, balcony railings, and safely located entrance hatches shall be provided where applicable. [Recommended Standards for Water Works 7.0.12.a]
T-75	All water storage structures shall be provided with an overflow which is brought down to an elevation between 12 and 24 inches above the ground surface, and discharges over a drainage inlet structure or a splash plate. All overflow pipes shall be located so that any discharge is visible. [Recommended Standards for Water Works 7.0.7]
T-76	No drain on a water storage structure may have a direct connection to a sewer or storm drain. [Recommended Standards for Water Works 7.0.5]
T-77	The design shall allow draining the storage facility for cleaning or maintenance without causing loss of pressure in the distribution system. [Recommended Standards for Water Works 7.0.5]
T-78	No overflow may be connected directly to a sewer or a storm drain. [Recommended Standards for Water Works 7.0.7]
T-79	Proper protection shall be given to metal surfaces by paints or other protective coatings, by cathodic protective devices, or by both. [Recommended Standards for Water Works 7.0.17]
T-80	Paint systems shall meet ANSI/NSF standard 61. [Recommended Standards for Water Works 7.0.17.a]
T-81	Interior paint must be applied, cured, and used in a manner consistent with the ANSI/NSF approval. [Recommended Standards for Water Works 7.0.17.a]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-82	After curing, the coating shall not transfer any substance to the water which will be toxic or cause taste or odor problems. [Recommended Standards for Water Works 7.0.17.a]
T-83	Wax coatings for the tank interior shall not be used on new tanks. [Recommended Standards for Water Works 7.0.17.b]
T-84	Old wax coating must be completely removed before using another tank coating. [Recommended Standards for Water Works 7.0.17.b]
T-85	Finished water storage structures shall be disinfected in accordance with AWWA Standard C652. Two or more successive sets of samples, taken at 24?hour intervals, shall indicate microbiologically satisfactory water before the facility is placed into operation. [Recommended Standards for Water Works 7.0.18.a]
T-86	The disinfection procedure specified in AWWA Standard C652 chlorination method 3, section 4.3 which allows use of the highly chlorinated water held in the storage tank for disinfection purposes, is prohibited unless the initial heavily chlorinated water is properly disposed. [Recommended Standards for Water Works 7.0.18.c]
T-87	The overflow for an elevated tank shall open downward and be screened with a four mesh, non-corrodible screen. [Recommended Standards for Water Works 7.0.7.c]
T-88	Elevated storage tanks shall have at least one of the access manholes framed at least four inches above the surface of the roof at the opening. All other manholes or access ways shall be bolted and gasketed. [Recommended Standards for Water Works 7.0.8.1]
T-89	Elevated storage tank vents shall open downward, and be fitted with either four mesh non-corrodible screen, or with finer mesh non-corrodible screen in combination with an automatically resetting pressure-vacuum relief mechanism. [Recommended Standards for Water Works 7.0.9.e]
T-90	Elevated tanks with riser pipes over eight inches in diameter shall have protective bars over the riser openings inside the tank. [Recommended Standards for Water Works 7.0.12.b]
T-91	Railings or handholds shall be provided on elevated tanks where persons must transfer from the access tube to the water compartment. [Recommended Standards for Water Works 7.0.12.c]
T-92	When an internal overflow pipe is used on elevated tanks, it should be located in the access tube. For vertical drops on other types of storage facilities, the overflow pipe should be located on the outside of the structure. [Recommended Standards for Water Works 7.0.7.a]
T-93	If a water circulation system is used, it is recommended that the circulation pipe be located separately from the riser pipe. [Recommended Standards for Water Works 7.0.13]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-94	Reservoirs with pre-cast concrete roof structures must be made watertight with the use of a waterproof membrane or similar product. [Recommended Standards for Water Works 7.0.10.f]

NOTICE OF COMPLETION OF ENCROACHMENT PERMIT WORK

PERMITTEE

Name: Northern Kentucky Water District
Contact Person:
Address: 2835 Crescent Springs Road
City: Erlanger
State: Kentucky
Zip: 41018
Telephone:

PROJECT IDENTIFICATION

Permit Number: 06-2023-00550

I wish to notify the Department of Highways that the above mentioned permit work and any necessary right-of-way restoration have been completed and are ready for final inspection.

Permittee

Please return this form to the address below when work is completed and ready for final inspection.

Please Return to: Permit Engineer
Department of Highways, District 6 Office
421 Buttermilk Pike
Covington, Kentucky 41017
(859) 341-2700
www.transportation.ky.gov/

LOCATION(S)			
Description	**County - Route**	**Latitude**	**Longitude**
A 16" DI water line needs to be installed from the NKWD existing 16"DI water line in the west KY 16 right-of-way across KY 16 to the tank site.	Kenton - KY 16	38.986783	-84.503465

Andy Beshear
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Department of Highways, District 6 Office
421 Buttermilk Pike
Covington, Kentucky 41017
(859) 341-2700
www.transportation.ky.gov/

Jim Gray
Secretary

June 28, 2023

Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, Kentucky 41018

Subject: Permit #: 06-2023-00550
Permit Type: Utilities - Water
Approval

Dear Applicant:

Attached is your permit approval and documentation for the subject permit.

Be advised that all work must be done in conformity with permit and application conditions. If you have any questions, please contact the Permits Section at this office.

Sincerely,

Linzy Brefeld

Linzy Brefeld
D6 Permits Supervisor

Attachments

APPROVED
JUNE 28, 2023
KENTUCKY TRANSPORTATION CABINET
06-2023-00550

Kentucky Transportation Cabinet
Department of Highways
Division of Maintenance
Permits Branch

ENCROACHMENT PERMIT

KYTC KEPT #: 06-2023-00550

Permittee: Northern Kentucky Water District

Permit Type / Subtype: Utilities / Water

Work Completion Date: 6/21/2024

INDEMNITIES		
Type	**Amount Required**	**Tracking Number**
Performance Bond	$0.00	
Cash / Check	$0.00	
Self-Insured	$0.00	
Payment Bond	$0.00	
Liability Insurance	$0.00	

This permit has been: **APPROVED** [X] **DENIED** [ ]

Linzy Brefeld	D6 Permits Supervisor	6/28/2023
SIGNATURE	**TITLE**	**DATE**

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

LOCATION(S)			
Description	**County - Route**	**Latitude**	**Longitude**
A 16" DI water line needs to be installed from the NKWD existing 16"DI water line in the west KY 16 right-of-way across KY 16 to the tank site.	Kenton - KY 16	38.986783	-84.503465

APPROVED
JUNE 28, 2023
TRANSPORTATION CABINET
KENTUCKY
06-2023-00550

Kentucky811 Know what's below. Call before you dig

To Submit a Locate Request
24 Hours a Day, Seven Days a Week:
Call 811 or 800-752-6007

KENTUCKY TRANSPORTATION CABINET
Department of Highways
PERMITS BRANCH

APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: T06-2023-00550

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Northern Kentucky Water District	**ADDRESS** 2835 Crescent Springs Road		
EMAIL	**CITY** Erlanger	**STATE** KY	**ZIP** 41018
CONTACT NAME 1 Steve Broering, NKWD	**EMAIL** sbroering@nkywater.org	**PHONE #** 859-426-2728	**CELL #**
CONTACT NAME 2 (*if applicable*) Adalyn Haney, GRW	**EMAIL** ahaney@grwinc.com	**PHONE #** 502-489-8484	**CELL #** 502-432-0570

SECTION 2: PROPOSED WORK LOCATION

ADDRESS 5402 Pride Parkway	**CITY** Taylor Mill		**STATE** Kentucky	**ZIP** 41015
COUNTY Kenton	**ROUTE #** KY 16	**MILE POINT** 10.5	**LONGITUDE** (*X*) -84.5044	**LATITUDE** (*Y*) 38.9944

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other:_____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☐ Right ☑ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

The Northern Kentucky Water District intends to construct a new 500,000 gallon elevated water storage tank across KY 16 from 5402 Pride Parkway in Taylor Mill, Kentucky. To supply water to/from the new tank, a 16" DI water line needs to be installed from the NKWD existing 16"DI water line in the west KY 16 right-of-way across KY 16 to the tank site. Proposed work in the KY 16 right-of-way consists of connection of the new 16" DI water line to the existing 16" DI water line via new tee and valves, sidewalk repair/replacement, and boring and jacking the new 16" DI water line in a 24" steel casing pipe across KY 16. Please see enclosed project drawings showing this work.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.

Steve Broering
SIGNATURE

1-16-2023
DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.

APPLICATION FOR ENCROACHMENT PERMIT

TERMS AND CONDITIONS

1. The permit, including this application and all related and accompanying documents and drawings making up the permit, remains in effect and is binding upon the Applicant/Permittee, its successors and assigns, as long as the encroachment(s) exists and also until the permittee is finally relieved by the Department of Highways from all its obligations.

2. Applicant shall meet all requirements of the Clean Water Act if the project will disturb one acre or more, the applicant shall obtain a KPDES KYR10 Permit from the Kentucky Division of Water. All disturbed areas shall meet the requirements of the Department of Highway's Standard Specifications, Sections 212 and 213, as amended.

3. **INDEMNITY:**

- **A.** PERFORMANCE BOND: The permittee shall provide to the Department a performance bond according to the Permits Manual, Section PE-203 as a guarantee of conformance with the Department's Encroachment Permit requirements.
- **B.** PAYMENT BOND: At the discretion of the department, a payment bond shall be required of the permittee to ensure payment of liquidated damages assessed to the permittee.
- **C.** LIABILITY INSURANCE: Liability insurance shall be required of the permittee (in an amount approved by the department) to cover all liabilities associated with the encroachment.
- **D.** It shall be the responsibility of the permittee, its successors and assigns, to maintain all indemnities in full force and effect until the permittee is authorized to release the indemnity by the Department.

4. A copy of this application and all related documents making up the approved permit shall be given to the applicant and shall be made readily available for review at the work site at all times.

5. Perpetual maintenance of the encroachment is the responsibility of the permittee, its successors and assigns, with the approval of the Department as required, unless otherwise stated.

6. Permittee, its successors and assigns, shall comply with and agree to be bound by the requirements and terms of (a) this application and all related documents making up the approved permit, (b) by the Department's Permits Manual, and (c) by the Manual on Uniform Traffic Control Devices, both manuals as revised to and in effect on the date of issuance of the permit, all of which documents are made a part thereof by this reference. Compliance by the permittee, its successors and assigns, with subsequent revisions to applicable provisions of either manual or other policy of the Department may be made a condition of allowing the encroachment to persist under the permit.

7. Permittee agrees that this and any encroachment may be ordered removed by the Department at any time, and for any reason, upon thirty days written notice to the last known address of the applicant or to the address at the location of the encroachment. The permittee agrees that the cost of removing and of restoring the associated right-of-way is the responsibility of the permittee, its successors and assigns.

8. Permittee, its successors and assigns, agree that if the Department determines that motor vehicular safety deficiencies develop as a result of the installation or use of the encroachment, the permittee, its successors and assigns, shall provide and bear the expenses to adjust, relocate, or reconstruct the facilities, add signs, auxiliary lanes, or other corrective measures reasonably deemed necessary by the Department within a reasonable time after receipt of a written notice of such deficiency. The period within which such adjustments, relocations, additions, modifications, or other corrective measures must be completed will be specified in the notice.

9. Where traffic signals are required as a condition of granting the requested permit or are thereafter required to correct motor vehicular safety deficiencies, as determined by the Department, the costs for signal equipment and installation(s) shall be borne by the permittee, its successors and assigns and the Department in its reasonable discretion and only in accordance with the Department's current policy set forth in the Traffic Operations Manual and Permits Manual. Any modifications to the permittee's entrance necessary to accommodate signalization (including necessary easement(s) on private property) shall be the responsibility of the permittee, its successors and assigns, at no expense to the Department.

APPLICATION FOR ENCROACHMENT PERMIT

10. The requested encroachment shall not infringe on the frontage rights of an abutting owner without their written consent as hereinafter described. Each abutting owner shall express their consent, which shall be binding on their successors and assigns, by the submission of a notarized statement as follows, "I (we), _____, hereby consent to the granting of the permit requested by the applicant along Route_____, which permit does affect frontage rights along my (our) adjacent real property." By signature(s)_____, subscribed and sworn by_____, on this date_____.

11. The permit, if approved, is subject to the agreement that it shall not interfere with any similar rights or permit(s) previously granted to any other party, except as otherwise provided by law.

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

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

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

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

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

APPLICATION FOR ENCROACHMENT PERMIT

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

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

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

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

21. Before You Dig: The contractor is instructed to call 1-800-752-6007 to reach KY 811, the One-Call system for information on the location of existing underground utilities. The call is to be placed a minimum of two (2) and no more than ten (10) business days prior to excavation. The contractor should be aware that the owners of underground facilities are not required to be members of the KY 811 One-Call Before U-Dig (BUD) service. The contractor must coordinate excavation with the utility owners, including those whom do not subscribe to KY 811. It may be necessary for the contractor to contact the County Clerk to determine what utility companies have facilities in the area.

22. The undersigned Utility acknowledges ownership and control of the facilities proposed to be installed, modified, or extended by the Applicant/Permittee and agrees to be bound by the requirements and terms of this application and all related documents making up the approved permit, by the Department's Permits Guidance Manual, and by all applicable regulations and statutes in effect on the date of issuance of the permit. This information and application is certified correct to the best knowledge and belief of the undersigned Utility.

Northern Kentucky Water District
UTILITY

Steve Broering
NAME (Utility Representative)

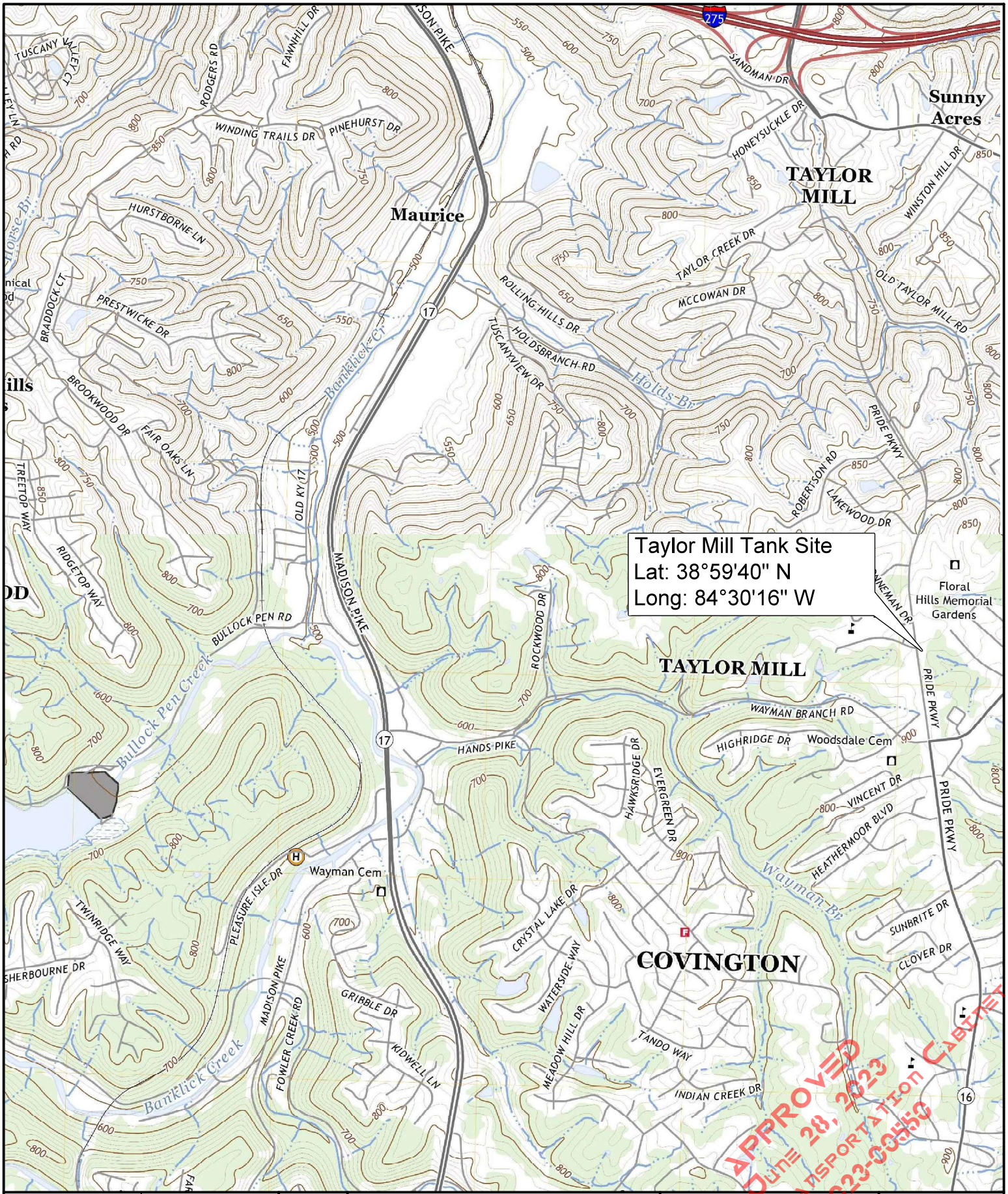
Steve Broering
SIGNATURE (Utility Representative)

Engineering Technician
TITLE (Utility Representative)

1-16-2023
DATE

Kentucky 811 Know what's below. Call before you dig.

To Submit a Locate Request
24 Hours a Day, Seven Days a Week:
Call 811 or 800-752-6007



GRW PROJECT NO. 5059	CLIENT PROJECT NO.	DESIGNED: ADH	PROJECT LOCATION MAP N.K.W.D. NEW TAYLOR MILL TANK CITY OF TAYLOR MILL, KENTUCKY
REVISIONS NO. / DESCRIPTION / DATE / BY		DRAWN: RLT	
		REVIEWED: ADH	
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: MAY, 2023
SCALE:
SHEET NO.

APPROVED
JUNE 28, 2023
TRANSPORTATION CABINET
KYTC-2023-00550

KYTC Division of Maintenance
Permits Branch
District 6

ENCROACHMENT PERMIT GENERAL NOTES & SPECIFICATIONS

YOU MUST NOTIFY KYTC BEFORE BEGINNING ANY WORK IN THE RIGHT-OF-WAY. ***Failure to alert KYTC of working within the right of way may result in permit revocation.***

Two ways to notify KYTC of your construction start date:

By Email: KYTCD6PERMITS@KY.GOV

**must include permit number and county in subject line*

By Phone: 859-341-2700

**must know permit number and county when calling*

YOU MUST ALSO NOTIFY KYTC UPON COMPLETION OF WORK WITHIN RIGHT-OF-WAY. ***Failure to alert KYTC of completion of work may result in withholding release of any associated bonds.***

Kentucky UNBRIDLED SPIRIT

APPROVED
June 28, 2023
Kentucky Transportation Cabinet
06-2023-00550

I. SAFETY

A. General Provisions

☑ All signs and control of traffic shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, latest edition, Part VI, and safety requirements shall comply with the Permits Manual. Federal law requires that traffic control shall be implemented in accordance with MUTCD standards and KYTC's Standard Specifications for Road and Bridge Construction (KYTC SSRBC) under the supervision of a certified Work Zone Traffic Control Supervisor.

☑ All work necessary in shoulder or ditch line areas of a state highway shall be scheduled to be promptly completed so that hazards adjacent to the traveled way are kept to an absolute minimum.

☑ No more than one (1) traveled-lane shall be blocked or obstructed during normal working hours. All signs and flaggers during lane closure shall conform to the MUTCD. The traveled-way and shoulders shall be kept clear of mud and other construction debris at all times during construction of the permitted facility. No non-construction equipment or vehicles or office trailers shall be allowed on the right of way during working hours. The right of way shall be left free and clear of equipment, material, and vehicles during non-working hours.

☑ When necessary to block one (1) traveled-lane of a state highway, the normal working hours shall be as directed by the Department. No lanes shall be blocked or obstructed during adverse weather conditions (rain, snow, fog, etc.) without specific permission from the Department.

☑ Working hours shall be between **9:00 AM** and **3:00 PM**. Further date and time restrictions are as follows:

B. Explosives

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

C. OSHA

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

D. Archaeological

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

E. Environmental

☑ If the activity to which this permit related disturbs one acre of more of land, you must obtain KPDES KYR10 permit. Information can be found at http://water.ky.gov/permitting/Pages/GeneralPermits.aspx

F. Additional Notes

☑ The following additional notes apply to this permit:

Due to bore pits being in the clear zone, they must be traversable by an errant vehicle during non working hours.

II. UTILITIES

- [x] The permittee shall be responsible for any damage to existing utilities. Any utility modifications or relocations within state right of way necessary, as determined by the Department or by the owner of the utility, shall be at the expense of the permittee and subject to the approval of the Department. Operators of underground utilities in right of way shall be members of Kentucky 811.

- [ ] All existing manholes and valve boxes shall be adjusted to be flush with finished grade.

- [ ] All pavement cuts shall be restored per Kentucky Transportation Cabinet standards and specifications.

- [x] Any excavation within 3' of edge of pavement will require flowable fill as backfill.

- [ ] The clear zone requirement shall be met to the extent possible in accordance with the Roadside Design Guide.

- [x] Encasement pipe shall conform to current standards for highway crossings in accordance with the Permits Manual. Pipe encasing shall not be required if the pipe crossing is 2" or less.

- [ ] Aerial crossing of utility lines shall have a minimum clearance from the high point of the roadway to the low point of the line of 24' on fully controlled access highways and 18' on non-fully controlled access highways

- [x] Minimum depth for underground Gas and Electric lines is 60" under roadways, ramps, and ditch lines and 42" in all other areas within state right of way. The minimum depth for all other utilities is 42" in all areas.

- [ ] When steel plates are installed over an open excavation in the roadway, they must be anchored to the pavement and have asphalt applied to all exposed edges and an MUTCD approved sign noting "Road Plates Ahead." KYTC must be notified of the location, date, time, and permit number associated to BOTH the installation and removal of the plate. Failure to do so may result in permit revocation.

- [ ] Utility poles moved for replacement must be removed in their entirety and the hole left behind must be backfilled.

- [ ] No poles or anchors shall be installed in a roadside ditch.

- [ ] ***Utility notes specific to fully-controlled access highways ONLY:***
All work necessary within the right-of-way shall be performed behind a temporary fence erected prior to the start of work. The temporary woven wire fence shall be removed immediately upon completion of work on the right-of-way, and the control of access immediately restored to original condition, in accordance with applicable KYTC SSRBC. All vents, valves, manholes, etc., shall be located outside of the right-of-way. Encasement pipe shall extend from right-of-way line to right-of-way line and shall be one continuous run of pipe. The encasement pipe shall be welded at all joints. The boring pit and tail ditch shall extend past the existing toe of slope or bottom of ditch line and shall be a minimum of 42 inches deep. Work in interstate right-of-way requires approval from FHWA (Federal Highway Administration).

- [ ] Additional notes:

III. DRAINAGE

- [x] Negative impacts to existing drainage will be the applicant's responsibility to repair in accordance with KYTC SSRBC.
- [ ] All pipe shall be laid in a straight alignment, to proper grades, and with all materials and methods of installation including bedding and joint seating. Pipe shall not be covered until inspected by the Department and express permission obtained to make backfill. It is the applicant's responsibility to request inspection.
- [ ] All gutter lines at the base of new curbs shall be on continuous grades, and pockets of water along with curbs or in entrance areas or other paved areas within the right-of-way shall not be acceptable.
- [ ] All drainage structures and appurtenances (manholes, catch basins, curbing, inlet basins, etc.) shall conform to the Department specifications and shall be constructed in accordance with the KYTC's Standard Drawings.
- [ ] Additional notes:

IV. PAVING

- [ ] No bituminous pavement shall be installed within the right of way between November 15 and April 1, nor when the temperature is below 40 degrees Fahrenheit, without the express consent of the Department. No bituminous pavement shall be installed when the underlying course is wet.
- [ ] Paving within the right of way shall be as follows:
  - Base (Type): **Match Existing**, (Thickness) **Match Existing**
  - Surface Base (Type) **Match Existing**, (Thickness) **Match Existing**
  - Finished Surface (Type) **Match Existing**, (Thickness) **Match Existing**
- [ ] All materials and methods of construction, including base and subgrade preparation, shall be in accordance with KYTC's Standard Specifications. At least 24 hours notice to the Department is required prior to beginning paving operations.

  Phone: **859-341-2700** Name: _____
- [ ] Utility companies performing road cuts must restore the pavement to pre-existing condition. Pictures/videos are recommended to ensure proper placement of signs and lane markers that are temporarily removed for paving operations. In some cases, a pre-work inventory may be requested from the Department.
- [ ] Existing pavement and shoulder material shall be removed to accommodate the above paving specifications.
- [ ] The finished surface of all new pavement within the right of way shall be true to the required slope and grade, uniform in density and texture, free of irregularities, and equivalent in riding qualities to the adjacent highway pavement or as determined by KYTC.
- [ ] To ensure proper surface drainage, the new pavement shall be flush with the edge of existing highway pavement and shall slope away from the existing edge of the pavement as specified in drawings.
- [ ] Existing edge of pavement shall be saw-cut to provide a straight and uniform joint for new pavement, and an edge key will be installed in the overlap. An approved joint sealer, in accordance with Kentucky Department of Highways Standard Specifications (latest edition), shall be applied between new and existing pavements.
- [ ] Additional notes:

V. ENTRANCES

- ☐ Encroachment permits issued by KYTC in no way supersede local planning/zoning requirements or subdivision regulations. KYTC has no authority with zoning changes.
- ☐ Commercial entrances must be paved to the right-of-way line. Any deviations must be approved by KYTC before installation.
- ☐ KTYC can dictate drainage improvement installation during construction or after entrance is at final grade. The permit release does not release the permit applicant from drainage maintenance.
- ☐ Signs (ground-mounted and span-mounted), stop bars, crosswalk, and proper lane markings must be in-place before entrance is open for traffic. Lane width modifications must be approved by the Department.
- ☐ Guardrail installation must be pre-approved by the Department and installed by a KYTC pre-qualified contractor. Any guardrail that is removed during construction must be returned to the local KTYC maintenance facility.
- ☐ Additional notes:

VI. TRAFFIC

- ☐ Any contractor performing work within the vicinity of KYTC roadway lighting or traffic signals, must request locates from the KYTC District 6 Traffic section at least one week before of starting work in the right-of-way.
- ☑ Applicant must maintain all KYTC Roadway signage that is impacted by the permitted work. In the event that any signs have to be moved, it is the applicant's responsibility to mark the sign's location before removal and to install the original or new sign per KYTC standards for sign installation.
- ☑ Any thermoplastic or striping damaged during the encroachment must be restored in a timely manner per KYTC standards. Stopbars, arrows, and crosswalks must be thermoplastic material, paint is not acceptable. This work must be performed by a KYTC pre-qualified contractor.
- ☐ Excavating near a signal, lighting pole, or anchoring facility must be done so that it does not impact the structural integrity of the pole. Any work that requires a temporary support or anchoring must receive prior approval.
- ☐ If the scope of the permit involves a signal build or rebuild, it is the applicant's responsibility to apply for power service (and pay monthly electrical bill) as well as request electrical inspection from the KYTC District 6 Traffic section. If the signal modifications require timing or phasing changes this must be requested at least two weeks in advance of the signal's turn-on date. KYTC will not take ownership of permitted signals until the electrical inspection is formally accepted and approved.
- ☐ Work which impacts traffic loops requires 48-hour notice to the KYTC District 6 Traffic section at 859-341-2700. Accidental damage of a traffic loop must be reported immediately to KYTC District 6's emergency line at 859-620-2738. Any disturbed traffic loops must be replaced in a timely manner. Traffic loops out of operation for more than five working days will subject the applicant to the cancellation of the permit. Loop repair must be performed by a KYTC pre-qualified contractor.
- ☐ Additional Notes:

VII. SIDEWALK SPECIFICATIONS

☐ All sidewalk modifications, retrofitting, or installations must meet current ADA guidelines

A. New Sidewalks

☐ New sidewalk specifications, dimensions, and designs shall be in accordance with KYTC's latest edition of the Standard Specifications, or with the plans provided on the permit if approved by a KYTC D6 Construction or Permits Engineer.

☐ All materials and methods of construction, including curing, shall be in accordance with KYTC's latest edition of the Standard Specifications.

B. Existing Sidewalks

☐ Use of the sidewalk shall not be blocked or obstructed and a usable walkway shall be maintained across the construction area at all times per MUTCD . Sidewalk closures must be approved by the Department before implementation.

☐ The location of ADA ramps (truncated domes/tactile warnings/etc.) will need to be field verified by KYTC before installation.

☑ Any section of sidewalk that becomes damaged shall be entirely replaced to match existing sections.

☐ Additional notes:

VIII. RIGHT OF WAY RESTORATION

☑ All disturbed portions of the right of way shall be restored to grass as per Kentucky Department of Highways Standard Specifications for Road and Bridge Construction (latest edition). A satisfactory turf, as determined by the Department, shall be established by the permittee prior to release of indemnity. Sodding or seeding shall be as follows:

- ☑ Slopes 3:1 or Less: 90% Kentucky 31 Tall Fescue and 10% White Dutch Clover at 100 lbs/acre
- ☑ Slopes Greater than 3:1: 90% Kentucky 31 Tall Fescue and 10% Partridge Pea at 100 lbs/acre
- ☑ Urban or Residential Areas: 95% Turf Type Fall Fescue Blend and 5% White Dutch Clover at 275 lbs/acre

☑ Two tons of clean straw mulch per acre of seeding.

☑ Prior to seeding, the ground shall be prepared in accordance with Kentucky Department of Highways Standard Specifications for Road and Bridge Construction (latest edition).

☐ Substitutes for sod such as artificial turf, rocked mulch, or paved areas may be acceptable if they are aesthetically pleasing and receive prior approval from KYTC.

☐ All ditch-flow lines and all ditch-side slopes shall be sodded.

☑ Existing concrete right of way markers shall not be disturbed. If damaged in any way, they shall be entirely replaced by the permittee with new concrete markers to match the original markers, in accordance with Kentucky Department of Highways Standard Drawings. Markers that are entirely removed shall be re-established in the proper locations by the permittee and to the satisfaction of the Department.

☐ Additional notes:

IX. RIGHT OF WAY FENCE RESTORATION

- ☐ The replacement fence shall be a height of at least 48 inches and shall be of sufficient density to protect against encroachment.
- ☐ The replacement fence shall be a minimum of 1 foot and a maximum of 2 feet outside the right-of-way line
- ☐ The fence materials and design shall meet accepted industry standards and be treated as paintable. Durable finish materials such as vinyl are acceptable.
- ☐ The permittee shall be required to construct and maintain the replacement fencing to an acceptable level of functionality and state of repair. All work on the fencing shall be performed by access from the private property. Access from the roadway is not allowed.
- ☐ The existing fence shall be removed by permittee and stored at the Department's maintenance storage yard for future reuse by the Department, or the Department shall be reimbursed the cost of fencing removed.
- ☐ Right of way monuments shall be installed regardless of if replacement fence is installed or not.
- ☐ The control of access shall not be diminished as a result of replacement of the fence.
- ☐ Additional notes:

X. MISCELLANEOUS NOTES

NOTICE TO PERMITTEE

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

Northern Kentucky Water District

64 PAGES EXCERPTED AND SUBMITTED FOR CONFIDENTIAL TREATMENT PURSUANT TO 807 KAR 5:001, SECTION 13

Northern Kentucky Water District

EXHIBIT A-7

ADDENDA

This Addendum forms a part of the Contract documents and modifies the original Bidding Documents.

PRE-BID MEETING MINUTES, SUMMARY OF QUESTIONS, AND SIGN-IN SHEET

Item No. AD1-1

Attachment A consisting of the Pre-bid Meeting Minutes and Summary of Questions, and Attachment B consisting of the Pre-bid Meeting Sign-in Sheet, are hereby incorporated into the Bidding Documents as Addendum No. 1.

ATTACHMENT A

PRE-BID MEETING MINUTES
AND SUMMARY OF QUESTIONS

engineering | architecture | geospatial

Pre-Bid Meeting Minutes

New Taylor Mill Tank **GRW Project No. 5059**
Northern Kentucky Water District **Date: January 9, 2024**

Please note that the Bidding Documents stand as issued. Nothing discussed during the pre-bid meeting will be construed to have changed the intent of the Bidding Documents. Any potential modification, which may be discussed during the meeting, will not become official until issued in an Addendum.

1. Introduction

- Owner: Northern Kentucky Water District
  - Kyle Ryan, PE, Project Manager
  - Jenna Bareswilt, EIT, Engineering Supervisor

- Engineer: GRW Engineers, Inc.
  - Adalyn Haney, PE, Project Manager

2. Project Description

- Construction of a new 500,000 gallon multi-column or pedesphere style elevated water tank, with all associated site piping, valves, site work, instrumentation and electrical work.

3. Bid / Construction Schedule

• Pre-Bid Meeting:	January 9, 2024 @ 10:00 AM EST
• Questions Due:	January 15, 2024, EOD
• Responses Due:	January 19, 2024, EOD
• Bids Due:	February 1, 2024 @ 2:00 PM EST
• Contract Time: (substantial completion)	425 calendar days for Multi-Column 480 calendar days for Pedesphere

4. Bid Form

- 00300 Bid Disclosure Form
  - Lump Sum bid price(s) for Bid Option No. 1 and/or Bid Option No. 2 to be entered in the Bid Schedule table on Page 3.
  - Bidders can provide pricing for one or both bid options.
  - Proposed manufactures for the tank, coatings, and solenoid control valve to be entered in table at the bottom of Page 3 for each bid option.

5. Permits

- KDOW Construction Permit – Approved, permit conditions in Appendix B
- KYTC Encroachment Permit – Approved, permit conditions in Appendix B
- FAA has reviewed the proposed tank project and provided a Determination of No Hazard to Air Navigation for the project. Tank lighting or marking were not required.
- Contractor shall submit FAA Form 7460-2 Notice of Actual Construction or Alteration to the FAA for construction activities.

6. Project Elements

- Bid Option No. 1 – Multi-Column Style Tank
  - Utility Building

- Bid Option No. 2 – Pedesphere Style Tank
  - Conditioned space in Base Cone
- Both Bid Options
  - Site piping
  - Concrete parking area
  - Site grading
  - Fencing and gates
  - Crushed stone surface
  - Landscaping
  - Altitude Valve
  - Submersible Mixer
  - Chemical analyzers
  - New electrical service from Duke Energy
  - Electrical and instrumentation work

8. Questions/Comments

Other comments:

- Bids to be submitted online via the QuestCDN website.
- Questions during bidding to be submitted online via the QuestCDN website.
- The tank site is located across KY 16 from 5402 Pride Parkway, Taylor Mill, KY, just south of Scott High School and Woodland Middle School.
- The above contract times are from the date of the Notice to Proceed to substantial completion.
- The Notice of Award can be expected approximately 90 days after the bid opening after PSC approval.
- Provisions for weather delays are included in the contract documents. NKWD will work with the Contractor on unforeseen substantial delays due to supply chain issues.

Questions and Answers:

Q1: What is the selection process for bid selection? Will there be consideration for life-cycle costs in addition to the bid price?

A1: Other factors will be considered in the selection process such as life-cycle costs. The Owner reserves the right to select the Bid Option at their discretion based on conditions most advantageous to the needs of the project.

Q2: Is any environmental permitting needed for tree clearing?

A2: No.

Q3: Is there any opposition to listing Sherwin Williams coating systems in the Tank Coatings specification?

A3: Any proposed alternate coatings systems to the systems listed in the Steel Water Storage Tank Coatings specification will be reviewed by NKWD and the Engineer after the project has been awarded during the submittal review process.

Q4: What tank coating systems are specified?

A4: Interior wet is AWWA D102 ICS No. 3 and exterior is AWWA D102 OCS No. 4.

Q5: Is the project located within any city limits?

A5: Yes, it's located in the City of Taylor Mill.

ATTACHMENT B

PRE-BID MEETING SIGN-IN SHEET

engineering | architecture | geospatial

PRE BID MEETING SIGN-IN

NEW TAYOR MILL TANK
Northern Kentucky Water District
Taylor Mill, KY

January 9, 2024

Name	Representing	Phone	Email
SHANNON BENJAMIN	SHERWIN WILLIAMS	513 432-4018	shannon.benjamin@sherwin.com
Walt King	Advanced Industrial Services	419-340-8306	wking@irex.com
Michael Wilcox	Early Construction	606-316-9522	wilcox at early cc. com
Joey Wilcox	EARLY Construction	606-316-0499	jwilcox @ earlycc.com
Jenna Bareswilt	NKWD	859-578-4893	jbareswilt @nkywater.org
Adalyn Haney	GRW	502-489-8484	ahaney@grwinc.com
KYLE RYAN	NKWD	859-426-2713	kryan@nkywater.org
Jason Nellis	CB&I	770-521-6552	jason.nellis@mcdermott.com

End Addendum No. 1

This Addendum forms a part of the Contract documents and modifies the original Bidding Documents.

REVISIONS TO DRAWINGS

Item No. AD2-1: Replacement of SHEET M-01-302-1 and SHEET M-01-302-2

Addendum No. 2 - Attachment A, consisting of revisions to the Drawings, is attached and hereby incorporated into the Bidding Documents.

QUESTIONS AND ANSWERS

Item No. AD2-2: Additional Questions and Answers

Q1: Are separate field offices required for both the Contractor and the Owner/Engineer?

A1: No, a field office is only required for the contractor. A separate field office is not required for the Engineer and/or Owner's use.

Q2: Can we work weekends (Saturday and Sunday)?

A2: No.

Q3: Can the Progress Meetings be conducted by telephone if we do not have a representative at the site?

A3: Yes.

Q4: Are there any local building permit fees or business license fees?

A4: The Contractor is responsible for acquiring an occupational license which is needed to operate a business within the City of Taylor Mill. Occupational licenses are available through Kenton County's Occupational License department https://www.kentoncounty.org/221/Business-Services

Q5: Can the site superintendent change with different construction phases?

A5: Yes, as long as there is a Project Manager that oversees all construction phases and superintendents.

Q6: Is OCP (Owner/contractor liability insurance) required?

A6: Insurance requirements are found in Specification Section 00800, Supplemental Conditions, Sub-Section SC-5. BONDS AND INSURANCE and Specification Section 00700 General Conditions, Sub-Section ARTICLE 5 – BONDS AND INSURANCE.

Q7: Are there any funding sources, that would require domestic pipe and valve materials, i.e. AIS or BABA? Or will import materials be allowed?

A7: This project's funding source does not have special requirements regarding the use of domestic materials. Materials used for the pipe and valves must meet requirements outlined in the project

specifications and in the Northern Kentucky Water District's most current Standard Specifications & Drawings for the Installation of Water Mains found at https://nkywater.org/wp-content/uploads/2023/02/2021Standards.pdf

Q8: Can you provide example suppliers for the cameras and SCADA Equipment?

A8: Example suppliers include but are not limited to the following:
Cameras – Verkada – Matt Neilson, Account Executive | matt.neilsen@verkada.com | (606) 393-4949 (Office) | (408) 960-4366 (Cell)

PLC Panel and Instrumentation - Rawdon Myers, PCS Technologies, Southern Flow, BL Anderson | Please note all PLC Panel and Instrumentation work included under Division 40 shall be supplied from a single system supplier as specified in Specification Section 409000, Part 1.3 – Quality Assurance. Additionally, all SCADA system programming will be performed outside this contract.

Q9: Are field offices required in addition to our job tool units?

A9: Field offices are required. Please see Specification Section 015213 – "FIELD OFFICES" for requirements.

Q10: Is this project taxable or tax exempt (labor and materials or just materials)?

A10: See Section 21 "SALES TAX EXEMPTION" of the Instructions to Bidders regarding tax exemption for materials. Labor is not tax exempt.

Q11: Would you consider any other Gate Valve Manufacturers, such as Mueller or Clow?

A11: Any proposed "or equal" products or manufacturers will be reviewed by NKWD and the Engineer after the project has been awarded during the submittal review process.

Q12: Would you allow Romac DJ400 for dismantling joints?

A12: Any proposed "or equal" products or manufacturers will be reviewed by NKWD and the Engineer after the project has been awarded during the submittal review process.

Q13: Is there a spec for the Flapper valve on end of overflow pipe?

A13: See specifications 331619 Multi-Column Elevated Water Storage Tank and 331620 Pedesphere Elevated Water Storage Tank.

Q14: Any other manufacturers you would consider on Check Valves, other than GA?

A14: Any proposed "or equal" products or manufacturers will be reviewed by NKWD and the Engineer after the project has been awarded during the submittal review process.

[Addendum No. 2 - Attachment A follows.]

ADDENDUM

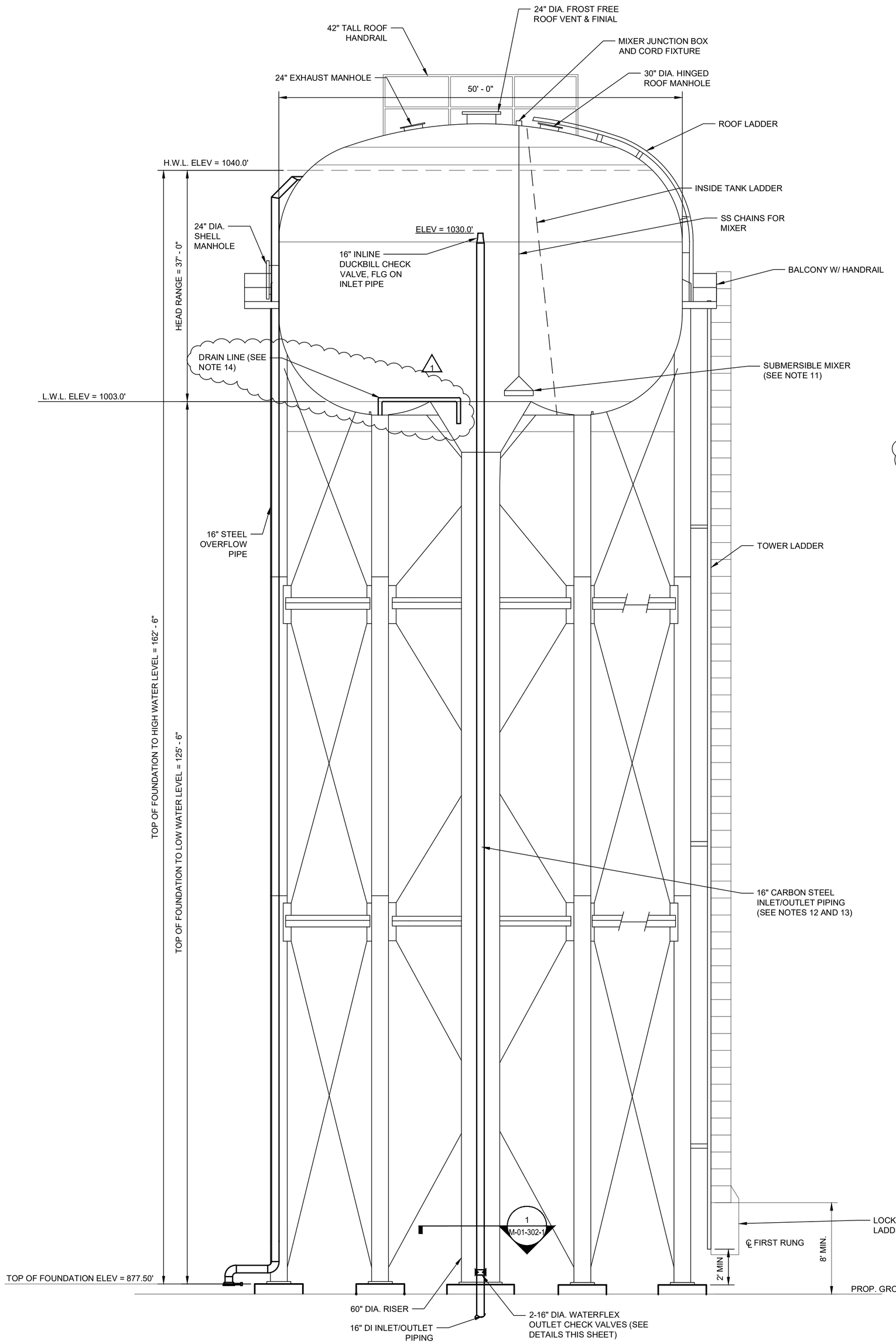
NEW TAYLOR MILL TANK
NORTHERN KENTUCKY WATER DISTRICT

GRW Project No. 5059

Date: January 26, 2024

DRAWINGS

1. SHEET M-01-302-1 (Replace sheet in its entirety with the attached version)
   a. Added Drain Line and Note 14
2. SHEET M-01-302-2 (Replace sheet in its entirety with the attached version)
   a. Added Drain Line and Valve and Note 15

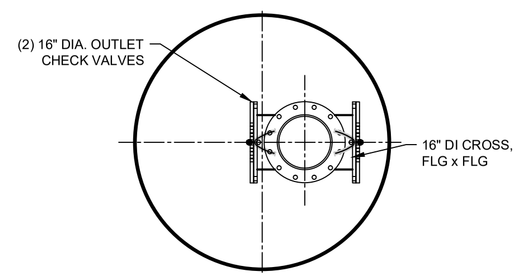


500,000 GALLON MULTI-COLUMN TANK SECTION

NOT TO SCALE

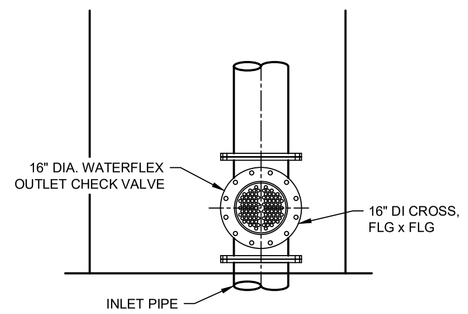
GENERAL NOTES:

1. THIS DRAWING IN GENERAL REFLECTS THE CONSTRUCTION OF BID OPTION NO.1 NEW 500,000 GALLON MULTI-COLUMN ELEVATED WATER STORAGE TANK.
2. TANK MANUFACTURER SHALL DESIGN, FABRICATE AND ERECT THE WATER TANK IN ACCORDANCE WITH D-100.
3. NUMBER OF TOWER LEGS SHALL BE PER THE TANK MANUFACTURER'S DESIGN.
4. MATERIALS USED IN THE FABRICATION OF THE WATER TANK SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
5. ALL HANDRAILS, PLATFORM LANDINGS, WALKWAYS, LADDERS, AND SAFETY CLIMB DEVICES SHALL CONFORM WITH CURRENT OSHA STANDARDS.
6. WATER TANK SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATION SECTION 099720 - STEEL TANK COATINGS.
7. WATER TANK SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA C652 AND AS DESCRIBED MORE IN THE CONTRACT SPECIFICATIONS.
8. THE NEW TANK FOUNDATION SHALL BE DESIGNED BY THE TANK MANUFACTURER, PROFESSIONAL ENGINEER LICENSED IN THE STATE OF KENTUCKY AND BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT'S RECOMMENDATION. THE GEOTECHNICAL REPORT IS ATTACHED AS AN APPENDIX TO THE CONTRACT SPECIFICATIONS.
9. CONCRETE FOR THE NEW FOUNDATION SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 033100 - CAST IN PLACE CONCRETE.
10. TANK MANUFACTURER SHALL INSTALL MOUNTING STRUCTURES FOR THE ATTACHMENT OF CELLULAR EQUIPMENT AND ATTACHMENT OF NKWD'S TELEMETRY. MOUNTING STRUCTURES SHALL BE IN ACCORDANCE WITH THE DETAILS SHOWN ON SHEETS M-01-502 & M-01-503.
11. SUBMERSIBLE MIXER SHALL BE INSTALLED THROUGH THE 30" ROOF MANHOLE. MIXER SHALL BE INSTALLED AT A MIN. 2" OFF THE TANK FLOOR.
12. INLET/OUTLET PIPE SUPPORTS SHALL BE PROVIDED AND SPACED PER TANK MANUFACTURER RECOMMENDATIONS.
13. CONTRACTOR SHALL INSTALL TRANSITION COUPLING ADAPTOR BETWEEN CARBON STEEL INLET/OUTLET PIPE AND 16" DI CROSS.
14. CONTRACTOR SHALL INSTALL A 2" SCH80 SIPHON DRAIN LINE FROM THE BOWL AND DOWN INTO THE RISER 5'. SECURE TO STAND OF FS WITH STAINLESS STEEL U-BOLTS.



1 SECTION

NOT TO SCALE



ELEVATION - OUTLETS

NOT TO SCALE

BID SET

STATE OF KENTUCKY
ADALYN O. HANEY
27660
LICENSED PROFESSIONAL ENGINEER
1/26/2024

GRW PROJECT NO. 5059

CLIENT PROJECT NO. XXXX

engineering | architecture | geospatial

www.grwinc.com

BID OPTION NO.1
500,000 GAL. MULTI-COLUMN TANK - SECTION II

NEW TAYLOR MILL TANK
TAYLOR MILL, KENTUCKY

DESIGNED:	DRAWN:	REVIEWED:	APPROVED:
ADH	CEK	ADH	JVP

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	ADDED DRAIN LINE	01-26-24	ADH

SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1" WHEN PLOTTED

DATE:
DECEMBER 2023

SCALE:
NOT TO SCALE

SHEET NO.
M-01-302-1

PLOTTED BY: dknatz

PRINTED: 1/26/2024 @ 10:48AM

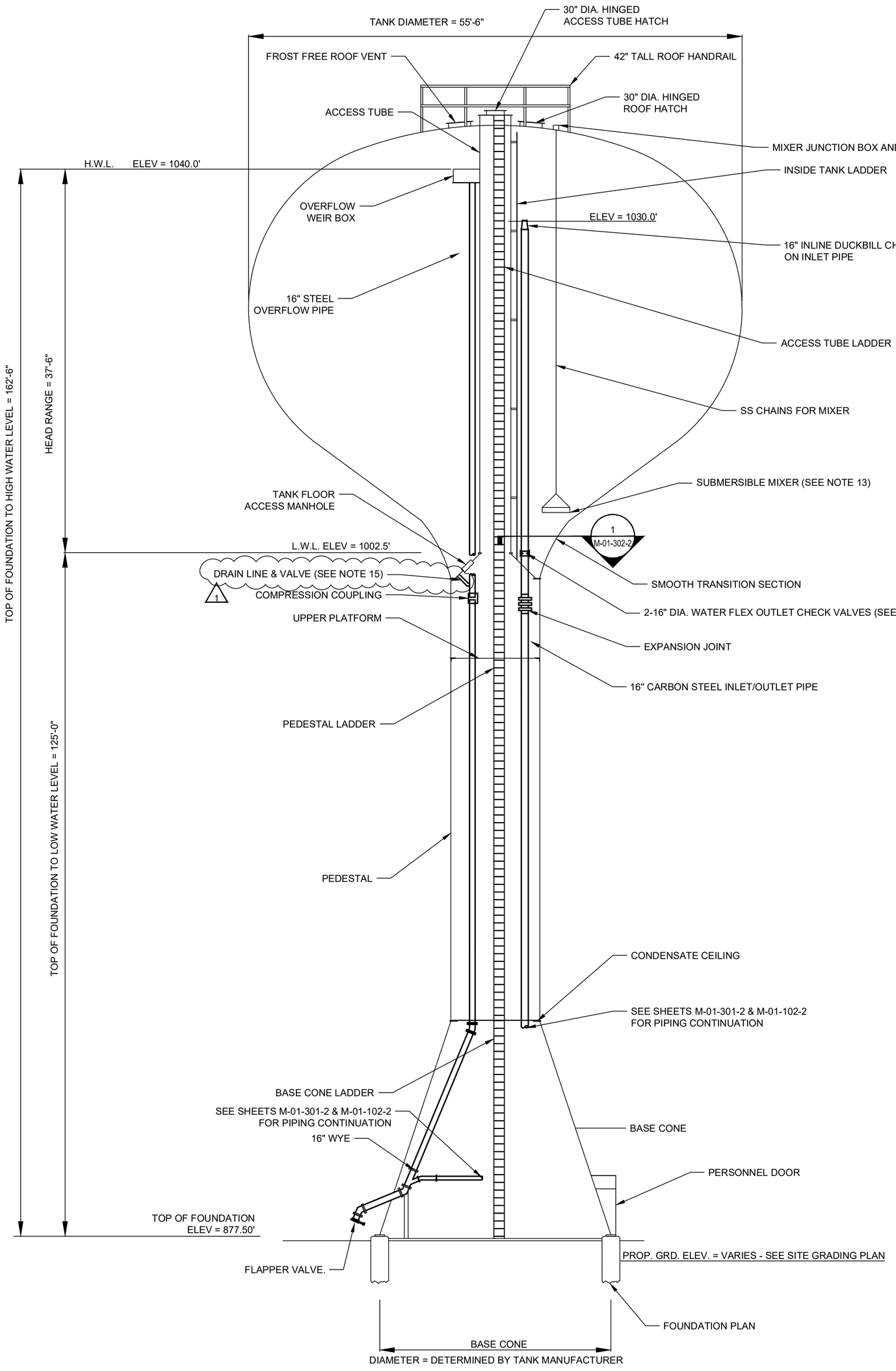
FILE NAME: G:\5059-NKWD Taylor\Mill\Working Drawings\AutoCAD\5059-M-01-302-1.dwg

GENERAL NOTES:

1. THIS DRAWING IN GENERAL REFLECTS THE CONSTRUCTION OF BID OPTION NO.2 NEW 500,000 GALLON PEDESPHERE ELEVATED WATER STORAGE TANK.
2. TANK MANUFACTURER SHALL DESIGN, FABRICATE AND ERECT THE WATER TANK IN ACCORDANCE WITH D-100.
3. MATERIALS USED IN THE FABRICATION OF THE WATER TANK SHALL BE IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS.
4. ALL HANDRAILS, PLATFORM LANDINGS, WALKWAYS, LADDERS, AND SAFETY CLIMB DEVICES SHALL CONFORM WITH CURRENT OSHA STANDARDS.
5. WATER TANK SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATION SECTION 099720 - STEEL TANK COATINGS.
6. WATER TANK SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA C652 AND AS DESCRIBED MORE IN THE CONTRACT SPECIFICATIONS.
7. THE NEW TANK FOUNDATION SHALL BE DESIGNED BY THE TANK MANUFACTURER, PROFESSIONAL ENGINEER LICENSED IN THE STATE OF KENTUCKY AND BE IN ACCORDANCE WITH THE GEOTECHNICAL REPORT'S RECOMMENDATION. THE GEOTECHNICAL REPORT IS ATTACHED AS AN APPENDIX TO THE CONTRACT SPECIFICATIONS.
8. CONCRETE FOR THE NEW FOUNDATION SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 033100 - CAST IN PLACE CONCRETE.
9. RINGWALL AND FOOTING DIMENSIONS AND CONCRETE REINFORCEMENT SHALL BE DESIGNED BY THE TANK MANUFACTURER.
10. TEH TOP OF TEH RING WALL SHALL BE LEVEL WITHIN ± 1/8" IN 30' WITH A MAXIMUM DIFFERENTIAL OF ± 1/4" BETWEEN ANY TWO POINTS ON THE CIRCUMFERENCE.
11. ANCHOR BOLTS SHALL BE PLACED WITHIN ± 1/8" OF THE PLAN DIMENSION, PLUMB WITHIN 1/4" IN 12", AND EXTENDED ABOVE TEH TOP OF THE FOUNDATION TO WITHIN 1/2" OF THE SPECIFIED PROJEECTION.
12. PROVIDE 1/2" THICK EXPANSION JOINT MATERIAL BETWEEN FLOOR AND RINGWALL AND AT ALL PIPING PENETRATIONS.
11. TANK MANUFACTURER SHALL INSTALL ACTIVE MIXING SYSTEM INSIDE TANK. IN ACCORDANCE WITH SPECIFICATION SECTION 331220 - RESERVOIR MIXING SYSTEM.
12. TANK MANUFACTURER SHALL INSTALL MOUNTING STRUCTURES FOR THE ATTACHMENT OF CELLULAR EQUIPMENT AND ATTACHMENT OF NKWD'S TELEMETRY. MOUNTING STRUCTURES SHALL BE IN ACCORDANCE WITH THE DETAILS SHOWN ON SHEETS C-1-502 AND C-1-503.
13. SUBMERSIBLE MIXER SHALL BE INSTALLED THROUGH THE 30" DIA. ROOF HATCH. MIXER SHALL BE INSTALLED AS CLOSE TO THE TANK FLOOR AS POSSIBLE.
14. INLET/OUTLET PIPE SUPPORTS SHALL BE PROVIDED AND SPACED PER MANUFACTURER RECOMMENDATIONS.
15. CONTRACTOR SHALL INSTALL A 2" THREADED COUPLING DRAIN VALVE IN THE TANK FLOOR AND A 2" FLEXIBLE TUBING DRAIN LINE FROM THE DRAIN VALVE TO THE OVER FLOW PIPE. LOCATE AS CLOSE TO PEDESTAL LADDER AS POSSIBLE.

1 SECTION
NOT TO SCALE

ELEVATION - OUTLETS
NOT TO SCALE



500,000 GALLON PEDESPHERE TANK SECTION
NOT TO SCALE

STATE OF KENTUCKY
ADALYN D. HANEY
27660
LICENSED PROFESSIONAL ENGINEER
1/26/2024

BID SET

GRW PROJECT NO. 5059
CLIENT PROJECT NO. XXXX

engineering | architecture | geospatial
www.grwinc.com

BID OPTION NO. 2
500,000 GAL PEDESPHERE TANK SECTION II
NEW TAYLOR MILL TANK
TAYLOR MILL, KENTUCKY

DESIGNED: ADH
DRAWN: CEK
REVIEWED: ADH
APPROVED: JVP

REVISIONS

NO.	DESCRIPTION	DATE	BY
1	ADDED DRAIN LINE & VALVE	01-26-24	ADH

SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1" WHEN PLOTTED

DATE: DECEMBER 2023
SCALE: 3/4"=1'
SHEET NO. M-01-302-2

PLOTTED BY: dkraitz
PRINTED: 1/26/2024 @ 11:05AM
FILE NAME: G:\5059-NKWD TaylorMill\Working Drawings\AutoCAD\5059-M-01-302-2.dwg

This Addendum forms a part of the Contract documents and modifies the original Bidding Documents.

REVISIONS TO SPECIFICATIONS

Item No. AD3-1: Clarification Regarding Inspections and Testing

The following sentence is added to the Specifications:

> "Regarding third-party inspection and testing services, the Owner/Engineer will provide all initial third-party inspection and testing services for soils, subgrades, foundations, reinforcing steel, cast-in-place concrete, and tank welding and coatings related to the elevated water storage tank and Utility Building. Contractor will not be responsible to provide these initial services but will need to coordinate with the Owner/Engineer for scheduling these services and will be responsible for costs of any re-testing and/or re-inspections.:"

END ADDENDUM NO. 3

EXHIBIT B

APPROVALS AND PERMITS
(Franchises, Plan Review and Permit Status, Easements, Right-of-Ways, Construction Start and In-Service Date, Plant Retirements)

APPROVAL AND PERMITS
SUMMARY SHEET

Franchises required – None

Plan Review and Permit Status - The District has reviewed and approved the Plans and Specifications prepared by GRW Engineers, titled "New Taylor Mill Tank" dated December, 2023, stamped and signed by a P.E.

The Kentucky Division of Water approval is attached.

The Kentucky Transportation Cabinet approval is attached.

The Federal Aviation Administration determination is attached.

Easements and Right-of-Way Status – The tank site property was purchased by the District in February 2022.

Estimated Start date of construction – June 2024

Proposed date in service – November 2025

Plant retirements – The former 330,000-gallon ground-level standpipe which served the Taylor Mill area was taken out of service 2019 and sold as surplus. The Kenton County School District purchased the property and demolished the standpipe.

EXHIBIT B-1

KENTUCKY DIVISION OF WATER APPROVAL

Andy Beshear
GOVERNOR

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
300 Sower Boulevard
Frankfort, Kentucky 40601
Phone: (502) 564-2150
Fax: 502-564-4245

Rebecca W. Goodman
SECRETARY

Anthony R. Hatton
COMMISSIONER

August 28, 2023

Kyle Ryan, P.E.
Northern KY Water District
2835 Crescent Springs Rd
Erlanger, KY 41018

RE: New Taylor Mill Tank
Campbell County, KY
Northern KY Water District
AI #: 2485, APE20230009
PWSID #: 0590220-23-009

Dear Mr. Ryan:

We have reviewed the plans and specifications for the above referenced project. The plans include the construction of a 500,000 gallon elevated water storage tank with approximately 230 linear feet of 16 inch DI water line. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit with the following stipulation:

- Record drawings shall be included with the construction certification due within 30 days of construction completion to identify the alternative chosen for the tank.

If you have any questions concerning this project, please contact Daniel Kulik at 502-782-6998.

Sincerely,

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH:DK
Enclosures
c: GRW Engineers Inc
Campbell County Health Department
Division of Plumbing

Distribution-Major Construction

Northern KY Water District

Facility Requirements

Activity ID No.:APE20230009

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-1	Construction of this project shall not result in the water system's inability to supply consistent water service in compliance with 401 KAR 8:010 through 8:600. [401 KAR 8:100 Section 5]
T-2	The public water system shall not implement a change to the approved plans without the prior written approval of the cabinet. [401 KAR 8:100 Section 4(3)]
T-3	A proposed change to the approved plans affecting sanitary features of design shall be submitted to the cabinet for approval in accordance with Section 2 of this administrative regulation. [401 KAR 8:100 Section 4(2)]
T-4	During construction, a set of approved plans and specifications shall be available at the job site. Construction shall be performed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 3(1)]
T-5	Unless construction begins within two (2) years from the date of approval of the final plans and specifications, the approval shall expire. [401 KAR 8:100 Section 3(3)]
T-6	Upon completion of construction, a professional engineer shall certify in writing that the project has been completed in accordance with the approved plans and specifications. [401 KAR 8:100 Section 4(1)]
T-7	The system shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow. [Recommended Standards for Water Works 8.2.1, Drinking Water General Design Criteria IV.1.a]
T-8	Water lines should be hydraulically capable of a flow velocity of 2.5 ft/s while maintaining a pressure of at least 20 psi. [Drinking Water General Design Criteria IV.1.b]
T-9	The normal working pressure in the distribution system at the service connection shall not be less than 30 psi under peak demand flow conditions. Peak demand is defined as the maximum customer water usage rate, expressed in gallons per minute (gpm), in the pressure zone of interest during a 24 hour (diurnal) time period. [Drinking Water General Design Criteria IV.1.d]
T-10	When static pressure exceeds 150 psi, pressure reducing devices shall be provided on mains or as part of the meter setting on individual service lines in the distribution system. [Drinking Water General Design Criteria IV.1.c]
T-11	The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three (3) inch diameter. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and can be considered only in special circumstances. [Recommended Standards for Water Works 8.2.2, Drinking Water General Design Criteria IV.2.b]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-12	Water mains not designed to carry fire-flows shall not have fire hydrants connected to them. [Recommended Standards for Water Works 8.4.1.b]
T-13	Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-14	No flushing device shall be directly connected to any sewer. [Recommended Standards for Water Works 8.2.4.b, Recommended Standards for Water Works 8.4.1.b]
T-15	Pipe shall be constructed to a depth providing a minimum cover of 30 inches to top of pipe. [Drinking Water General Design Criteria IV.3.a]
T-16	Water mains shall be covered with sufficient earth or other insulation to prevent freezing. [Recommended Standards for Water Works 8.7]
T-17	A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones found in the trench shall be removed for a depth of at least six inches below the bottom of the pipe. [Recommended Standards for Water Works 8.7]
T-18	Water line installation shall incorporate the provisions of the AWWA standards and/or manufacturer's recommended installation procedures. [Recommended Standards for Water Works 8.7]
T-19	All materials used for the rehabilitation of water mains shall meet ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-20	Packing and jointing materials used in the joints of pipe shall meet the standards of AWWA and the reviewing authority. [Recommended Standards for Water Works 8.1]
T-21	All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement. [Recommended Standards for Water Works 8.7]
T-22	All materials including pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the ASTM, AWWA and ANSI/NSF, where such standards exist, and be acceptable to the Division of Water. [Recommended Standards for Water Works 8.1]
T-23	Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been restored practically to their original condition. [Recommended Standards for Water Works 8.1]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-24	Manufacturer approved transition joints shall be used between dissimilar piping materials. [Recommended Standards for Water Works 8.1]
T-25	The minimum size of water main which provides for fire protection and serving fire hydrants shall be six?inch diameter. [Recommended Standards for Water Works 8.2, Drinking Water General Design Criteria IV.2.a]
T-26	Pipes and pipe fittings containing more than 8% lead shall not be used. All products shall comply with ANSI/NSF standards. [Recommended Standards for Water Works 8.1]
T-27	Gaskets containing lead shall not be used. Repairs to lead?joint pipe shall be made using alternative methods. [Recommended Standards for Water Works 8.1]
T-28	Pipe materials shall be selected to protect against both internal and external pipe corrosion. [Recommended Standards for Water Works 8.1]
T-29	Dead end mains shall be equipped with a means to provide adequate flushing. [Recommended Standards for Water Works 8.2]
T-30	The hydrant lead shall be a minimum of six inches in diameter. Auxiliary valves shall be installed on all hydrant leads. [Recommended Standards for Water Works 8.4.3]
T-31	A sufficient number of valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs. [Recommended Standards for Water Works 8.3]
T-32	Wherever possible, chambers, pits or manholes containing valves, blow?offs, meters, or other such appurtenances to a distribution system, shall not be located in areas subject to flooding or in areas of high groundwater. Such chambers or pits should drain to the ground surface, or to absorption pits underground. The chambers, pits and manholes shall not connect directly to any storm drain or sanitary sewer. Blow?offs shall not connect directly to any storm drain or sanitary sewer. [Recommended Standards for Water Works 8.6]
T-33	At high points in water mains where air can accumulate provisions shall be made to remove the air by means of air relief valves. [Recommended Standards for Water Works 8.5.1]
T-34	Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. [Recommended Standards for Water Works 8.5.1]
T-35	The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, downward?facing elbow. [Recommended Standards for Water Works 8.5.2.c]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-36	Discharge piping from air relief valves shall not connect directly to any storm drain, storm sewer, or sanitary sewer. [Recommended Standards for Water Works 8.5.2.d]
T-37	Water pipe shall be constructed with a lateral separation of 10 feet or more from any gravity sanitary or combined sewer measured edge to edge where practical. If not practical a variance may be requested to allow the water pipe to be installed closer to the gravity sanitary or combined sewer provided the water pipe is laid in a separate trench or undisturbed shelf located on one side of the sewer with the bottom of the pipe at least 18 inches above the top of the gravity sanitary or combined sewer pipe. [Drinking Water General Design Criteria IV.3.b]
T-38	Water lines crossing sanitary, combined or storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sanitary, combined or storm sewer with preference to the water main located above the sanitary, combined or storm sewer. [Drinking Water General Design Criteria IV.3.c]
T-39	At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. [Recommended Standards for Water Works 8.8.3.b]
T-40	There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. [Recommended Standards for Water Works 8.10.1]
T-41	Water utilities shall have a cross connection program conforming to 401 KAR 8. [Recommended Standards for Water Works 8.10.1]
T-42	Installed pipe shall be pressure tested and leakage tested in accordance with the appropriate AWWA Standards. [Recommended Standards for Water Works 8.7.6]
T-43	New, cleaned and repaired water mains shall be disinfected in accordance with AWWA Standard C651. The specifications shall include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all water mains. In an emergency or unusual situation, the disinfection procedure shall be discussed with the Division of Water. [Recommended Standards for Water Works 8.7.7]
T-44	A minimum cover of five feet shall be provided over pipe crossing underwater. [Recommended Standards for Water Works 8.9.2]
T-45	Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding for pipes crossing underwater. [Recommended Standards for Water Works 8.9.2.b]
T-46	Permanent taps or other provisions to allow insertion of a small meter to determine leakage and obtain water samples on each side of the valve closest to the supply source for pipes crossing. [Recommended Standards for Water Works 8.9.2.c]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-47	Water storage tanks shall have a minimum 100% turnover rate of once per 72 hours. [Drinking Water General Design Criteria IV.6.a]
T-48	Minimum water level for all gravity storage tanks shall maintain a minimum design pressure of 30 psi for all potential points of use supplied by the tank. [Drinking Water General Design Criteria IV.6.b]
T-49	Separate inlet and outlet is required on storage tanks; and the inlet has to be in the upper half of the tank (unless there is a separate mixing system). [Drinking Water General Design Criteria IV.6.c]
T-50	The maximum variation between high and low levels in storage structures providing pressure to a distribution system should not exceed 30 feet. [Recommended Standards for Water Works 7.3.1]
T-51	Finished water storage structures which provide pressure directly to the distribution system shall be designed so they can be isolated from the distribution system and drained for cleaning or maintenance without causing a loss of pressure in the distribution system. [Recommended Standards for Water Works 7.3.2]
T-52	The storage structure drain shall discharge to the ground surface with no direct connection to a sewer or storm drain. [Recommended Standards for Water Works 7.3.2]
T-53	Adequate controls shall be provided to maintain levels in distribution system storage structures. Level indicating devices should be provided at a central location. [Recommended Standards for Water Works 7.3.3]
T-54	The minimum storage capacity (or equivalent capacity) for systems not providing fire protection shall be equal to the average daily consumption. [Recommended Standards for Water Works 7.0.1.b]
T-55	The system should be designed to facilitate turnover of water in the reservoir. [Recommended Standards for Water Works 7.0.6]
T-56	Excessive storage capacity should be avoided to prevent potential water quality deterioration problems. [Recommended Standards for Water Works 7.0.1.c]
T-57	The overflow pipe shall be of sufficient diameter to permit waste of water in excess of the filling rate. [Recommended Standards for Water Works 7.0.7.d]
T-58	Finished water storage structures shall be designed with reasonably convenient access to the interior for cleaning and maintenance. [Recommended Standards for Water Works 7.0.8]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-59	Finished water storage structures shall be vented. Vents shall prevent the entrance of surface water, rainwater, bird, and animals. The overflow pipe shall not be considered a vent. Open construction between the sidewall and roof is not permissible. [Recommended Standards for Water Works 7.0.9]
T-60	Finished water storage structures and their appurtenances, especially the riser pipes, overflows, and vents, shall be designed to prevent freezing. Equipment used for freeze protection that will come into contact with the potable water shall meet ANSI/NSF Standard 61. [Recommended Standards for Water Works 7.0.13]
T-61	If a flapper valve is utilized, a screen shall be provide inside the valve. Provisions must be included to prevent the flapper from freezing shut. [Recommended Standards for Water Works 7.0.7.e]
T-62	The roof and sidewalls of all water storage structures must be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow. [Recommended Standards for Water Works 7.0.10]
T-63	Any pipes running through the roof or sidewall of a metal storage structure must be welded, or properly gasketed. In concrete tanks, these pipes shall be connected to standard wall castings which were poured in place during the forming of the concrete. [Recommended Standards for Water Works 7.0.10.a]
T-64	Openings in the roof of a storage structure designed to accommodate control apparatus or pump columns, shall be curbed and sleeved with proper additional shielding to prevent contamination from surface or floor drainage. [Recommended Standards for Water Works 7.0.10.b]
T-65	Valves and controls should be located outside the storage structure so that the valve stems and similar projections will not pass through the roof or top of the reservoir. [Recommended Standards for Water Works 7.0.10.c]
T-66	Every catwalk over finished water in a storage structure shall have a solid floor with sealed raised edges, designed to prevent contamination from shoe scrapings and dirt. [Recommended Standards for Water Works 7.0.14]
T-67	The discharge pipes from water storage structures shall be located in a manner that will prevent the flow of sediment into the distribution system. [Recommended Standards for Water Works 7.0.15]
T-68	Smooth-nosed sampling tap(s) shall be provided to facilitate collection of water samples for both bacteriological and chemical analyses. The sample tap(s) shall be easily accessible. [Recommended Standards for Water Works 7.0.19]
T-69	Sewers, drains, standing water, and similar sources of possible contamination must be kept at least 50 feet from water storage facilities. Gravity sewers constructed of water main quality pipe, pressure tested in place without leakage, may be used at distances greater than 20 feet but less than 50 feet. [Recommended Standards for Water Works 7.0.2.c]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-70	The roof of the storage structure shall be well drained. Downspout pipes shall not enter or pass through the reservoir. [Recommended Standards for Water Works 7.0.10.d]
T-71	Porous material, including wood and concrete block shall not be used for potable water contact applications. [Recommended Standards for Water Works 7.0.11]
T-72	All finished water storage structures shall have suitable watertight roofs which exclude birds, animals, insects, and excessive dust. [Recommended Standards for Water Works 7.0.3]
T-73	Fencing, locks on access manholes, and other necessary precautions shall be provided to prevent trespassing, vandalism, and sabotage. [Recommended Standards for Water Works 7.0.4]
T-74	Ladders, ladder guards, balcony railings, and safely located entrance hatches shall be provided where applicable. [Recommended Standards for Water Works 7.0.12.a]
T-75	All water storage structures shall be provided with an overflow which is brought down to an elevation between 12 and 24 inches above the ground surface, and discharges over a drainage inlet structure or a splash plate. All overflow pipes shall be located so that any discharge is visible. [Recommended Standards for Water Works 7.0.7]
T-76	No drain on a water storage structure may have a direct connection to a sewer or storm drain. [Recommended Standards for Water Works 7.0.5]
T-77	The design shall allow draining the storage facility for cleaning or maintenance without causing loss of pressure in the distribution system. [Recommended Standards for Water Works 7.0.5]
T-78	No overflow may be connected directly to a sewer or a storm drain. [Recommended Standards for Water Works 7.0.7]
T-79	Proper protection shall be given to metal surfaces by paints or other protective coatings, by cathodic protective devices, or by both. [Recommended Standards for Water Works 7.0.17]
T-80	Paint systems shall meet ANSI/NSF standard 61. [Recommended Standards for Water Works 7.0.17.a]
T-81	Interior paint must be applied, cured, and used in a manner consistent with the ANSI/NSF approval. [Recommended Standards for Water Works 7.0.17.a]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-82	After curing, the coating shall not transfer any substance to the water which will be toxic or cause taste or odor problems. [Recommended Standards for Water Works 7.0.17.a]
T-83	Wax coatings for the tank interior shall not be used on new tanks. [Recommended Standards for Water Works 7.0.17.b]
T-84	Old wax coating must be completely removed before using another tank coating. [Recommended Standards for Water Works 7.0.17.b]
T-85	Finished water storage structures shall be disinfected in accordance with AWWA Standard C652. Two or more successive sets of samples, taken at 24?hour intervals, shall indicate microbiologically satisfactory water before the facility is placed into operation. [Recommended Standards for Water Works 7.0.18.a]
T-86	The disinfection procedure specified in AWWA Standard C652 chlorination method 3, section 4.3 which allows use of the highly chlorinated water held in the storage tank for disinfection purposes, is prohibited unless the initial heavily chlorinated water is properly disposed. [Recommended Standards for Water Works 7.0.18.c]
T-87	The overflow for an elevated tank shall open downward and be screened with a four mesh, non-corrodible screen. [Recommended Standards for Water Works 7.0.7.c]
T-88	Elevated storage tanks shall have at least one of the access manholes framed at least four inches above the surface of the roof at the opening. All other manholes or access ways shall be bolted and gasketed. [Recommended Standards for Water Works 7.0.8.1]
T-89	Elevated storage tank vents shall open downward, and be fitted with either four mesh non-corrodible screen, or with finer mesh non-corrodible screen in combination with an automatically resetting pressure-vacuum relief mechanism. [Recommended Standards for Water Works 7.0.9.e]
T-90	Elevated tanks with riser pipes over eight inches in diameter shall have protective bars over the riser openings inside the tank. [Recommended Standards for Water Works 7.0.12.b]
T-91	Railings or handholds shall be provided on elevated tanks where persons must transfer from the access tube to the water compartment. [Recommended Standards for Water Works 7.0.12.c]
T-92	When an internal overflow pipe is used on elevated tanks, it should be located in the access tube. For vertical drops on other types of storage facilities, the overflow pipe should be located on the outside of the structure. [Recommended Standards for Water Works 7.0.7.a]
T-93	If a water circulation system is used, it is recommended that the circulation pipe be located separately from the riser pipe. [Recommended Standards for Water Works 7.0.13]

GACT0000000294 (New Taylor Mill Tank) 500,000 gallon elevated storage tank with 230 linear feet of 16 inch DI water line:

Narrative Requirements:

Condition No.	Condition
T-94	Reservoirs with pre-cast concrete roof structures must be made watertight with the use of a waterproof membrane or similar product. [Recommended Standards for Water Works 7.0.10.f]

EXHIBIT B-2

KENTUCKY TRANSPORTATION CABINET APPROVAL

NOTICE OF COMPLETION OF ENCROACHMENT PERMIT WORK

PERMITTEE

Name: Northern Kentucky Water District
Contact Person:
Address: 2835 Crescent Springs Road
City: Erlanger
State: Kentucky
Zip: 41018
Telephone:

PROJECT IDENTIFICATION

Permit Number: 06-2023-00550

I wish to notify the Department of Highways that the above mentioned permit work and any necessary right-of-way restoration have been completed and are ready for final inspection.

Permittee

Please return this form to the address below when work is completed and ready for final inspection.

Please Return to: Permit Engineer
Department of Highways, District 6 Office
421 Buttermilk Pike
Covington, Kentucky 41017
(859) 341-2700
www.transportation.ky.gov/

LOCATION(S)			
Description	**County - Route**	**Latitude**	**Longitude**
A 16" DI water line needs to be installed from the NKWD existing 16"DI water line in the west KY 16 right-of-way across KY 16 to the tank site.	Kenton - KY 16	38.986783	-84.503465

Andy Beshear
Governor

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
Department of Highways, District 6 Office
421 Buttermilk Pike
Covington, Kentucky 41017
(859) 341-2700
www.transportation.ky.gov/

Jim Gray
Secretary

June 28, 2023

Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, Kentucky 41018

Subject: Permit #: 06-2023-00550
Permit Type: Utilities - Water
Approval

Dear Applicant:

Attached is your permit approval and documentation for the subject permit.

Be advised that all work must be done in conformity with permit and application conditions. If you have any questions, please contact the Permits Section at this office.

Sincerely,

Linzy Brefeld

Linzy Brefeld
D6 Permits Supervisor

Attachments

APPROVED
JUNE 28, 2023
KENTUCKY TRANSPORTATION CABINET
06-2023-00550

Kentucky Transportation Cabinet
Department of Highways
Division of Maintenance
Permits Branch

ENCROACHMENT PERMIT

KYTC KEPT #: 06-2023-00550

Permittee: Northern Kentucky Water District

Permit Type / Subtype: Utilities / Water

Work Completion Date: 6/21/2024

INDEMNITIES		
Type	**Amount Required**	**Tracking Number**
Performance Bond	$0.00	
Cash / Check	$0.00	
Self-Insured	$0.00	
Payment Bond	$0.00	
Liability Insurance	$0.00	

This permit has been: **APPROVED** [X] **DENIED** [ ]

Linzy Brefeld	D6 Permits Supervisor	6/28/2023
SIGNATURE	**TITLE**	**DATE**

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

LOCATION(S)			
Description	**County - Route**	**Latitude**	**Longitude**
A 16" DI water line needs to be installed from the NKWD existing 16"DI water line in the west KY 16 right-of-way across KY 16 to the tank site.	Kenton - KY 16	38.986783	-84.503465

APPROVED
JUNE 28, 2023
TRANSPORTATION CABINET
KENTUCKY
06-2023-00550

Kentucky811 Know what's below. Call before you dig

To Submit a Locate Request
24 Hours a Day, Seven Days a Week:
Call 811 or 800-752-6007

KENTUCKY TRANSPORTATION CABINET
Department of Highways
PERMITS BRANCH

APPLICATION FOR ENCROACHMENT PERMIT

KYTC KEPT #: T06-2023-00550

SECTION 1: APPLICANT CONTACT INFORMATION

APPLICANT Northern Kentucky Water District	**ADDRESS** 2835 Crescent Springs Road		
EMAIL	**CITY** Erlanger	**STATE** KY	**ZIP** 41018
CONTACT NAME 1 Steve Broering, NKWD	**EMAIL** sbroering@nkywater.org	**PHONE #** 859-426-2728	**CELL #**
CONTACT NAME 2 (*if applicable*) Adalyn Haney, GRW	**EMAIL** ahaney@grwinc.com	**PHONE #** 502-489-8484	**CELL #** 502-432-0570

SECTION 2: PROPOSED WORK LOCATION

ADDRESS 5402 Pride Parkway	**CITY** Taylor Mill		**STATE** Kentucky	**ZIP** 41015
COUNTY Kenton	**ROUTE #** KY 16	**MILE POINT** 10.5	**LONGITUDE** (*X*) -84.5044	**LATITUDE** (*Y*) 38.9944

ADDITIONAL LOCATION INFORMATION:

FOR KYTC USE ONLY

PERMIT TYPE: ☐ Air Right ☐ Entrance ☒ Utilities ☐ Vegetation Removal ☐ Other:_____

ACCESS: ☐ Full ☐ Partial ☒ by Permit **LOCATION:** ☐ Left ☐ Right ☑ Crossing

SECTION 3: GENERAL DESCRIPTION OF WORK

The Northern Kentucky Water District intends to construct a new 500,000 gallon elevated water storage tank across KY 16 from 5402 Pride Parkway in Taylor Mill, Kentucky. To supply water to/from the new tank, a 16" DI water line needs to be installed from the NKWD existing 16"DI water line in the west KY 16 right-of-way across KY 16 to the tank site. Proposed work in the KY 16 right-of-way consists of connection of the new 16" DI water line to the existing 16" DI water line via new tee and valves, sidewalk repair/replacement, and boring and jacking the new 16" DI water line in a 24" steel casing pipe across KY 16. Please see enclosed project drawings showing this work.

THE UNDERSIGNED APPLICANT(s), being duly authorized representative(s) or owner(s), DO AGREE TO ALL ORIGINAL UNEDITED TERMS AND CONDITIONS ON THE TC 99-1A, pages 1-4.

Steve Broering
SIGNATURE

1-16-2023
DATE

This is not a permit unless and until the applicant(s) receives an approved TC 99-1B from KYTC. This application shall become void if not approved by the cancellation date. The cancellation date shall be a minimum of one year from the date the applicant submits their application.

APPLICATION FOR ENCROACHMENT PERMIT

TERMS AND CONDITIONS

1. The permit, including this application and all related and accompanying documents and drawings making up the permit, remains in effect and is binding upon the Applicant/Permittee, its successors and assigns, as long as the encroachment(s) exists and also until the permittee is finally relieved by the Department of Highways from all its obligations.

2. Applicant shall meet all requirements of the Clean Water Act if the project will disturb one acre or more, the applicant shall obtain a KPDES KYR10 Permit from the Kentucky Division of Water. All disturbed areas shall meet the requirements of the Department of Highway's Standard Specifications, Sections 212 and 213, as amended.

3. INDEMNITY:

- **A.** PERFORMANCE BOND: The permittee shall provide to the Department a performance bond according to the Permits Manual, Section PE-203 as a guarantee of conformance with the Department's Encroachment Permit requirements.
- **B.** PAYMENT BOND: At the discretion of the department, a payment bond shall be required of the permittee to ensure payment of liquidated damages assessed to the permittee.
- **C.** LIABILITY INSURANCE: Liability insurance shall be required of the permittee (in an amount approved by the department) to cover all liabilities associated with the encroachment.
- **D.** It shall be the responsibility of the permittee, its successors and assigns, to maintain all indemnities in full force and effect until the permittee is authorized to release the indemnity by the Department.

4. A copy of this application and all related documents making up the approved permit shall be given to the applicant and shall be made readily available for review at the work site at all times.

5. Perpetual maintenance of the encroachment is the responsibility of the permittee, its successors and assigns, with the approval of the Department as required, unless otherwise stated.

6. Permittee, its successors and assigns, shall comply with and agree to be bound by the requirements and terms of (a) this application and all related documents making up the approved permit, (b) by the Department's Permits Manual, and (c) by the Manual on Uniform Traffic Control Devices, both manuals as revised to and in effect on the date of issuance of the permit, all of which documents are made a part thereof by this reference. Compliance by the permittee, its successors and assigns, with subsequent revisions to applicable provisions of either manual or other policy of the Department may be made a condition of allowing the encroachment to persist under the permit.

7. Permittee agrees that this and any encroachment may be ordered removed by the Department at any time, and for any reason, upon thirty days written notice to the last known address of the applicant or to the address at the location of the encroachment. The permittee agrees that the cost of removing and of restoring the associated right-of-way is the responsibility of the permittee, its successors and assigns.

8. Permittee, its successors and assigns, agree that if the Department determines that motor vehicular safety deficiencies develop as a result of the installation or use of the encroachment, the permittee, its successors and assigns, shall provide and bear the expenses to adjust, relocate, or reconstruct the facilities, add signs, auxiliary lanes, or other corrective measures reasonably deemed necessary by the Department within a reasonable time after receipt of a written notice of such deficiency. The period within which such adjustments, relocations, additions, modifications, or other corrective measures must be completed will be specified in the notice.

9. Where traffic signals are required as a condition of granting the requested permit or are thereafter required to correct motor vehicular safety deficiencies, as determined by the Department, the costs for signal equipment and installation(s) shall be borne by the permittee, its successors and assigns and the Department in its reasonable discretion and only in accordance with the Department's current policy set forth in the Traffic Operations Manual and Permits Manual. Any modifications to the permittee's entrance necessary to accommodate signalization (including necessary easement(s) on private property) shall be the responsibility of the permittee, its successors and assigns, at no expense to the Department.

APPLICATION FOR ENCROACHMENT PERMIT

10. The requested encroachment shall not infringe on the frontage rights of an abutting owner without their written consent as hereinafter described. Each abutting owner shall express their consent, which shall be binding on their successors and assigns, by the submission of a notarized statement as follows, "I (we), _____, hereby consent to the granting of the permit requested by the applicant along Route_____, which permit does affect frontage rights along my (our) adjacent real property." By signature(s)_____, subscribed and sworn by_____, on this date_____.

11. The permit, if approved, is subject to the agreement that it shall not interfere with any similar rights or permit(s) previously granted to any other party, except as otherwise provided by law.

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

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

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

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

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

APPLICATION FOR ENCROACHMENT PERMIT

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

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

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

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

21. Before You Dig: The contractor is instructed to call 1-800-752-6007 to reach KY 811, the One-Call system for information on the location of existing underground utilities. The call is to be placed a minimum of two (2) and no more than ten (10) business days prior to excavation. The contractor should be aware that the owners of underground facilities are not required to be members of the KY 811 One-Call Before U-Dig (BUD) service. The contractor must coordinate excavation with the utility owners, including those whom do not subscribe to KY 811. It may be necessary for the contractor to contact the County Clerk to determine what utility companies have facilities in the area.

22. The undersigned Utility acknowledges ownership and control of the facilities proposed to be installed, modified, or extended by the Applicant/Permittee and agrees to be bound by the requirements and terms of this application and all related documents making up the approved permit, by the Department's Permits Guidance Manual, and by all applicable regulations and statutes in effect on the date of issuance of the permit. This information and application is certified correct to the best knowledge and belief of the undersigned Utility.

Northern Kentucky Water District
UTILITY

Steve Broering
NAME (Utility Representative)

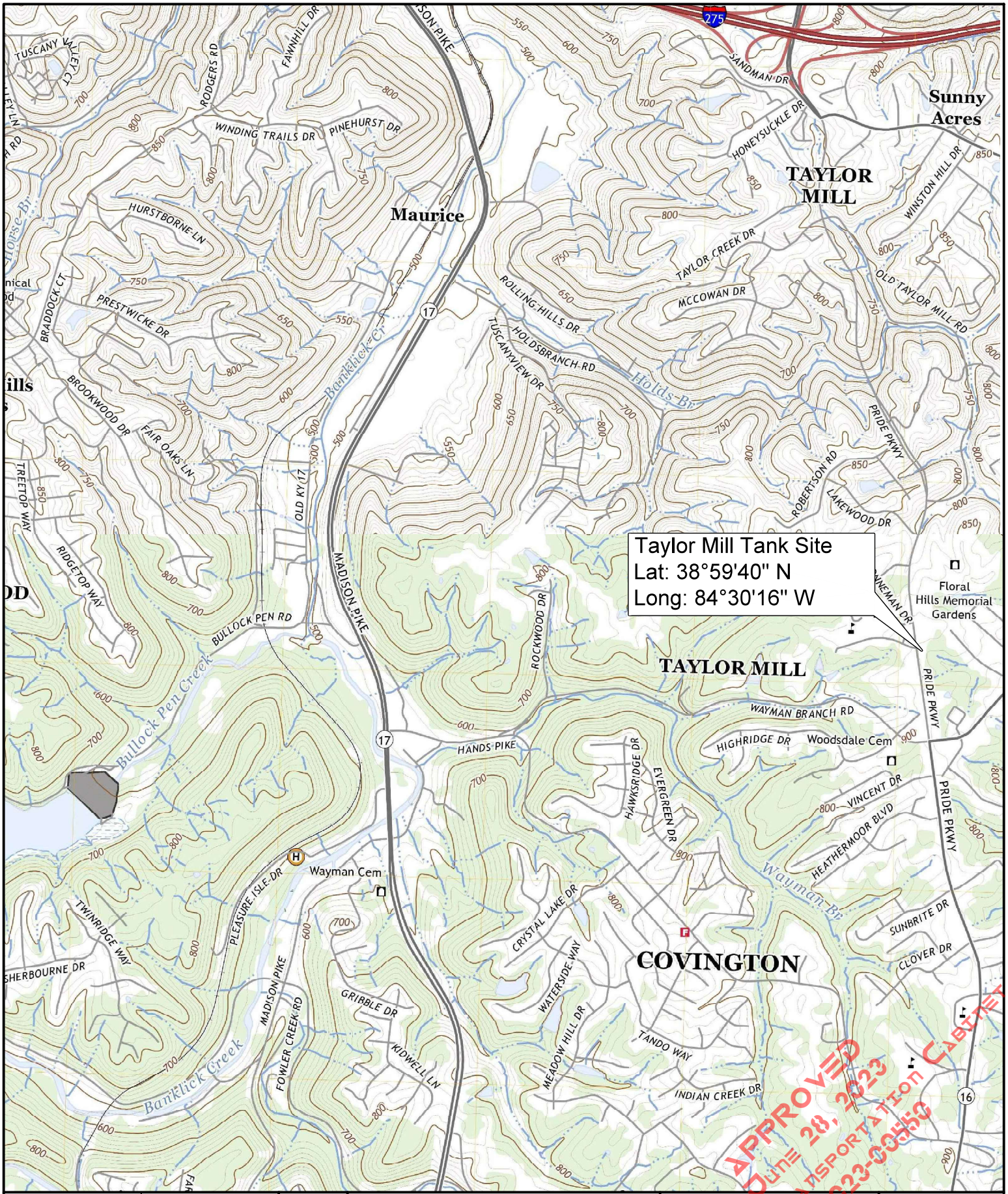
Steve Broering
SIGNATURE (Utility Representative)

Engineering Technician
TITLE (Utility Representative)

1-16-2023
DATE

Kentucky 811 Know what's below. Call before you dig.

To Submit a Locate Request
24 Hours a Day, Seven Days a Week:
Call 811 or 800-752-6007



GRW PROJECT NO. 5059	CLIENT PROJECT NO.	DESIGNED: ADH	PROJECT LOCATION MAP N.K.W.D. NEW TAYLOR MILL TANK CITY OF TAYLOR MILL, KENTUCKY
REVISIONS NO. / DESCRIPTION / DATE / BY		DRAWN: RLT	
		REVIEWED: ADH	
SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1/2" WHEN PLOTTED		APPROVED: ADH	

engineering | architecture | geospatial
www.grwinc.com

DATE: MAY, 2023
SCALE:
SHEET NO.

APPROVED
JUNE 28, 2023
TRANSPORTATION CABINET
KYTC-2023-00550

Northern Kentucky Water District

16 PAGES EXCERPTED AND SUBMITTED FOR CONFIDENTIAL TREATMENT PURSUANT TO 807 KAR 5:001, SECTION 13

KYTC Division of Maintenance
Permits Branch
District 6

ENCROACHMENT PERMIT GENERAL NOTES & SPECIFICATIONS

YOU MUST NOTIFY KYTC BEFORE BEGINNING ANY WORK IN THE RIGHT-OF-WAY. ***Failure to alert KYTC of working within the right of way may result in permit revocation.***

Two ways to notify KYTC of your construction start date:

By Email: KYTCD6PERMITS@KY.GOV

**must include permit number and county in subject line*

By Phone: 859-341-2700

**must know permit number and county when calling*

YOU MUST ALSO NOTIFY KYTC UPON COMPLETION OF WORK WITHIN RIGHT-OF-WAY. ***Failure to alert KYTC of completion of work may result in withholding release of any associated bonds.***

Kentucky UNBRIDLED SPIRIT

APPROVED
June 28, 2023
Kentucky Transportation Cabinet
06-2023-00550

I. SAFETY

A. General Provisions

☑ All signs and control of traffic shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, latest edition, Part VI, and safety requirements shall comply with the Permits Manual. Federal law requires that traffic control shall be implemented in accordance with MUTCD standards and KYTC's Standard Specifications for Road and Bridge Construction (KYTC SSRBC) under the supervision of a certified Work Zone Traffic Control Supervisor.

☑ All work necessary in shoulder or ditch line areas of a state highway shall be scheduled to be promptly completed so that hazards adjacent to the traveled way are kept to an absolute minimum.

☑ No more than one (1) traveled-lane shall be blocked or obstructed during normal working hours. All signs and flaggers during lane closure shall conform to the MUTCD. The traveled-way and shoulders shall be kept clear of mud and other construction debris at all times during construction of the permitted facility. No non-construction equipment or vehicles or office trailers shall be allowed on the right of way during working hours. The right of way shall be left free and clear of equipment, material, and vehicles during non-working hours.

☑ When necessary to block one (1) traveled-lane of a state highway, the normal working hours shall be as directed by the Department. No lanes shall be blocked or obstructed during adverse weather conditions (rain, snow, fog, etc.) without specific permission from the Department.

☑ Working hours shall be between **9:00 AM** and **3:00 PM**. Further date and time restrictions are as follows:

B. Explosives

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

C. OSHA

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

D. Archaeological

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

E. Environmental

☑ If the activity to which this permit related disturbs one acre of more of land, you must obtain KPDES KYR10 permit. Information can be found at http://water.ky.gov/permitting/Pages/GeneralPermits.aspx

F. Additional Notes

☑ The following additional notes apply to this permit:

Due to bore pits being in the clear zone, they must be traversable by an errant vehicle during non working hours.

II. UTILITIES

- [x] The permittee shall be responsible for any damage to existing utilities. Any utility modifications or relocations within state right of way necessary, as determined by the Department or by the owner of the utility, shall be at the expense of the permittee and subject to the approval of the Department. Operators of underground utilities in right of way shall be members of Kentucky 811.

- [ ] All existing manholes and valve boxes shall be adjusted to be flush with finished grade.

- [ ] All pavement cuts shall be restored per Kentucky Transportation Cabinet standards and specifications.

- [x] Any excavation within 3' of edge of pavement will require flowable fill as backfill.

- [ ] The clear zone requirement shall be met to the extent possible in accordance with the Roadside Design Guide.

- [x] Encasement pipe shall conform to current standards for highway crossings in accordance with the Permits Manual. Pipe encasing shall not be required if the pipe crossing is 2" or less.

- [ ] Aerial crossing of utility lines shall have a minimum clearance from the high point of the roadway to the low point of the line of 24' on fully controlled access highways and 18' on non-fully controlled access highways

- [x] Minimum depth for underground Gas and Electric lines is 60" under roadways, ramps, and ditch lines and 42" in all other areas within state right of way. The minimum depth for all other utilities is 42" in all areas.

- [ ] When steel plates are installed over an open excavation in the roadway, they must be anchored to the pavement and have asphalt applied to all exposed edges and an MUTCD approved sign noting "Road Plates Ahead." KYTC must be notified of the location, date, time, and permit number associated to BOTH the installation and removal of the plate. Failure to do so may result in permit revocation.

- [ ] Utility poles moved for replacement must be removed in their entirety and the hole left behind must be backfilled.

- [ ] No poles or anchors shall be installed in a roadside ditch.

- [ ] ***Utility notes specific to fully-controlled access highways ONLY:***
All work necessary within the right-of-way shall be performed behind a temporary fence erected prior to the start of work. The temporary woven wire fence shall be removed immediately upon completion of work on the right-of-way, and the control of access immediately restored to original condition, in accordance with applicable KYTC SSRBC. All vents, valves, manholes, etc., shall be located outside of the right-of-way. Encasement pipe shall extend from right-of-way line to right-of-way line and shall be one continuous run of pipe. The encasement pipe shall be welded at all joints. The boring pit and tail ditch shall extend past the existing toe of slope or bottom of ditch line and shall be a minimum of 42 inches deep. Work in interstate right-of-way requires approval from FHWA (Federal Highway Administration).

- [ ] Additional notes:

III. DRAINAGE

- [x] Negative impacts to existing drainage will be the applicant's responsibility to repair in accordance with KYTC SSRBC.
- [ ] All pipe shall be laid in a straight alignment, to proper grades, and with all materials and methods of installation including bedding and joint seating. Pipe shall not be covered until inspected by the Department and express permission obtained to make backfill. It is the applicant's responsibility to request inspection.
- [ ] All gutter lines at the base of new curbs shall be on continuous grades, and pockets of water along with curbs or in entrance areas or other paved areas within the right-of-way shall not be acceptable.
- [ ] All drainage structures and appurtenances (manholes, catch basins, curbing, inlet basins, etc.) shall conform to the Department specifications and shall be constructed in accordance with the KYTC's Standard Drawings.
- [ ] Additional notes:

IV. PAVING

- [ ] No bituminous pavement shall be installed within the right of way between November 15 and April 1, nor when the temperature is below 40 degrees Fahrenheit, without the express consent of the Department. No bituminous pavement shall be installed when the underlying course is wet.
- [ ] Paving within the right of way shall be as follows:
  - Base (Type): **Match Existing**, (Thickness) **Match Existing**
  - Surface Base (Type) **Match Existing**, (Thickness) **Match Existing**
  - Finished Surface (Type) **Match Existing**, (Thickness) **Match Existing**
- [ ] All materials and methods of construction, including base and subgrade preparation, shall be in accordance with KYTC's Standard Specifications. At least 24 hours notice to the Department is required prior to beginning paving operations.

  Phone: **859-341-2700** Name: _____
- [ ] Utility companies performing road cuts must restore the pavement to pre-existing condition. Pictures/videos are recommended to ensure proper placement of signs and lane markers that are temporarily removed for paving operations. In some cases, a pre-work inventory may be requested from the Department.
- [ ] Existing pavement and shoulder material shall be removed to accommodate the above paving specifications.
- [ ] The finished surface of all new pavement within the right of way shall be true to the required slope and grade, uniform in density and texture, free of irregularities, and equivalent in riding qualities to the adjacent highway pavement or as determined by KYTC.
- [ ] To ensure proper surface drainage, the new pavement shall be flush with the edge of existing highway pavement and shall slope away from the existing edge of the pavement as specified in drawings.
- [ ] Existing edge of pavement shall be saw-cut to provide a straight and uniform joint for new pavement, and an edge key will be installed in the overlap. An approved joint sealer, in accordance with Kentucky Department of Highways Standard Specifications (latest edition), shall be applied between new and existing pavements.
- [ ] Additional notes:

V. ENTRANCES

- ☐ Encroachment permits issued by KYTC in no way supersede local planning/zoning requirements or subdivision regulations. KYTC has no authority with zoning changes.
- ☐ Commercial entrances must be paved to the right-of-way line. Any deviations must be approved by KYTC before installation.
- ☐ KTYC can dictate drainage improvement installation during construction or after entrance is at final grade. The permit release does not release the permit applicant from drainage maintenance.
- ☐ Signs (ground-mounted and span-mounted), stop bars, crosswalk, and proper lane markings must be in-place before entrance is open for traffic. Lane width modifications must be approved by the Department.
- ☐ Guardrail installation must be pre-approved by the Department and installed by a KYTC pre-qualified contractor. Any guardrail that is removed during construction must be returned to the local KTYC maintenance facility.
- ☐ Additional notes:

VI. TRAFFIC

- ☐ Any contractor performing work within the vicinity of KYTC roadway lighting or traffic signals, must request locates from the KYTC District 6 Traffic section at least one week before of starting work in the right-of-way.
- ☑ Applicant must maintain all KYTC Roadway signage that is impacted by the permitted work. In the event that any signs have to be moved, it is the applicant's responsibility to mark the sign's location before removal and to install the original or new sign per KYTC standards for sign installation.
- ☑ Any thermoplastic or striping damaged during the encroachment must be restored in a timely manner per KYTC standards. Stopbars, arrows, and crosswalks must be thermoplastic material, paint is not acceptable. This work must be performed by a KYTC pre-qualified contractor.
- ☐ Excavating near a signal, lighting pole, or anchoring facility must be done so that it does not impact the structural integrity of the pole. Any work that requires a temporary support or anchoring must receive prior approval.
- ☐ If the scope of the permit involves a signal build or rebuild, it is the applicant's responsibility to apply for power service (and pay monthly electrical bill) as well as request electrical inspection from the KYTC District 6 Traffic section. If the signal modifications require timing or phasing changes this must be requested at least two weeks in advance of the signal's turn-on date. KYTC will not take ownership of permitted signals until the electrical inspection is formally accepted and approved.
- ☐ Work which impacts traffic loops requires 48-hour notice to the KYTC District 6 Traffic section at 859-341-2700. Accidental damage of a traffic loop must be reported immediately to KYTC District 6's emergency line at 859-620-2738. Any disturbed traffic loops must be replaced in a timely manner. Traffic loops out of operation for more than five working days will subject the applicant to the cancellation of the permit. Loop repair must be performed by a KYTC pre-qualified contractor.
- ☐ Additional Notes:

VII. SIDEWALK SPECIFICATIONS

☐ All sidewalk modifications, retrofitting, or installations must meet current ADA guidelines

A. New Sidewalks

☐ New sidewalk specifications, dimensions, and designs shall be in accordance with KYTC's latest edition of the Standard Specifications, or with the plans provided on the permit if approved by a KYTC D6 Construction or Permits Engineer.

☐ All materials and methods of construction, including curing, shall be in accordance with KYTC's latest edition of the Standard Specifications.

B. Existing Sidewalks

☐ Use of the sidewalk shall not be blocked or obstructed and a usable walkway shall be maintained across the construction area at all times per MUTCD . Sidewalk closures must be approved by the Department before implementation.

☐ The location of ADA ramps (truncated domes/tactile warnings/etc.) will need to be field verified by KYTC before installation.

☑ Any section of sidewalk that becomes damaged shall be entirely replaced to match existing sections.

☐ Additional notes:

VIII. RIGHT OF WAY RESTORATION

☑ All disturbed portions of the right of way shall be restored to grass as per Kentucky Department of Highways Standard Specifications for Road and Bridge Construction (latest edition). A satisfactory turf, as determined by the Department, shall be established by the permittee prior to release of indemnity. Sodding or seeding shall be as follows:

- ☑ Slopes 3:1 or Less: 90% Kentucky 31 Tall Fescue and 10% White Dutch Clover at 100 lbs/acre
- ☑ Slopes Greater than 3:1: 90% Kentucky 31 Tall Fescue and 10% Partridge Pea at 100 lbs/acre
- ☑ Urban or Residential Areas: 95% Turf Type Fall Fescue Blend and 5% White Dutch Clover at 275 lbs/acre

☑ Two tons of clean straw mulch per acre of seeding.

☑ Prior to seeding, the ground shall be prepared in accordance with Kentucky Department of Highways Standard Specifications for Road and Bridge Construction (latest edition).

☐ Substitutes for sod such as artificial turf, rocked mulch, or paved areas may be acceptable if they are aesthetically pleasing and receive prior approval from KYTC.

☐ All ditch-flow lines and all ditch-side slopes shall be sodded.

☑ Existing concrete right of way markers shall not be disturbed. If damaged in any way, they shall be entirely replaced by the permittee with new concrete markers to match the original markers, in accordance with Kentucky Department of Highways Standard Drawings. Markers that are entirely removed shall be re-established in the proper locations by the permittee and to the satisfaction of the Department.

☐ Additional notes:

Permit No. T06-2023-00550

IX. RIGHT OF WAY FENCE RESTORATION

☐ The replacement fence shall be a height of at least 48 inches and shall be of sufficient density to protect against encroachment.

☐ The replacement fence shall be a minimum of 1 foot and a maximum of 2 feet outside the right-of-way line

☐ The fence materials and design shall meet accepted industry standards and be treated as paintable. Durable finish materials such as vinyl are acceptable.

☐ The permittee shall be required to construct and maintain the replacement fencing to an acceptable level of functionality and state of repair. All work on the fencing shall be performed by access from the private property. Access from the roadway is not allowed.

☐ The existing fence shall be removed by permittee and stored at the Department's maintenance storage yard for future reuse by the Department, or the Department shall be reimbursed the cost of fencing removed.

☐ Right of way monuments shall be installed regardless of if replacement fence is installed or not.

☐ The control of access shall not be diminished as a result of replacement of the fence.

☐ Additional notes:

X. MISCELLANEOUS NOTES

NOTICE TO PERMITTEE

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

EXHIBIT B-3

FEDERAL AVIATION ADMINISTRATION DETERMINATION

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2023-ASO-20082-OE

Issued Date: 07/06/2023

Amy Kramer
Northern Kentucky Water District
2835 Crescent Springs Road
Erlanger, KY 41018

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Water Tank Taylor Mill Tank
Location:	Taylor Mill, KY
Latitude:	38-59-40.00N NAD 83
Longitude:	84-30-16.00W
Heights:	877 feet site elevation (SE) 172 feet above ground level (AGL) 1049 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 01/06/2025 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO

SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Communications Commission (FCC) because the structure is subject to their licensing authority.

If we can be of further assistance, please contact our office at (206) 231-2993, or lynnette.farrell@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2023-ASO-20082-OE.

Signature Control No: 589715911-592516271 (DNE)
Lynnette Farrell
Technician

Attachment(s)
Map(s)

cc: FCC

Verified Map for ASN 2023-ASO-20082-OE

EXHIBIT C

BID INFORMATION AND BOARD APPROVAL

EXHIBIT C-1

BID TABULATION

BID TAB

Northern Kentucky Water District
New Taylor Mill Tank
February 1, 2024

CONTRACTOR	**AMOUNT**	**AMOUNT**
	Bid Option 1 (Multi-Column)	Bid Option 2 (Pedesphere)
Phoenix Fabricators and Erectors, LLC	$4,101,412.00	$4,247,758.00
Caldwell Tanks, Inc.	$4,112,000.00	$4,321,000.00
The early Construction	No Bid	$5,359,635.00

EXHIBIT C-2

ENGINEER'S RECOMMENDATION OF AWARD

GRW | engineering | architecture | geospatial
10350 Ormsby Park Place, Suite 101 | Louisville, KY 40223
502.489.8484 | www.grwinc.com

February 9, 2024

Kyle Ryan, P.E.
Engineering Manager, Design & Construction
Northern Kentucky Water District
2835 Crescent Springs Road
P.O. Box 18640
Erlanger, KY 41018

Re: Taylor Mill Tank
Taylor Mill, KY
GRW Project No. 5059
Reference Letter

Dear Mr. Ryan,

As you are aware, construction bids for the referenced project were received on Thursday, February 1, 2024. The bid results are as follows:

Bid Option	Early Construction Corporation	Caldwell Tanks, Inc.	Phoenix Fabricators and Erectors, LLC
Bid Option No. 1 - Multi-Column Tank	-	$4,112,000.00	$4,101,412.00
Bid Option No. 2 - Pedesphere Tank	$5,359,635.00	$4,321,000.00	$4,247,758.00

Therefore, Phoenix Fabricators and Erectors, LLC was the apparent low bidder for both Bid Option No. 1 and Bid Option No. 2. Phoenix has been in business for 39 years and is located in Avon, Indiana. As a part of their bid, Phoenix provided extensive lists of multi-column and pedesphere style tank projects currently in construction, completed since 2009 and completed in the last five years, as well as reference information, financial information and proposed general design drawings for both tanks styles.

We at GRW have worked with Phoenix previously on a few elevated water storage tank projects in Ohio and Indiana that were 400,000 gallon and 750,000 gallon multi-column style tanks. There is no record of any significant issues with performance on these projects.

As is customary, GRW contacted some of the references provided by Phoenix Fabricators and Erectors in their bid package. The following is a brief summary of these discussions.

Project References:

- GRW contacted JR Wauford & Company, Consulting Engineers, Inc. and spoke with Daniel Tribble about their experiencing working with Phoenix. Mr. Tribble indicated that JR Wauford worked with Phoenix on a 250,000 gallon pedesphere style tank in 2019, on a 500,000 gallon multi-column style tank in 2021 and currently on a 2,000,000 gallon composite style tank that is almost complete. Mr. Tribble indicated that they have not had a bad experience with Phoenix overall, have found them to be well organized to

keep the project and subcontractors on schedule and he was not aware of any safety issues on any of their projects with Phoenix. He stated that he would recommend Phoenix for this type of work.

- GRW also contacted Elliott and Britt Engineering and spoke with Ron Campbell. Elliott and Britt is currently working with Phoenix on a 500,000 gallon multi-column tank and Mr. Campbell indicated that they have also worked with Phoenix previously on other tank projects. Mr. Campbell stated that Phoenix is the best elevated tank contractor that they have worked with, that their project supervision has been good and that the paperwork/submittals have been excellent. He indicated he was not aware of any safety issues or concerns on any of their projects with Phoenix, that he has been very satisfied with Phoenix's work and would most definitely recommend and work with them again.

Supplier References:

- Phoenix Fabricators and Erectors listed Edgen Murray as a trade/supplier reference. Scott Jettan with Edgen Murray indicated that Phoenix has been a customer of theirs for an estimated 7 – 10 years and that they were a good, steady customer with no issues. Edgen Murray supplies steel pipe to Phoenix, mostly for multi-column style tanks.

Surety Reference:

- GRW contacted Jon Kirkpatrick with WTW Surety. WTW is Phoenix's bonding broker that works with Phoenix and their bonding partners. Mr. Kirkpatrick indicated that WTW has been Phoenix's bonding broker of record for 3.5 – 4 years and that Phoenix has had no claim activity or formal dispute letters from Owners during that time. He also indicated that Phoenix has available bonding capacity for new bids and that they typically complete projects in the 1.5 million to 10 million dollar range, so this project is well within their capacity.

Financial Reference:

- GRW spoke with Beth Salanders at Enterprise Bank, Phoenix's listed banking institution. Ms. Salanders indicated that Pheonix has been a customer of theirs since 2022 and that they have maintained their accounts in good standing. She added that Phoenix is a good client and carries good balances on their accounts.

During the bid evaluation process, GRW noted that Phoenix did not submit EMR and TRIR safety rate data for the last three (3) years as indicated in specification sections 331619 and 331620. To complete our evaluation, this data was requested, and Phoenix supplied a letter from their insurance provider regarding recent EMRs and a data sheet for 5-year safety statistics from 2019 to 2023 to GRW and NKWD via email. Upon review, neither the last three (3) year EMR or TRIR rates complied with the numerical rate requirements in the above-mentioned specifications.

GRW spoke with Phoenix about their recent safety history and were told that a few significant incidents in 2018, 2019 and 2020 resulted in subsequent compromised rates. GRW understands that since these incidents, Phoenix has taken measures to improve their safety policies and standards. The attached Phoenix HSE (Health, Safety and Environmental)

Performance and Path Forward document provided by Phoenix summarizes the actions that have been taken and current HSE processes. As stated in the attached document, these actions include replacing their President and CEO, contracting an independent safety consulting firm, redefining the culture of the organization, establishing safety as a core value, implementing a zero-tolerance policy for life critical activities, developing four cardinal safety rules, conducting a companywide safety standdown, hiring an experienced Vice President of Health, Safety and Environment (HSE) and updating the HSE processes. Although Phoenix's recent safety ratings do not meet the specified rates, which is concerning, GRW finds that Phoenix has been forthcoming with their history and improvements and finds their current safety policies to be encouraging.

Due to the above-mentioned safety ratings not meeting the specifications, GRW is unable to provide an unqualified recommendation for Phoenix. However, based upon GRW's past experience with Phoenix, along with the references we have contacted, and Phoenix's extensive lists of current and completed elevated water storage tank projects since 2009, it would appear that Phoenix has a capable record of performance on similar projects. Therefore, we do not see a reason to not award the Taylor Mill Tank project to the low bidder, Phoenix Fabricators and Erectors.

For additional consideration, present value 60-year life cycle coating costs are estimated to be $1,640,000 for a 500,000 gallon multi-column tank and $1,268,000 for a 500,000 gallon pedeshere tank based on information provided to GRW during design from two tank manufacturers. Coating costs are generally higher for multi-column tanks due to these types of tanks having more steel surface area that requires coating.

If there are any questions or comments, please feel free to contact me at 502-489-8484 or ahaney@grwinc.com.

Sincerely,

Adalyn Haney, P.E.
Project Manager

TO: Jonathan Dixon

Matthew Harris

From: Paul Oliver

Subject: Phoenix HSE Performance and Path Forward

Summary of Major Events

2019 - Fatality

On December 3, 2019, two employees were assigned the task of climbing the inside shaft ladder to install rigging for the task of raising the jacks to the top of the tank in preparation of raising the tank. The first employee, the Erection Pusher, had climbed the first ladder section with a rope to the first platform inside of the shaft. The employee was protected from a fall by his PFAS secured to a rope grab while ascending the ladder. Once on the platform, the employee disconnected his PFAS from the rope grab and began walking across the platform. At this point the employee was on a fully enclosed platform with full grating and standard handrails on each side.

The employee began walking with the rope toward the end of the platform, approximately 15', where a solid barricade had been installed across the walkway due to a missing piece of grating. There were three Self Retracting Lifeline secured on the right side of the walkway at this point and the employee was still protected from a fall with full grating, standard guardrails on both sides and a solid barricade across the walkway approximately 3' from the floor opening.

The only other employee inside the shaft had begun climbing the ladder from the ground to the platform and stated that he heard a noise and looked up and saw the first employee falling approximately halfway between the platform and the ground. He did not actually see the events that caused the fall.

The investigation could not determine the exact root cause of the fall but the assumptions are limited – either the employee went under the solid barricade and did not secure his fall protection equipment or else the employee climbed onto the handrail to perform a task without securing his fall protection equipment and fell. At the time of the fall the employee was wearing a full body harness with dual shock absorbing lanyards

2020 - Fatality

On April 15, 2020, an employee was stripping, painting with a brush and roller, the seams inside the bowl of the elevated water tower. Upon completing the task, he approached the guardrails around the riser ladder and secured his PFAS to the vertical lifeline running down through the shaft next to the access ladder. The employee then went through the access point of the guardrails and began climbing down the ladder, approximately three rungs, and began to position himself in a boatswain chair to continue stripping the seams on the riser.

There were no witnesses to the actual fall, however, the investigation revealed that the employee apparently disconnected his PFAS from the independent lifeline and during the process of getting into

the boatswain chair he lost his balance and fell pulling the boatswain chair rigging down with him. Upon hearing the noise, the Foreman rushed to render aid and observed that connectors on both of his lanyards were snapped back into the side "D" rings on his harness.

The investigation revealed that the employee had failed to remain connected to the independent lifeline while attempting to gain access to the boatswain chair, lost his balance, and displaced the boatswain chair and rigging and fell down the riser.

Company Actions

Shortly after the last incident the Company replaced the President and CEO and contracted an independent Safety Consulting firm to perform a top to bottom Safety review of the Company's safety policies and procedures, interviews with Operations Management and HSE Staff, site visits/audits and interviews with Foremen and crew members, and submittal of a comprehensive reports and recommendations.

Based on the recent events, the contents of the independent report and the recommendations contained therein Phoenix made the decision to redefine the Culture of the organization and establish Safety as a Core Value and implement a ***Zero Tolerance Policy*** for ***Life Critical Activities*** *which* resulted in the development of the Phoenix Four Cardinal Safety Rules:

- Fall Arrest and Fall Restraint Systems
- Guardrails and Covers
- Permit Required Confined Space
- and Construction Crane and Derrick Safety

In late July 2020, a Companywide Safety Standdown was conducted where the Leadership Team communicated the findings of the independent report, the Company's Zero Tolerance Policy, and the implementation of the Phoenix Four Cardinal Safety Rules to the entire Company.

To address HSE Staffing concerns the Company restructured the HSE Department by recruiting and hiring a more seasoned Senior HSE leader with experience in the changing and implementation of a Proactive Safety Culture. This was accomplished in August 2020 with the hiring of a Vice President of HSE with over 48 years of HSE industry experience and 12+ years of specific HSE tank construction leadership.

Under the direction of the new HSE Leadership the Company has made numerous changes to the HSE Processes within the organization as follows:

1. Conducted a more detailed analysis of not only significant incidents but all incidents resulting in bodily injury.
2. Implemented Near Miss reporting and analysis.
3. Defined, developed, and communicated specific HSE Roles and Responsibilities for all levels of the organization, from President and CEO through field level employees.
4. Reviewed and updated all HSE Policies and Procedures.
5. Implemented a strict HSE Disciplinary Action Procedure with progressive discipline with ***Zero Tolerance*** for violation of the Phoenix Four Cardinal Safety Rules and Life Critical Activities.
6. Enhanced our onboarding HSE training requirements and program.

7. Implemented a Foreman's Weekly Safety Audit which is reviewed by Management and HSE Staff with communications back to the Foremen for verification of Corrective Actions.
8. Increase the number of site visits by HSE staff from one (1) per quarter per field crew to one visit per month per field crew.
9. The HSE Staff performs Monthly comprehensive Audits at each project site on unannounced visits, ensures corrective actions are completed for unsafe conditions and at-risk behaviors observed, and conducts on the spot training.
10. Analysis of Audit findings, both Foreman and Corporate, are performed, trends are identified, and corrective actions are communicated to all sites.
11. All Near Miss incidents are reviewed, analysis conducted, and prescriptive Corrective Actions are communicated to all Project Sites for review with all crew members.
12. Specific Safety Topics are developed from audit findings, Near Miss analysis, procedure review and changes, and regulatory updates.
13. HSE has been integrated with Project planning and with Operations staff to develop Activity Hazard Analysis (AHA) for each project identifying each step of the project execution with identification of the hazards, risks, and mitigation plan to exposures.
14. Incident reviews of past incidents have been conducted to identify the root causes of incidents resulting in lacerations/contusions, slips/trips/falls at grade and from heights, fractures sprains/strains and changes in procedures and processes have been implemented to include:
    a. Hand protection
    b. Pinch point awareness trainings
    c. Safe operator training for grinders
    d. Cord/hose management
    e. Fall Protection/Prevention
    f. Training for lifting and maximum lifting limits for personnel
    g. Housekeeping requirements
    h. Walking/Working surfaces inspection
    i. Material laydown
    j. Tools/equipment inspections
    k. PPE selections and usage

With these actions currently in place Phoenix has realized a marked improvement in incident prevention, employee engagement in correcting at risk behaviors and reductions in unsafe conditions. However, our journey to Nobody Gets Hurt is still progressing and we realize that the changes that have been made is only the tip of the iceberg. We have increased the level of awareness and engagement in incident prevention to all levels of the organization and are actively planning safety into each task performed on a daily basis, from engineering to field execution, and are committed to constantly improving each of our processes to ensure that each employee is Involved, Committed, Aware, Responsible and Engaged in the identification and correction of unsafe conditions and eliminating at-risk behaviors.

Northern Kentucky Water District

EXHIBIT C-3

BOARD MEETING MINUTES

Northern Kentucky Water District
Board of Commissioners
Regular Meeting
February 15, 2024

A regular meeting of the Board of Commissioners of the Northern Kentucky Water District was held on February 15, 2024 at the District's facility located at 2835 Crescent Springs Road in Erlanger, Kentucky and via video teleconference in accordance with KRS 61.826. All Commissioners were present. Also present were Lindsey Rechtin, Amy Stoffer, Stacey Kampsen, Tom Edge, Kim Clemons, Chris Bryant, Canaan Harrison, Mike Flynn, Daniel Vollrath, Mark Raffenberg, Jenna Bareswilt, Kyle Ryan, and Adam Smith.

Commissioner Macke called the meeting to order at 12:04 p.m., and Amy Stoffer led the pledge of allegiance.

The Commissioners reviewed correspondence received and articles published since the last regular Board meeting on January 18, 2024.

On motion of Commissioner Wagner, seconded by Commissioner Winnike, the Board unanimously approved the minutes for the regular Board meeting held on January 18, 2024.

The Board was provided a copy of the District's check registers, which included the check number, check date, payee, check amount and description of the reason for each payment, detailing the District's expenditures for the period January 1, 2024 through January 31, 2024. On motion of Commissioner Lange, seconded by Commissioner Winnike, and after discussion, the Board unanimously approved the expenditures of the District for the month of January 2024.

On motion of Commissioner Koester, seconded by Commissioner Lange, the Board unanimously accepted the bid of $169,710.00 from Rector Excavating, awarded a contract for the East First Street Water Main Replacement project with a total project budget of $215,000, and authorized staff to execute the applicable contract documents.

On motion of Commissioner Wagner, seconded by Commissioner Winnike, the Board unanimously accepted the bids from Jefferson Contracting LLC and Bray Trucking, Inc., and authorized staff to execute the applicable contract documents.

On motion of Commissioner Winnike, seconded by Commissioner Lange, the Board unanimously awarded one year standing vendor contracts to Florence Winwater Works, Core and Main Ohio, Plumbers Supply Company, and CITCO Water for the purchase of copper piping, authorized staff to purchase up to $152,550.00 in copper service piping under these contracts, and authorized staff to execute the necessary contract documents and applicable purchase documents.

On motion of Commissioner Lange, seconded by Commissioner Wagner, the Board unanimously accepted the bids of and awarded contracts to Matlock Electric and Electric Motor Technologies and authorized staff to negotiate and execute contracts for the repair and delivery of the Electric Motor Repair for Pump No. 1 – Ohio River Pump Station 1.

On motion of Commissioner Holland, seconded by Commissioner Wagner, the Board unanimously authorized staff to negotiate and execute a Change Order to the Taylor Mill Treatment Plant Emergency Generator Project Contract with Glenwood Electric, Inc. to increase the not-to-exceed amount for the aggregate pier ground improvement additions to $400,000.

On motion of Commissioner Holland, seconded by Commissioner Wagner, the Board unanimously accepted the bid of $4,247,758 for a pedesphere style tank, awarded a contract to Phoenix Fabricators and Erectors, LLC for the Taylor Mill Tank project with a total project budget of $5,000,000, and authorized staff to execute the applicable contract documents.

On motion of Commissioner Winnike, seconded by Commissioner Lange, the Board unanimously authorized Staff to negotiate and purchase up to 13 vehicles and equipment in a total amount not to exceed the 2024 budget amount through either the Kentucky State Procurement Master Contracts, after traditional advertisement and bid process, or other Cooperative Purchasing Agreements; declare as surplus and authorized sale of the vehicles and equipment listed in the board communication; and authorized staff to execute necessary documents to effectuate these actions.

On motion of Commissioner Winnike, seconded by Commissioner Koester, the Board unanimously adopted the Resolution No. 050-021524 authorizing the issuance of a Revenue Bond, Series 2024A, for up to $28,000,000 and authorized staff to execute contracts and other necessary documents and filings to effectuate the issuance of the bonds.

The Board reviewed the District's financial reports and Department reports.

Vice President of Finance & Support Services Stacey Kampsen updated the Board on revenues and expenses and on fieldwork for 2023 audit, the Memorial Parkway Treatment Plant North reservoir solids removal project, and main breaks.

General Counsel and Director of Compliance, Communications, and Regulatory Affairs Tom Edge provided the Board an update on Water Commissioner Training scheduled for May 8, 2024, and the NPR discussion of EPA's proposed lead service line replacement regulation and NKWD's current service line inventory efforts.

Vice President of Engineering, Production & Water Quality Amy Stoffer reviewed with the Board the status of on-going projects within the 2024 5-Year Capital Budget, and provided an update on a letter submitted to the US EPA regarding concerns on proposed Lead and Copper Rule Improvements, and on 2024 HB 141.

Other matters of a general nature were discussed.

The meeting was adjourned at 1.07 p.m.

_____ _____

CHAIRMAN SECRETARY

EXHIBIT D

PROJECT FINANCE INFORMATION

Exhibit D

Customers Added and Revenue Effect: There are no new customers anticipated.

Debt Issuance and Source of Debt: The project will be funded using $5,000,000 from a future Bond Anticipation Note. This budget includes design, contingencies, and miscellaneous costs. The District will have some labor expense to inspect the project. A summary of the project costs is provided below:

○ Engineering	$ 317,064.00
○ Contractor Bid	$ 4,247,758.00
○ Misc. & Contingencies	$ 435,178.00
Total Project Cost	**$ 5,000,000.00**

USoA Accounts: The anticipated amounts for the project cost of $5,000,000 will fall under the following Uniform System of Accounts Codes:

Code 304 "Structures & Improvements" (sitework)	$1,329,000
Code 330 "Distribution Reservoirs and Standpipes" (tank)	$3,100,000
Code 331 "Transmission and Distribution Mains" (pipe, valves)	$ 565,000
Code 335 "Hydrants"	$ 6,000

Additional Costs and O&M: Additional annual operating and maintenance costs incurred for the project are estimated at $85,000 per year.

Depreciation and Debt Service: Annual depreciation and debt service after construction are as follows:

Depreciation: $35,440.00/year over 37.5 years for Code 304 Structures & Improvements
$68,888.89/year over 45 years for Code 330 Distribution Reservoirs and Standpipes
$9,040.00/year over 62.5 years for Code 331 Transmission and Distribution Mains
$120.00/year over 50 years for Code 335 Hydrants

Debt Service: $320,059.81 over 25 years for 4.00% conventional loan.

EXHIBIT E

MORTGAGES, BONDS, NOTES, AND OTHER INDEBTEDNESS

Northern Kentucky Water District
Bonds & Notes
November 30, 2023

Existing bonds are secured through the pledge of future revenues of the water system

Bonds

Bond Identification	Amount Authorized	Par Amount Issued	Amount Outstanding 11/30/2023	Date of Issue	Rate of Interest	Date of Maturity	Interest Paid Year 2022
2013A	28,165,000	26,400,000	19,175,000	6/27/2013	4.250 - 5.000%	2/1/2038	891,650
2013B	26,570,000	24,120,000	8,555,000	9/25/2013	5.000 - 4.000%	2/1/2028	489,450
2014A	1,733,000	1,733,000	1,623,000	12/11/2017	2.750%	2/1/2057	45,801
2014B	16,965,000	15,805,000	3,260,000	12/23/2014	3.125 - 4.000%	2/1/2029	135,253
2016A	47,335,000	41,905,000	25,695,000	11/22/2016	5.000 - 3.000%	2/1/2031	1,235,900
2019	19,600,000	17,845,000	15,900,000	9/26/2019	3.000 - 5.000%	2/1/2044	560,750
2020	25,195,000	22,325,000	18,780,000	11/5/2020	5.000 - 2.000%	2/1/2035	746,950
2021B	32,395,000	27,730,000	18,430,000	12/14/2021	4.000%	2/1/2027	603,112
2023A	27,335,000	17,615,000	17,615,000	1/26/2023	5.000 - 4.125%	2/1/2048	
			129,033,000				

Notes

Note Identification	Date of Issue	Par Amount Issued	Amount Outstanding 11/30/2023	Date of Maturity	Rate of Interest	In Whose Favor	Interest Paid Year 2022
KIA Loan F08-07	11/1/2008	4,000,000	1,999,586	12/1/2032	1.2000%	KIA	28,110
KIA Loan F09-02	6/1/2010	24,000,000	13,190,114	6/1/2033	2.2500%	KIA	329,876
KIA Loan F14-015	6/1/2015	3,545,910	2,771,704	6/1/2038	2.0000%	KIA	59,431
KIA Loan F15-011	3/1/2016	3,535,094	2,763,250	6/1/2038	2.0000%	KIA	59,249
KIA Loan B15-003	7/1/2016	1,392,195	1,031,021	12/1/2037	0.9500%	KIA	10,590
KIA Loan F13-012*	8/1/2014	8,000,000	4,523,000	N/A	2.0000%	KIA	90,460
KIA Loan F16-027*	1/1/2019	4,000,000	1,558,034	N/A	2.0000%	KIA	27,785
KIA Loan F20-044*	N/A	8,000,000	-	N/A	1.7500%	KIA	-
**not yet closed*			27,836,709				

Other Notes

	Amount Outstanding 11/30/2023
Deferred Note Kenton County	100,000

EXHIBIT F

FINANCIAL STATEMENTS
(Balance Sheet and Income Statement)

NORTHERN KENTUCKY WATER DISTRICT
STATEMENT OF NET POSITION
November 30, 2023

ASSETS AND DEFERRED OUTFLOWS OF RESOURCES

Current Assets	
Cash and Cash Equivalents	$ 40,483,550
Investments	4,562,766
Accounts Receivable	
Customers, Net	5,278,608
Unbilled Customers	9,100,000
Others	243,187
Assessments Receivable	185,400
Lease Receivable - Current	117,382
Inventory Supplies for New Installation and Maintenance, at Cost	2,782,707
Prepaid Items	1,468,930
Restricted Assets - Cash and Cash Equivalents	
Bond Proceeds Fund	517,430
Debt Service Account	1,977,490
Improvement, Repair & Replacement	364,624
Total Current Assets	67,082,074
Noncurrent Assets	
Restricted Assets - Cash and Cash Equivalents	
Bond Proceeds Fund	7,357,447
Debt Service Account	18,676,909
Improvement, Repair and Replacement	3,730,079
Restricted Assets - Investments	
Debt Service Reserve Account	19,519,886
Miscellaneous Deferred Charges	9,882,529
Lease Receivable - Non Current	5,074,517
Capital Assets	
Land, System, Buildings and Equipment	542,523,858
Construction in Progress	26,145,426
Total Capital Assets	568,669,284
Less Accumulated Depreciation	219,766,664
Total Capital Assets, Net of Accumulated Depreciation	348,902,620
Total Noncurrent Assets	413,143,987
Total Assets	480,226,061
Deferred Outflows of Resources	
Deferred Outflows Related to Pension	2,207,924
Deferred Outflows Related to OPEB	2,469,945
Deferred Loss on Refundings	2,082,464
Total Deferred Outflows of Resources	6,760,333
Total Assets and Deferred Outflows of Resources	$ 486,986,394

NORTHERN KENTUCKY WATER DISTRICT
STATEMENT OF NET POSITION
November 30, 2023

LIABILITIES, DEFERRED INFLOWS OF RESOURCES, AND NET POSITION

Liabilities and Deferred Inflows of Resources		
Current Liabilities		
Bonded Indebtedness	$	13,807,773
Notes Payable		1,799,000
Accounts Payable		494,100
Accrued Payroll and Taxes		493,157
Compensated Absences		199,476
Other Accrued Liabilities		477,493
Liabilities Payable-Restricted Assets		
Accrued Interest Payable		1,977,490
Accounts Payable		882,054
Total Current Liabilities		20,130,543
Long-Term Liabilities (Net of Current Portion)		
Liabilities Payable-Restricted Assets		
Accounts Payable		768,496
Compensated Absences		1,686,455
Arbitrage Liability		77,706
Bond Indebtedness		124,757,222
Notes Payable		26,137,707
Net Pension Liability		24,663,515
Net Unfunded OPEB Liability		6,732,760
Total Long-Term Liabilities		184,823,861
Total Liabilities		204,954,404
Deferred Inflows of Resources		
Deferred Inflows Related to Pension		656,657
Deferred Inflows Related to OPEB		2,640,933
Deferred Inflows Related to Leases		5,074,275
Deferred Inflows Related to Refundings		1,757,112
Total Deferred Inflows of Resources		10,128,977
Total Liabilities and Deferred Inflows of Resources		215,083,381
Net Position		
Net Investment in Capital Assets		178,791,269
Restricted For		
Debt Service Funds		38,196,796
Capital Improvement Projects		14,254,030
Unrestricted		40,660,918
Total Net Position		271,903,013
Total Liabilities, Deferred Inflows of Resources, and Net Position	$	486,986,394

NORTHERN KENTUCKY WATER DISTRICT
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET POSITION
12 MONTH PERIOD ENDED NOVEMBER 30, 2023

Operating Revenues		
Water Sales	$	63,991,912
Forfeited Discounts		1,012,844
Rents From Property		383,882
Other Water Revenues		322,196
Total Operating Revenues		65,710,834
Operating Expenses		
Operating and Maintenance Expense		36,655,311
Depreciation Expense		12,602,979
Total Operating Expenses		49,258,290
Net Operating Income		16,452,544
Non-Operating Income (Expense)		
Investment Income		4,436,041
Miscellaneous Non-Operating Income/(Expense)		285,336
Loss on Abandonment of Mains		(157,566)
Gain/(Loss) on Disposal of Fixed Assets		(25,583)
Interest on Long Term Debt		(5,078,390)
Pension Expense		(40,243)
Other Post Employment Benefit Expense		(560,705)
Arbitrage Expense		(261,842)
Amortization of Debt Premiums and Defeasance Costs		1,547,727
Bond Issuance Costs		(308,753)
Total Non-Operating Income (Expenses)		(163,978)
Change in Net Position Before Capital Contributions		16,288,566
Capital Contributions		2,135,452
Change in Net Position		18,424,018
Net Position - Beginning of Year		253,478,995
Net Position - End of Year	$	271,903,013

Northern Kentucky Water District

EXHIBIT G

AFFIDAVIT

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC APPLICATION OF NORTHERN KENTUCKY WATER DISTRICT FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO CONSTRUCT A 0.50 MG WATER STORAGE TANK	))))	**CASE NO. 2024-00025**

AFFIDAVIT

Comes now the affiant, STACEY KAMPSEN, after first being duly sworn and cautioned, states as follows:

1. That she is the Vice President of Finance and Support Services for the Northern Kentucky Water District;
2. That she is authorized to submit this Petition on behalf of the Northern Kentucky Water District;
3. That the information contained in the Petition and its Exhibits are true and correct to the best of her knowledge and belief except as to those matters that are based on information provided to her and as to those she believes to be true and correct.

Further Affiant sayeth naught.

2/21/2024
Date

Stacey Kampsen
Stacey Kampsen

COMMONWEALTH OF KENTUCKY :
: SS
COUNTY OF KENTON :

The foregoing instrument was subscribed and sworn before me by Stacey Kampsen this 21st day of February 2024.

Notary Public, Kentucky at Large
Notary ID Number: KYPN17828
My Commission Expires:12/21/24