

**SPECIFICATIONS**  
**FOR**  
**NORTHERN KENTUCKY**  
**WATER DISTRICT**

Lumley Tank Replacement

July, 2015

**BID SET**

KIA Loan No. F15-011  
SAI #KY20140903-0958

COMPILED BY:  
NORTHERN KENTUCKY WATER DISTRICT  
2835 Crescent Springs Road  
P.O. Box 18640  
Erlanger, Kentucky 41018

IN ASSOCIATION WITH:



engineering | architecture | geospatial

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**SPECIFICATIONS**  
**FOR**  
**NORTHERN KENTUCKY WATER DISTRICT**  
  
**Lumley Tank Replacement**

July, 2015

**GOVERNING BODY**

**COMMISSIONERS:**

DR. PATRICIA SOMMERKAMP – CHAIR  
DAVID M. SPAULDING ESQ. - VICE-CHAIR  
FRED A. MACKE, JR. - SECRETARY  
CLYDE CUNNINGHAM - TREASURER  
ANDREW C. COLLINS - COMMISSIONER  
DOUGLAS C. WAGNER - COMMISSIONER

**RON LOVAN, PRESIDENT/CEO**

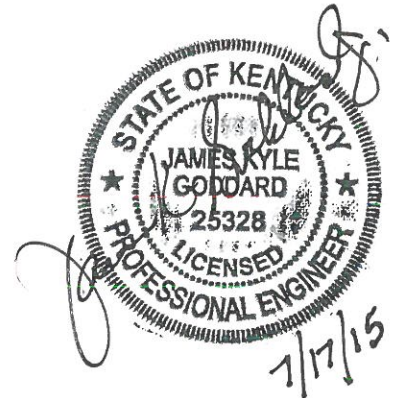
COMPILED BY:  
Northern Kentucky Water District  
2835 Crescent Springs Road  
P.O. Box 18640  
Erlanger, Kentucky 41018

IN ASSOCIATION WITH:



engineering | architecture | geospatial

9710 Bunsen Parkway  
Louisville, KY 40299



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**DIVISION 00**

**PROCUREMENT AND CONTRACTING  
REQUIREMENTS – SRF FUNDED**

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Section 001120

INVITATION TO BID

Advertisement Run Date: July 16, 2015

PROJECT: Lumley Tank Replacement

SEALED BIDS WILL BE RECEIVED AT:

Northern Kentucky Water District (Owner)  
2835 Crescent Springs Road  
P.O. Box 18640  
Erlanger, Kentucky 41018

UNTIL: Date: August 6, 2015  
Time: 2:00 p.m., local time

At said place and time, and promptly thereafter, all Bids that have been duly received will be publicly opened and read aloud.

The proposed Work is generally described as follows: demolition of the existing 275,000 gallon multi-column elevated Lumley water storage tank, construction of a new 500,000 gallon elevated water tank, altitude valve, and associated site piping, instrumentation and electrical work.

All Bids must be in accordance with the Instructions to Bidders and Contract Documents on file, and available for examination at: Northern Kentucky Water District, 2835 Crescent Springs Road, Erlanger, Kentucky, 41018; or GRW Engineers, 9710 Bunsen Parkway, Louisville, Kentucky, 40299.

Copies of the Bidding Documents may be obtained from GRW Engineers at the address indicated above. Charges for all documents obtained will be made on the following basis:

Complete set of Bidding Documents	<u>Charge</u> \$ 130.00
Mailing and Handling	\$ 15.00

Charges for Bidding Documents and mailing and handling, if applicable, will not be refunded. The \$15.00 above is for standard U.S. Postal Service shipping. If a request is made that the bid documents be shipped via FedEx, the purchaser must provide the Engineer's office with their account number so that they are billed directly from FedEx.

Prospective Bidders may address written inquiries to Alan Bryan with GRW Engineers (abryan@grwinc.com).

Bids will be received on a lump sum basis as described in the Contract Documents.

Bid security, in the form of a certified check or 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 Performance Bond and a Construction Payment Bond (insuring/bonding company shall be rated "A" by AM Best) as security for the faithful performance of the project and the payment of all bills and obligations arising from the performance of the Contract.

The Successful Bidder and all Subcontractors will be required to conform to the labor standards set forth in the Contract Documents. This project falls under the provisions of KRS 337.505 to 337.550 for prevailing wage rates.

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.

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 to such an extent as may be determined by Owner.

A non-mandatory prebid conference will be held for prospective Bidders on July 23, 2015 at 1:00 p.m. at the Lumley site. The address is given in the Instructions to Bidders.

On request 24 hours in advance, Owner will provide each Bidder access to the site to conduct such investigations and tests as each Bidder deems necessary for submission of a Bid. Arrangements for site visits shall be made by calling Dave Enzweiler, Maintenance Supervisor with the Northern Kentucky Water District, at (859) 547-3265.

Bidders must comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours Standard Act.

The procurement and performance of this contract are subject to the requirements of the Davis-Bacon Act.

Bidders must comply with the President's Executive Order No. 11246 as amended, which prohibits discrimination in employment regarding race, creed, color, sex or national origin.

Successful Bidder shall comply with 41 CFR 60-4, in regard to affirmative action, to insure equal opportunity to females and minorities and will apply the time tables and goal set forth in 40 CFR 60-4.

Successful Bidder shall make positive efforts to use small, minority, women owned and disadvantaged businesses.

Attention of bidders is particularly called to the conditions of employment to be observed and minimum wage rates to be paid under the contract, Section 3, Segregated Facility, Section 109 and Executive Order 11246 and Title VI. Minority Bidders are encouraged to bid.

**Successful Bidder is required to employ the six “Good Faith Efforts” as listed in EPA’s Disadvantaged Business Enterprise Program when soliciting subcontractors and suppliers. Documentation of these efforts will be a required submittal prior to Contract Award. See Section 007301, Page 31 of the Bid Documents.**

The contract award will be made in writing to the lowest responsive and responsible bidder.

This project is partially or entirely funded by the Kentucky Infrastructure Revolving Loan Fund.

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.

Amy Kramer, Acting V.P. Engineering, Production & Distribution  
Northern Kentucky Water District

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Section 002100

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 lowest responsible 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.

3. QUALIFICATIONS OF BIDDERS. 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 the Issuing Office or Engineer on record in the advertised "Invitation to Bid". There shall be no substitution of bidders without proper registration with the Issuing Office or Engineer on record in the advertised "Invitation to Bid"

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. PREBID CONFERENCE. A non-mandatory prebid conference will be held for prospective Bidders on July 23, 2015 at 1:00 p.m. at the Lumley site which is located behind 130 N. Fort



Thomas Avenue in Fort Thomas, Kentucky. The site is accessed using N. Fort Thomas Avenue or Bluegrass Avenue. Representatives of the Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference. The site is secured and access at other times will require prospective Bidders to contact the District. Arrangements for site visits shall be made by calling Dave Enzweiler, Maintenance Supervisor with the Northern Kentucky Water District, at (859) 547-3265, 24 hours in advance. The Engineer will transmit to prospective Bidders of record such Addenda as the Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

6. 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.

7. 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.

8. 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 certified check or Bid Bond (see Specification Section 004313-Bid Bond) 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.

9. 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.

10. LIQUIDATED DAMAGES. Provisions for liquidated damages are set forth in the Agreement.

11. 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.

12. PREPARATION OF BID. The Bid form is included with the Bidding Documents. Additional copies may be obtained from Owner.

All blanks on the Bid 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 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 Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

The address and telephone number for communications regarding the Bid shall be shown.

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.

**Successful bidder is required to employ the six "good faith efforts" as listed in EPA's disadvantaged business enterprise program when soliciting subcontractors and suppliers. Documentation of these efforts will be a required submittal prior to contract award. See section 00835, page 31 of the bid documents.**

13. BASIS OF BID. Bidders shall submit a Bid on a lump sum basis. Discrepancies between words and figures will be resolved in favor of the words.

14. SUBMITTAL OF BID. A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title, the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "Bid Enclosed".

Bids shall be addressed to Owner at:

Northern Kentucky Water District (Owner)  
2835 Crescent Springs Road  
P.O. Box 18640  
Erlanger, Kentucky 41018

One complete and executed Bid Form along with "Non-Collusion Affidavit", "Resident Bidder Status Affidavit", "Bidders Qualifications Questionnaire", Supplements to Bid Form, if applicable, and Bid Bond shall be submitted. Bids shall be typed or in ink. Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids. Bids received after the time and date for receipt of Bids may be returned unopened. Oral, telephone, facsimile, or telegraph Bids are invalid and will not receive consideration.

15. MODIFICATION AND WITHDRAWAL OF BIDS. A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and

delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. 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 at the time and place indicated in the advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. 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 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 informalities and to negotiate with the apparent Successful Bidder 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, plant 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. RETAINAGE. Provisions concerning retainage are set forth on the Agreement.

22. "BUY AMERICA" PROVISIONS. The Bidder must comply with the requirements of the "Buy American" provisions of the State Revolving Fund Assistance Agreements.

All iron and steel manufacturing processes must take place in the US except for metallurgical processes involving refinement of steel additives. There is no requirement for the origin of components and sub-components of manufactured goods. Products listed at 48 CFR 25.104(A) have been determined to be unavailable in the US and if required for the project, may be purchased from foreign sources. No unauthorized use of foreign iron, steel, and or manufactured goods will be allowed on this project.

The technical specifications include the names of manufacturers for the purpose of establishing the type and quality of specified equipment, products and materials. Where

manufacturers' names are listed on the bid form or in the specifications it is not an indication that the named manufacturers can comply with the Buy American requirements. Bidders shall verify that the manufacturers of proposed equipment, products, and materials can comply with the Buy American requirements.

End of Section

## SECTION 003132 - GEOTECHNICAL EXPLORATION REPORT

### PART 1 - GENERAL

#### 1.1 Geotechnical Exploration Report

- A. The report of geotechnical data titled “Geotechnical Exploration Report, Lumley Tank Replacement” as investigated and written by Thelen Associates, Inc., has been included in this specification document as 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.

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION (Not Applicable)

END OF SECTION 003132

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Section 004100

BID FORM

PROJECT IDENTIFICATION: **Lumley Tank Replacement**

THIS BID IS SUBMITTED TO:

Northern Kentucky Water District (Owner)  
P.O. Box 18640  
2835 Crescent Springs Road  
Erlanger, Kentucky 41018

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 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 the following Addenda, receipt of all of which is hereby acknowledged:  
No. \_\_\_\_\_ Dated \_\_\_\_\_  
No. \_\_\_\_\_ Dated \_\_\_\_\_  
No. \_\_\_\_\_ Dated \_\_\_\_\_
  - 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. [Check the one that applies]

\_\_\_\_\_ Bidder is a “resident bidder” as defined in KRS 45A.494(2) of Kentucky’s resident bidder reciprocal preference statute AND submits with this Bid a properly executed and notarized Affidavit that affirms that Bidder meets the resident bidder criteria, which Affidavit is hereby incorporated herein and made a part of this Bid.

OR

\_\_\_\_\_ Bidder is a “nonresident bidder” as defined in KRS 45A.494(3) of Kentucky’s resident bidder reciprocal preference statute AND its principal place of business as identified its Certificate of Authority to transact business in Kentucky as filed with Kentucky’s Secretary of State or, if Bidder hereby represents and covenants that it is not required to obtain a Certificate of Authority to transact business in Kentucky, its mailing address, is:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- k. 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 price:

- Notes:
1. Bids shall include sales tax, where required, and all other applicable taxes and fees.
  2. All specific cash allowances shall be included in the base bid price and have been accounted for in accordance with Paragraph 11.02 of the General Conditions and Specification Section 012100 Allowances.
  3. The following allowances shall be included in the Contractors bid (see Spec Section 012100 for descriptions):
    - a. Parking lot repair and asphalt paving of the City of Fort Thomas property – \$35,000
    - b. City of Fort Thomas parking lot entrance repair - \$10,000
  4. The Contract award will be based on the lowest responsive bidder with a base bid exclusive of any alternates. The Owner reserves the right to select any, all, or none of the deductive alternates.
  5. The deductive alternates listed below are described in more detail in specification section 012300 Alternates.

Item No.	Base Bid Item
1.	New 500,000 Gallon Elevated Water Storage Tank and Passive Mixing System
<p><b>Contractor to Select Tank Construction Method/Material:</b></p> <p><b>Base Bid Option 1: Multi-Column Elevated Tank</b> <input type="checkbox"/></p> <p><b>Base Bid Option 2: Pedosphere Elevated Tank</b> <input type="checkbox"/></p>	

Lump Sum Base Bid of:

\$ \_\_\_\_\_ in numbers

and \_\_\_\_\_ in words

**The prices listed below shall be the dollar amount to be deducted from the Base Bid price to provide the alternate tank size.**

<b>Item No.</b>	<b>Deductive Bid Alternate No.1</b>
1.	Deduct amount to provide a new 400,000 Gallon Elevated Water Storage Tank and Passive Mixing System (Deduct price from Base Bid to provide this size tank)
<p><b>Contractor to Select Tank Construction Method/Material:</b></p> <p><b>Multi-Column Elevated Tank</b> <input type="checkbox"/></p> <p><b>Pedesphere Elevated Tank</b> <input type="checkbox"/></p>	

Deductive Alternate No. 1:

\$ \_\_\_\_\_ in numbers  
and \_\_\_\_\_ in words

<b>Item No.</b>	<b>Deductive Bid Alternate No.2</b>
1.	Deduct amount to provide a new 300,000 Gallon Elevated Water Storage Tank and Passive Mixing System (Deduct price from Base Bid to provide this size tank)
<p><b>Contractor to Select Tank Construction Method/Material:</b></p> <p><b>Multi-Column Elevated Tank</b> <input type="checkbox"/></p> <p><b>Pedesphere Elevated Tank</b> <input type="checkbox"/></p>	

Deductive Alternate No. 2:

\$ \_\_\_\_\_ in numbers  
and \_\_\_\_\_ in words

7. Bidder agrees that the Work will be substantially complete within 365 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 Article 14 of the General Conditions within 410 calendar days 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.

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

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. 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.

10. Proposed Subcontractors:

- a. The Bidder's proposed subcontractors shall be listed below for the various branches of work included in the proposed contract. All subcontractors are subject to the approval of the Owner.
- b. **Unless rejected or otherwise permitted by the Owner, no substitutions or changes to the listing of the entities proposed to perform that branch of the work will be allowed following opening of the Bids.**
- c. Where Bidder proposes to perform the branch of work with its own forces, the phrase "Prime Contractor" shall be entered in the box provided.

d.

Branch of Work	Name of Subcontractor
1. Foundation	
2. Painter	

Failure to submit a complete list shall be cause for rejection of the Bid.

11. Proposed Major Equipment Manufacturers:

- a. The Bidder's proposed major equipment manufacturers included in its Base Bid price shall be listed below for the requested items. **For the purposes of determining low bidder, the Bidder shall include only manufacturers named in the specification. Substitute "or equal" manufacturers will be considered after the Bid.** The Owner reserves the right to reject any equipment manufacturers not listed in the Specification.
  
- b. **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.**

c.

Major Equipment Item	Name of manufacturer
1. Elevated Water Tank	
2. Tank Coatings	

Failure to submit a complete list shall be cause for rejection of the Bid.

**SIGNATURE OF BIDDER**

**If an Individual**

Name (typed or printed): \_\_\_\_\_

By \_\_\_\_\_ (SEAL)  
*(Individual's signature)*

doing business as \_\_\_\_\_

Business address \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Date \_\_\_\_\_

**If a Partnership**

Partnership Name: \_\_\_\_\_ (SEAL)

By \_\_\_\_\_  
*(Signature of general partner - attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Business address \_\_\_\_\_

\_\_\_\_\_

Phone No. \_\_\_\_\_ Fax No.: \_\_\_\_\_

Date \_\_\_\_\_



**If a Corporation**

Corporation Name: \_\_\_\_\_ (SEAL)

State of Incorporation: \_\_\_\_\_

Type (General, Professional Service): \_\_\_\_\_

By \_\_\_\_\_  
*(Signature - attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_ (CORPORATE SEAL)

Attest \_\_\_\_\_

Business address \_\_\_\_\_

Phone No. \_\_\_\_\_ Fax No.: \_\_\_\_\_

Date \_\_\_\_\_

**If a Limited Liability Company**

Company Name: \_\_\_\_\_ (SEAL)

State of Organization: \_\_\_\_\_

Type (General, Professional): \_\_\_\_\_

By \_\_\_\_\_  
*Signature of Member or Manager (as applicable - attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_ (COMPANY SEAL)

Attest \_\_\_\_\_

Business address \_\_\_\_\_

Phone No. \_\_\_\_\_ Fax No.: \_\_\_\_\_

Date \_\_\_\_\_

**If a Joint Venture**

(Each joint venturer must sign. The manner for signing for each individual, partnership, and corporation that is party to the joint venture should be in the manner indicated above.)

Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature - attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

Business address: \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Date \_\_\_\_\_

Joint Venturer Name: \_\_\_\_\_ (SEAL)

By: \_\_\_\_\_  
*(Signature - attach evidence of authority to sign)*

Name (typed or printed): \_\_\_\_\_

Title: \_\_\_\_\_

Business address: \_\_\_\_\_

\_\_\_\_\_

Phone No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Date \_\_\_\_\_

# 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)  
Bidder's Name and Corporate Seal

\_\_\_\_\_(Seal)  
Surety's Name and Corporate Seal

By \_\_\_\_\_  
Signature and Title

By \_\_\_\_\_  
Signature and Title  
(Attach Power of Attorney)

Attest \_\_\_\_\_  
Signature and Title

Attest \_\_\_\_\_  
Signature and Title

- Note (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 Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and if applicable consented to by Surety when required by paragraph 5 hereof)

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

5 Surety waives notice of 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

BIDDER'S REQUIREMENTS  
CONCERNING THE  
DISADVANTAGED BUSINESS ENTERPRISE (DBE) POLICY  
(*"Six Good Faith Efforts"*)

All bidders must complete the "Six Good Faith Efforts" to obtain quotes and participation from DBE subcontractors and suppliers. The six efforts are as follows:

1. Develop a bidders list that includes DBEs for this project.  
Contractor can find a list of DBEs at the Kentucky Transportation Cabinet's website :  
<http://transportation.ky.gov/Civil-Rights-and-Small-Business-Development/Pages/Certified-DBE-Directory.aspx>.

**Low Bidder is required to submit a copy of the bidders list with names of DBEs.**

2. Use the services and assistance of the Small Business Administration (SBA) and the Minority Business Development Agency (MBDA) of the U.S. Department of Commerce, and/or the Kentucky Procurement Assistance Program (KPAP).  
[www.sba.gov](http://www.sba.gov)      [www.mbda.gov](http://www.mbda.gov)      [ced.kpap@ky.gov](mailto:ced.kpap@ky.gov)

**Low Bidder is required to submit pages from the websites or copies of email correspondence that document usage of these sites.**

3. Consider dividing the project into smaller tasks or quantities that would better permit DBEs to participate, if economically feasible. Document this effort with a memo.
4. Establish delivery and work schedules which encourage participation by DBEs.
5. Provide adequate notification of available opportunities to DBEs, including public advertisement, individual notification and other solicitations for bids or proposals.

**Low Bidder is required to submit copies of newspaper advertisements, letters, emails, faxes, certified mail receipts and any other documents that show that DBEs have been solicited.**

6. Require all subcontractors to follow these "Six Good Faith Efforts".

Note: See pages 007301-34 through 007301-37 for further details.

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# BIDDER'S QUALIFICATIONS QUESTIONNAIRE

The undersigned guarantees the accuracy of all statements and answers herein contained. (Please print in ink).

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

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2. List three (3) projects of this nature that you have completed and give the name, address, and telephone number of a reference from each. Also give the completed cost of each project listed.

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3. List projects presently under construction by your firm, dollar volume of the contract, and the percent of completion.

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4. Have you ever failed to complete work awarded to you? If so, state where and why.

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5. Do you plan to sublet any part of this work? If so, give details.

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6. What equipment do you own that is available for this work?

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7. What equipment do you plan to rent or purchase for this work?

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8. Have you ever performed similar work under the direction of a Consulting Engineer or Registered Architect? If so, list three (3) such firms giving the name of the firm, its address, telephone number and the name of the project. (List most recent project.)

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9. Give the name, address, and telephone number of an individual who represents each of the following who the Owner may contact to investigate your financial responsibility: A surety, a bank and a major material supplier.

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10. Give a summary of your financial statement. (List assets and liabilities; use an insert sheet, if desired).

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**Respectfully submitted,**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Title**

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## CONTRACTOR'S AMERICAN IRON AND STEEL (AIS) COMPLIANCE REQUIREMENT

The Contractor acknowledges to and for the benefit of the Northern Kentucky Water District ("Purchaser") and the State that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that

- (a) the Contractor has reviewed and understands the American Iron and Steel Requirement,
- (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and
- (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State.

Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

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Signature

Date

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Section 004600

NON-COLLUSION AFFIDAVIT

STATE OF: \_\_\_\_\_ )

COUNTY OF: \_\_\_\_\_ ) SS

\_\_\_\_\_, being first duly sworn, deposes

and says that it/its 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

End of Section

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

Bid Description: Lumley Tank Replacement

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:

- 1. Is authorized to transact business in the Commonwealth of Kentucky; AND
2. Has for one year prior to and through the date this contract was first advertised or announced as available for bidding:
a. Filed Kentucky corporate income taxes;
b. Made payments to the Kentucky unemployment insurance fund established in KRS 341.490; and
c. 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 )

Subscribed and sworn to before me by , as the
of , this day of
, 20.

Notary-at-Large
My comm. exp.:

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Section 005000

AGREEMENT

THIS AGREEMENT is made and entered 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:

The demolition of the existing 275,000 gallon multi-column elevated Lumley water storage tank, construction of a new 500,000 gallon elevated water tank, altitude valve, and associated site piping, instrumentation and electrical work.

Article 2. ENGINEER.

The Project has been designed by GRW Engineers, Inc., 9710 Bunsen Parkway, Louisville, Kentucky, 40299, who is referred to in the Contract Documents as Engineer. Engineer, and its duly authorized agents, are to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

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 365 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 Article 14 of the General Conditions within 410 days 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 \$750.00\_ 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 the General Conditions and Supplementary Conditions. Owner shall not be responsible or liable for any acceleration costs or damages.

Article 4. CONTRACT PRICE.

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents funds a total amount of:

Lump Sum Base Bid of (as indicated in Contractor's bid):

\$ \_\_\_\_\_ in numbers

and \_\_\_\_\_ in words

Selected Deductive Alternate (if any) of (as indicated in Contractor's bid):

\$ \_\_\_\_\_ in numbers

and \_\_\_\_\_ in words

**Total Contract Price:**

\$ \_\_\_\_\_ in numbers

and \_\_\_\_\_ in words

## 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 Engineer 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 as recommended by the Engineer monthly during construction as provided in the General Conditions. All progress payments will be on the basis of the progress of the work measured by the schedule of values established in accordance with paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed).

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.A.1 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.C 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.B and 1.07.C. of the General Conditions, Owner shall pay the remainder of the Contract Price as provided in paragraph 14.07.B and 14.07.C.

## 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 Contract 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 this Agreement, consist of the following:

- A. This Agreement;
- B. Performance Bond;
- C. Payment Bond;
- D. General Conditions;
- E. Supplementary Conditions;
- F. Prevailing Wage Requirements and Labor Provisions – Kentucky and Federal
- G. Specifications (including Geotechnical Exploration Report);

- H. Drawings consisting of a cover sheet and sheets numbered G-0-001 through E-0-501 inclusive, with each sheet bearing the following general title;  
Northern Kentucky Water District  
Lumley Tank Replacement
- I. Addenda (numbers \_\_\_ to \_\_\_, inclusive);
- J. Exhibits to this Agreement (enumerated as follows):
  - 1. Notice of Award and Notice to Proceed;
  - 2. Contractor's Bid;
  - 3. Documentation submitted by Contractor prior to Notice of Award;
- K. 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 paragraph 3.04.A and 3.04.B of the General Conditions.

#### Article 8. 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 9. EQUAL OPPORTUNITY

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

- 1. 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;
- 2. 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;

3. 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;
4. 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
5. Contractor will send a notice to each labor union or representative of workers with which it 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 10. 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 representatives to the other party hereto, its partners, successors, assigns, and 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.

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

\_\_\_\_\_

By: \_\_\_\_\_

Address for giving notices

2835 Crescent Springs Road  
P.O. Box 18640  
Erlanger, Kentucky 41018

CONTRACTOR: \_\_\_\_\_

By: \_\_\_\_\_

(Corporate Seal)

Address for giving notices

\_\_\_\_\_

\_\_\_\_\_

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

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**NOTICE OF AWARD**  
**Lumley Tank Replacement**

To: Contractor Name  
Street Address  
City, State, Zip

**Description of Work:** The proposed work is generally described, but not limited to the following:  
Demolition of the existing 275,000 gallon multi-column elevated Lumley water storage tank, construction of a new 500,000 gallon elevated water tank, altitude valve, and associated site piping, instrumentation and electrical work.

The Owner represented by the undersigned has considered the Bid submitted by you on July 23, 2015 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 in words (\$ in figures), 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 \_\_\_\_\_, 2015.

**Owner**  
Northern Kentucky Water District

By: \_\_\_\_\_  
Amy Kramer, Acting V.P. of Engineering, Production, & Distribution

**ACCEPTANCE OF NOTICE**

Receipt of the above Notice of  
Award is hereby acknowledged this  
\_\_\_\_\_ day of \_\_\_\_\_, 2015.

\_\_\_\_\_(contractor name)

By: \_\_\_\_\_

Title: \_\_\_\_\_

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**NOTICE TO PROCEED**  
**Lumley Tank Replacement**

To: Contractor Name  
Address  
City, State Zip  
Attention:

Date: \_\_\_\_\_, 2015

**Description of Work:** The proposed work is generally described, but not limited to the following: Demolition of the existing 275,000 gallon multi-column elevated Lumley water storage tank, construction of a new 500,000 gallon elevated water tank, altitude valve, and associated site piping, instrumentation and electrical work.

You are hereby notified to commence WORK in accordance with the agreement dated \_\_\_\_\_, 2015 on or before \_\_\_\_\_, 2015. 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 of the General Conditions, and completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions within \_\_\_\_\_ calendar days after the date when the Contract Times commence to run. Therefore, the date of Substantial Completion is \_\_\_\_\_, 201\_, and the date of Final Completion is \_\_\_\_\_, 201\_.

**OWNER**

Northern Kentucky Water District

By: \_\_\_\_\_

Amy Kramer  
Acting V.P. Eng, Production &  
Distribution  
ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO  
PROCEED is hereby acknowledged  
this the \_\_\_\_\_ day of  
\_\_\_\_\_, 2015.

By: \_\_\_\_\_

\_\_\_\_\_  
Title

2835 Crescent Springs Road P.O. Box 18640 Erlanger, KY 41018 (859) 578-9898 Fax (859) 578-5456

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## PERFORMANCE BOND

CONTRACTOR *(name and address):*

SURETY *(name and address of principal place of business):*

OWNER *(name and address):*

**CONSTRUCTION CONTRACT**

Effective Date of the Agreement:

Amount:

Description *(name and location):*

**BOND**

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bond Form:  None  See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

\_\_\_\_\_  
 Contractor's Name and Corporate Seal *(seal)*

\_\_\_\_\_  
 Surety's Name and Corporate Seal *(seal)*

**By:** \_\_\_\_\_  
 Signature

**By:** \_\_\_\_\_  
 Signature *(attach power of attorney)*

\_\_\_\_\_  
 Print Name

\_\_\_\_\_  
 Print Name

\_\_\_\_\_  
 Title

\_\_\_\_\_  
 Title

**Attest:** \_\_\_\_\_  
 Signature

**Attest:** \_\_\_\_\_  
 Signature

\_\_\_\_\_  
 Title

\_\_\_\_\_  
 Title

*Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.*

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

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. 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:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a

qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

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

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven 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 5.4, and the Owner refuses the payment 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.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 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 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction 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, successors, and assigns.

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

11. 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 a declaration of 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 periods of limitations 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 address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction 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. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### 14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for 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 Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

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**PAYMENT BOND**

CONTRACTOR (*name and address*):

SURETY (*name and address of principal place of business*):

OWNER (*name and address*):

**CONSTRUCTION CONTRACT**

Effective Date of the Agreement:

Amount:

Description (*name and location*):

**BOND**

Bond Number:

Date (*not earlier than the Effective Date of the Agreement of the Construction Contract*):

Amount:

Modifications to this Bond Form:  None  See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

**CONTRACTOR AS PRINCIPAL**

**SURETY**

\_\_\_\_\_ (*seal*)

Contractor's Name and Corporate Seal

\_\_\_\_\_ (*seal*)

Surety's Name and Corporate Seal

**By:** \_\_\_\_\_  
Signature

**By:** \_\_\_\_\_  
Signature (*attach power of attorney*)

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

**Attest:** \_\_\_\_\_  
Signature

**Attest:** \_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Title

**Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.**

1. The Contractor and 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 Construction Contract, which is incorporated herein by reference, subject to the following terms.
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.
3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.
4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.
5. The Surety's obligations to a Claimant under this Bond shall arise after the following:
  - 5.1 Claimants who do not have a direct contract with the Contractor,
    - 5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
    - 5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).
  - 5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).
6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.
7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:
  - 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and
  - 7.2 Pay or arrange for payment of any undisputed amounts.
  - 7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.
8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of

reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction 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 Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.
10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.
11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.
12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, 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.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.
14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction 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. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

#### 16. Definitions

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

16.2 **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 Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction 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.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default:** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.



# APPLICATION FOR PAYMENT

Project No:  
Project:

Application for Payment No.: \_\_\_\_\_  
Period Beginning Date: \_\_\_\_\_  
Period Ending Date: \_\_\_\_\_

Owner:

General Contractor:

## CONTRACTOR AFFIDAVIT

The undersigned affiant states that he/she is the Authorized Signatory of the CONTRACTOR for the construction of the PROJECT. By his personal knowledge, he further states that the WORK covered by this APPLICATION FOR PAYMENT has been completed in accordance with the CONTRACT DOCUMENTS and executed amendments thereto; that for all previous APPLICATIONS FOR PAYMENT, except as noted hereinafter as exceptions, the CONTRACTOR has paid in full or has otherwise satisfied all obligations (1) for equipment and materials (whether incorporated into the WORK or acceptably stored on-site), (2) for all work, labor, and services performed, and (3) for all known indebtedness and claims against the CONTRACTOR for damages arising in any manner in connection with the performance of this CONTRACT for which the OWNER, the OWNER's property, or the CONTRACT funds might in any way be held responsible, including the applicable State Statute, and that the current payment on this APPLICATION FOR PAYMENT is now due and payable. This affidavit is directed to the OWNER by and through its ENGINEER.

EXCEPTIONS: \_\_\_\_\_ (If none, write "NONE". Attach additional sheets, if necessary.)  
If required by the OWNER, the CONTRACTOR shall furnish a bond satisfactory to the OWNER for each exception)

\_\_\_\_\_  
**CONTRACTOR**

\_\_\_\_\_  
**DATE**

State of: \_\_\_\_\_

County of: \_\_\_\_\_

SUBSCRIBED and sworn to before me by \_\_\_\_\_ on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

My Commission expires: \_\_\_\_\_

\_\_\_\_\_  
**NOTARY PUBLIC**

## STATEMENT BY ENGINEER

BASED upon on-site observation, and to the best of my knowledge, understanding, and belief, the WORK has progressed to the point indicated herein; and the quality of the WORK complies with the requirements of the CONTRACT DOCUMENTS.

\_\_\_\_\_  
**ENGINEER**

\_\_\_\_\_  
**DATE**

## APPLICATION FOR PAYMENT SUMMARY

TOTAL WORK COMPLETED TO DATE	\$0.00	ORIGINAL CONTRACT PRICE	\$0.00
BALANCE OF STORED MATERIALS	0.00	CHANGE ORDER NO 1	
TOTAL ENTITLEMENT TO DATE	\$0.00	CHANGE ORDER NO 2	
AMOUNT RETAINED PER CONTRACT (10%)	0.00	CHANGE ORDER NO 3	
CLAIMS AGAINST THE CONTRACT FUNDS	0.00	CHANGE ORDER NO 4	
TOTAL DUE CONTRACTOR TO DATE	\$0.00	CHANGE ORDER NO 5	
AMOUNT OF PREVIOUS PAYMENTS		TOTAL CONTRACT PRICE TO DATE	\$0.00

**AMOUNT DUE CONTRACTOR THIS PAYMENT** \$0.00

Percent Complete (Excluding Stored Materials)

## AUTHORIZATION BY OWNER

\_\_\_\_\_  
**OWNER**

\_\_\_\_\_  
**DATE**

Attachments: Cost Breakdown  
Stored Material Breakdown (if applicable)

**COST BREAKDOWN**



Project No.: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Application for Payment No.: \_\_\_\_\_  
 Period Beginning Date: \_\_\_\_\_  
 Period Ending Date: \_\_\_\_\_

Item No.	Description of Work	Breakdown			Completed Previously Quantity	Completed This Month		Completed To Date Quantity	Percent Complete
		Quantity	Unit	Unit Price		Total	Quantity		
BASE BID									
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
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							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
<b>CHANGE ORDERS</b>									
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	0.00
<b>Total Base Bid</b>							<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>



engineering | architecture | geospatial

# MATERIALS STORED BREAKDOWN

**Project No.:**  
**Project:**

**Application for Payment No.:**  
**Period Beginning Date:**  
**Period Ending Date:**

Bid Item No.	Invoice #	Material Description	A Materials stored last period	B Materials purchased this period	C Total (A+B)	D Materials used this period	Materials currently stored (C-D)
					\$0.00		\$0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
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					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
					0.00		0.00
<b>TOTALS</b>					<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>

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# Change Order

GRW ENGINEERS, INC.

801 CORPORATE DRIVE

LEXINGTON, KENTUCKY 40503

Date:  
Project:

Change Order No.:  
Project No.:

Owner:

Contractor:

The Contractor is hereby directed to perform the **Work** described in the **Contract For Construction** as amended by the **Change Order**:

ADD

Attachments:	<b>TOTAL:</b>	<b>\$0.00</b>
--------------	---------------	---------------

Original Contract Amount.....	\$0.00
Net Change by Previous Change Orders.....	0.00
Contractor Amount Prior to This Change Order.....	0.00
Amount of This Change Order.....	0.00
New Contract Amount.....	\$0.00

The Substantial Completion Date:

This **Change Order** is intended to, and the **Contractor** agrees that it does, fairly and adequately compensate the **Contractor** for extra direct costs (labor, materials, etc.) as well as all expenses and damages which may result from any delays, suspensions, stretch-outs, scheduling, inefficiencies, and accelerations in the Work associated with this Change Order, and the Contractor releases the Owner and the Engineer from any claims for such expenses and damages, including but not limited to changes in sequence of work; delays; disruption; rescheduling; extended overhead; acceleration; wage; material; or other escalations; and all other impact costs.

This **Change Order** is intended to, and the **Contractor** agrees that it does, provide the **Contractor** a reasonable and adequate period of time in which to complete the Work in accordance with the Contract For Construction, as amended by this Change Order, and the Contractor releases the Owner and the Engineer from any claims for additional time to perform the Work.

All **Change Orders** to this **Contract For Construction**, if required, must be negotiated pursuant to 40 CFR 31.36(f)(1) and/or with DOW/KIA Procurement Guidance for Construction and Equipment Contracts.

<u>OWNER</u>	<u>DATE</u>	<u>CONTRACTOR</u>	<u>DATE</u>
--------------	-------------	-------------------	-------------

cc:

4383

CHANGE ORDER-SRF  
Bid Set

006363-1

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CERTIFICATE OF INSURANCE						Issue Date:	
PRODUCER:		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					
Code	Sub-Code	COMPANY LETTER A					
INSURED:		COMPANY LETTER B					
		COMPANY LETTER C					
		COMPANY LETTER D					
		COMPANY LETTER E					
<b>COVERAGES</b>							
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,	
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY	(Completed Operations & Products Liability remains in force for 2 years after final payment)			PRODUCTS-COMP/OPS AGGREGATE	\$1,000,	
	<input checked="" type="checkbox"/> OCCURRENCE				PERSONAL & ADVERTISING INJURY	\$1,000,	
	<input checked="" type="checkbox"/> BLANKET CONTRACTUAL				EACH OCCURRENCE	\$1,000,	
	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT EACH OCCURRENCE Bodily Injury & Property Damage	\$1,000,	
	<input checked="" type="checkbox"/> ANY AUTO						
	<input checked="" type="checkbox"/> HIRED AUTOS						
	<input checked="" type="checkbox"/> NON-OWNED AUTOS						
	EXCESS LIABILITY				EACH OCCURRENCE	\$4,000,	
	<input checked="" type="checkbox"/> UMBRELLA FORM	(Follows Form of the Primary)			AGGREGATE	\$4,000,	
	WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY				STATUTORY		
		(Includes US Longshoremen and Harbor Workers Act and Maritime Coverage Where Applicable and All States Endorsement)			EACH ACCIDENT	\$1,000,	
					DISEASE-POLICY LIMIT	\$1,000,	
					DISEASE-EACH EMPLOYEE	\$1,000,	
	OTHER				EACH OCCURRENCE		
					AGGREGATE		
<b>DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/SPECIAL ITEMS:</b>							
<ol style="list-style-type: none"> <li>Certificate Holder(s) &amp; their Officers, Directors, Partners, Employees, &amp; 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.)</li> <li>Blanket Coverage for XCU Hazards (General Liability &amp; Excess Liability).</li> <li>Waiver of Subrogation Against Certificate Holder(s), Their Officers, Directors, Partners, Employees, &amp; Agents (all policies).</li> <li>Contractual Coverage covers liability assumed in the Indemnification Clause of the Contract between Certificate Holder and Insured (General Liability &amp; Excess Liability).</li> <li>General and Products/Completed Operations aggregates apply for each Certificate Holder contract(s) or amendments (General Liability &amp; Excess Liability).</li> <li>Contractual Liability Limitation Endorsement CG2139 or its equivalent is not included in either General or Excess Liability policies.</li> <li>Severability of Interest or Cross Liability clause or endorsement included (General Liability &amp; Excess Liability).</li> </ol>							
<b>CERTIFICATE HOLDERS</b>				<b>CANCELLATION</b>			
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						

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**CERTIFICATE OF SUBSTANTIAL COMPLETION**

Owner:	Owner's Contract No.:
Contractor:	Contractor's Project No.:
Engineer:	Engineer's Project No.:
Project:	Contract Name:

**This [preliminary] [final] Certificate of Substantial Completion applies to:**

All Work  The following specified portions of the Work:

**Date of Substantial Completion**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work shall be as provided in the Contract, except as amended as follows: *[Note: Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.]*

Amendments to Owner's responsibilities:  None  
 As follows

Amendments to Contractor's responsibilities:  None  
 As follows:

The following documents are attached to and made a part of this Certificate: *[punch list; others]*

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

<b>EXECUTED BY ENGINEER:</b>		<b>RECEIVED:</b>		<b>RECEIVED:</b>	
By: _____	By: _____	By: _____	By: _____	By: _____	By: _____
(Authorized signature)	Owner (Authorized Signature)	Contractor	(Authorized		
Title: _____	Title: _____	Title: _____	Title: _____	Title: _____	Title: _____
Date: _____	Date: _____	Date: _____	Date: _____	Date: _____	Date: _____

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<b>CERTIFICATE OF PROPERTY INSURANCE</b>		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		
<b>PRODUCER</b>  Code                      Sub-Code	<b>COMPANY</b>	
<b>INSURED</b>	<b>POLICY NUMBER</b>	
	<b>EFFECTIVE DATE</b> (mm/dd/yy)	<b>EXPIRATION DATE</b> (mm/dd/yy)
<b>PROPERTY INFORMATION</b>		
LOCATION/DESCRIPTION		
<b>COVERAGE INFORMATION</b>		
<b>COVERAGES/PERILS/FORMS</b>	<b>AMOUNT OF INSURANCE</b>	<b>DEDUCTIBLE</b>
<b>BUILDERS RISK/INSTALLATION FLOATER</b> 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. _	
<b>REMARKS (including Special Conditions)</b>		
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		
<b>CANCELLATION</b>		
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		
<b>CERTIFICATE HOLDERS</b>		
Name and Address  1  2	<b>Nature of Interest</b>  <input checked="" type="checkbox"/> Additional Named Insured	
		<b>SIGNATURE OF AUTHORIZED AGENT OF THE COMPANY</b>

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

**Instructions**

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

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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**.

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**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



**ASCE** American Society  
of Civil Engineers

**P/E** 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



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).

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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## 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,

expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
  4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
  5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- 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.

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Section 007300

NKWD SUPPLEMENTARY CONDITIONS

SCOPE. These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (007200, 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.
15. Contract Times: Strike out the words "as evidenced by Engineer's written recommendation of final payment".
16. Delete the term "Contractor" and substitute therefore the terms "Contractor or Prime Contractor."
17. 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. 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 indicated 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.

"H. Engineer Interpretations. In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done, if, as, or, when, or where 'demonstrated, contemplated, required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned,' it shall be understood as if the expression were followed by the words 'by the Engineer' or 'to the Engineer.'

"I. 'Shown.' When this term is used in the specifications, it means 'shown on the Drawings' unless stated otherwise."

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:

“Five (5) 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 Owner shall be final and binding on the Contractor. The Owner 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 Owner.

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 Owner so that such items may be included. Should the Contractor fail to notify the Owner 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-3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE. No modifications.

SC-4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS.

SC-4.02. Subsurface and Physical Conditions. Replace paragraph 4.02 with the following:

"A. Reports and Drawings:

"1. In preparation of the Contract Documents, the following reports of explorations and tests of subsurface conditions at the Site were used: Geotechnical Exploration Report, NKWD Lumley Tank Replacement" as investigated and written by Thelen Associates, Inc., Those reports of explorations and tests of subsurface conditions at or contiguous to the Site which ENGINEER has used in preparing the Contract Documents are not Contract Documents and are to be considered 'technical data.'

In preparation of the Contract Documents, the following drawings of physical conditions in or relating to the existing surface and subsurface structures (except underground facilities) which are at or contiguous to the Site of the Work were relied upon: Geotechnical Exploration Report, NKWD Lumley Tank Replacement" as investigated and written by Thelen Associates, Inc.

"2. CONTRACTOR may not rely upon or make any claim against OWNER or ENGINEER with respect to:

"a. 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

"b. Other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

"c. Any CONTRACTOR interpretation of or conclusion drawn from any 'technical data' or any such other data, interpretations, opinions, or information.

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."

#### 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."

SC-4.06 Hazardous Environmental Conditions at Site.

Delete paragraph 4.06.A. in its 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-6.05. Substitutes and "Or-Equals". 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-6.06. Concerning Subcontractors, Suppliers, and Others. Delete paragraph 6.06.B in its entirety and insert the following new paragraph in its place:

B. Contractor must identify to Owner the following Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner by the date indicated: (Fill in or write Not applicable. Must be consistent with those listed on the Bid Form [i.e. Electrical and Instrumentation/SCADA Contractors, Major Equipment Manufacturers]).\_\_\_\_\_

Date:\_\_\_\_\_. If Contractor has submitted a list thereof in accordance with these 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 without an increase in the Contract Price. 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.

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-6.19. Contractor's General Warranty and Guarantee. 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. No modifications.

SC-8. OWNER'S RESPONSIBILITIES. No modifications.

SC-9. ENGINEER'S STATUS DURING CONSTRUCTION.

SC-9.02. Visits to Site. Delete paragraph 9.02.A in its entirety and insert the following new paragraph in its place:

- A. 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-10. CHANGES IN THE WORK. No Modifications.

SC-11. COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK. No modifications.

SC-12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES.

SC-12.03. Delays Beyond Contractor's Control. Insert the following new paragraph 12.03.F immediately after paragraph 12.03.E:

F. In no event shall Owner or Engineer 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-12.04. Delay Damages. Add the following new paragraph after paragraph 12.03.

A. Except as set forth in paragraph 3.3 of the Agreement, in no event shall Owner or Engineer 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-13.07. 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.

SC-14. PAYMENTS TO CONTRACTOR AND COMPLETION.

SC-14.02. Applications for Payments. 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.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 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.

SC-14.04. Substantial Completion. 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: New building completed and being used to store sodium hypochlorite in chemical tanks. The chemical feed pumps shall be capable of delivering the required dose to the point of application under the automatic SCADA controls from the Fort Thomas WTP, Taylor Mill WTP, and/or Memorial WTP. Additionally, submittal of approved O&M manuals and completion of vendor training must be completed for the project to be considered substantially 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: Fencing, seeding and sodding, and painting.

SC-14.07. Final Application for Payment. 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.

SC-15. SUSPENSION OF WORK AND TERMINATION.

SC-15.01 Owner may suspend Work. Delete the word "shall" in the fifth line of paragraph 15.01.A and substitute the word "may" therefore.

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

**SUPPLEMENTAL GENERAL CONDITIONS**  
**FOR**  
**CLEAN WATER STATE REVOLVING FUND**  
**DRINKING WATER STATE REVOLVING FUND**  
**(Drinking Water and Wastewater)**

**Project Name: Lumley Tank Replacement**

**Project Number: SRF F15-011**

The attached instructions and regulations as listed below shall be incorporated into the Specifications and comprise Special Conditions.

	<u>Attachment No.</u>
<b>SRF Special Provisions</b>	<b>1</b>
<b>Buy American Memo</b>	<b>2</b>
<b>KRS Chapter 45A-Kentucky Model Procurement Code</b>	<b>3</b>
<b>Equal Employment Opportunity (EEO) Documents:</b>	
<b>Notice of Requirement for Affirmative Action</b>	<b>4</b>
<b>Contract Specifications (Executive Order 11246)</b>	<b>5</b>
<b>EEO Goals for Region 4 Economic Areas</b>	<b>6</b>
<b>Special Notice #1 - Check List of EEO Documentation</b>	<b>7</b>
<b>Employer Information Report EEO-1 (SF 100)</b>	<b>8</b>
<b>Labor Standards Provisions for Federally Assisted Construction, EPA Form 5720-4</b>	<b>9</b>
<b>Certifications</b>	
<b>Debarment, Suspension and Other Responsibility Matters</b>	<b>10</b>
<b>Anti-lobbying</b>	<b>11</b>
<b>Region 4 Disadvantaged Business Enterprise (DBE)</b>	<b>12</b>
<b>Bonds and Insurance</b>	<b>13</b>
<b>Storm Water General Permit</b>	<b>14</b>
<b>Davis-Bacon Wage Rate Requirements under FY 2013 Continuing Resolution</b>	<b>15</b>



## SRF SPECIAL PROVISIONS

- (a) Line crossings of all roads and streets shall be done in accordance with the Kentucky Transportation Cabinet requirements as may be set forth in the Special Conditions.
- (b) Construction is to be carried out so as to prevent by-passing of flows during construction unless a schedule has been approved by the State or EPA, whichever is applicable. Siltation and soil erosion must be minimized during construction. All construction projects with surface disturbance of more than 1 acre during the period of construction must have a KPDES Storm Water General Permit. The permit can be found at the following web address: <https://dep.gateway.ky.gov/eForms/default.aspx?FormID=7>.  
  
If you have any questions regarding the completion of this form call the Surface Water Permits Branch at (502) 564-3410.
- (c) Restore disturbed areas to original or better condition.
- (d) **Use of Chemicals:** All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of either DOW or EPA. Use of all such chemicals and disposal of residues shall be in conformance with instructions on the manufacturer's label.
- (e) The construction of the project, including the letting of contracts in connection therewith, shall conform to the applicable requirements of state, territorial, and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.
- (f) The owner shall provide and maintain competent and adequate supervision and inspection.
- (g) The Kentucky Infrastructure Authority and Kentucky Division of Water shall have access to the site and the project work at all times.
- (h) In the event Archaeological materials (arrowheads, stone tools, stone axes, prehistoric and historic pottery, bottles, foundations, Civil War artifacts, and other types of artifacts) are uncovered during the construction of this project, work is to immediately cease at the location and the Kentucky Heritage Council shall be contacted. The telephone number is (502) 564-7005. Construction shall commence at this location until a written release is received from the Kentucky Heritage Council. Failure to report a find could result in legal action.
- (i) This procurement will be subject to DOW Procurement Guidance including the Davis-Bacon Act.
- (j) 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.
- (k) No wastewater bypassing will occur during construction unless a schedule has been approved by the Kentucky Division of Water.
- (l) Change orders to the construction contract (if required) must be negotiated pursuant to DOW/KIA Procurement Guidance for Construction and Equipment Contracts.



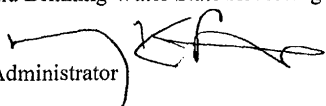
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

JAN 24 2014

OFFICE OF WATER

**MEMORANDUM**

**SUBJECT:** Application of Buy American Requirements to Fiscal Year 2014 Clean Water State Revolving Fund and Drinking Water State Revolving Fund Assistance Agreements

**FROM:** Nancy K. Stoner   
Acting Assistant Administrator

**TO:** Water Management Division Directors  
Regions I- X

On January 17, 2014, H.R. 3547, "Consolidated Appropriations Act, 2014," (Appropriations Act) was enacted. This law provides appropriations for both the Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) for Fiscal Year 2014, while adding a Buy American requirement to these already existing programs. Application of this new requirement is the focus of this memorandum.

H.R. 3547 includes the following language in Division G, Title IV, under the heading, "Use of American Iron and Steel,"

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the "Administrator") finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

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(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

In order to comply with this provision, States must include in all assistance agreements, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, executed on or after January 17, 2014 (date of enactment of H.R. 3547), and prior to October 1, 2014, for the construction, alteration, maintenance, or repair of treatment works under the CWSRF or for construction, alteration, maintenance, or repair of a public water system under the DWSRF, a provision requiring the application of Buy American requirements for the entirety of the construction activities financed by the assistance agreement through completion of construction, no matter when construction commences. The one exception to this requirement is if a project has approved engineering plans and specifications, by a State agency, prior to enactment of the Appropriations Act.

Application of the Buy American requirements extend not only to assistance agreements funded with Fiscal Year 2014 appropriations, but to all assistance agreements executed on or after January 17, 2014 and prior to October 1, 2014, whether the source of the funding is prior year's appropriations, state match, bond proceeds, interest earnings, principal repayments, or any other source of funding so long as the project is financed by an SRF assistance agreement. If a project began construction prior to January 17, 2014, but is financed or refinanced through an assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, Buy American requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a State agency prior to enactment of the Appropriations Act.

Notably, there is no application of the Buy American requirements where such a refinancing occurs for a project that has completed construction prior to January 17, 2014. This provision does not apply to any project for which an assistance agreement was executed prior to January 17, 2014, no matter when construction occurs.

Further information will be provided in the form of guidance as soon as possible.

We understand the complexity of this provision and the challenges involved in its application. If you have any questions, please contact Peter Grevatt or Andrew Sawyers, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at [dorfman.jordan@epa.gov](mailto:dorfman.jordan@epa.gov) or (202) 564-0614 and Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at [anderer.kirsten@epa.gov](mailto:anderer.kirsten@epa.gov) or (202) 564-3134

**KRS Chapter 45A**  
**Kentucky Model Procurement Code**

**45A.075 Methods of awarding state contracts.**

Except as otherwise authorized by law, all state contracts shall be awarded by:

- (1) Competitive sealed bidding, pursuant to KRS 45A.080; or
- (2) Competitive negotiation, pursuant to KRS 45A.085 and 45A.090 or 45A.180; or
- (3) Noncompetitive negotiation, pursuant to KRS 45A.095; or
- (4) Small purchase procedures, pursuant to KRS 45A.100.

**Effective:** June 24, 2003

**History:** Amended 2003 Ky. Acts ch. 98, sec. 4, effective June 24, 2003. -- Created 1978 Ky. Acts ch. 110, sec. 16, effective January 1, 1979.

**45A.080 Competitive sealed bidding.**

(1) Contracts exceeding the amount provided by KRS 45A.100 shall be awarded by competitive sealed bidding, which may include the use of a reverse auction, unless it is determined in writing that this method is not practicable. Factors to be considered in determining whether competitive sealed bidding is not practicable shall include:

- (a) Whether specifications can be prepared that permit award on the basis of best value; and
- (b) The available sources, the time and place of performance, and other relevant circumstances as are appropriate for the use of competitive sealed bidding.

(2) The invitation for bids shall state that awards shall be made on the basis of best value. In any contract which is awarded under an invitation to bid which requires delivery by a specified date and imposes a penalty for late delivery, if the delivery is late, the contractor shall be given the opportunity to present evidence that the cause of the delay was beyond his control. If it is the opinion of the purchasing officer that there is sufficient justification for delayed delivery, the purchasing officer may adjust or waive any penalty that is provided for in the contract.

(3) Adequate public notice of the invitation for bids and any reverse auction shall be given a sufficient time prior to the date set forth for the opening of bids or beginning of the reverse auction. The notice may include posting on the Internet or publication in a newspaper or newspapers of general circulation in the state as determined by the secretary of the Finance and Administration Cabinet not less than seven (7) days before the date set for the opening of the bids and any reverse auction. The provisions of this subsection shall also apply to price contracts and purchase contracts of state institutions of higher education.

(4) Bids shall be opened publicly or entered through a reverse auction at the time and place designated in the invitation for bids. At the time the bids are opened, or the reverse auction has ended, the purchasing agency shall announce the agency's engineer's estimate, if applicable, and make it a part of the agency records pertaining to the letting of any contract for which bids were received. Each written or reverse auction bid, together with the name of the bidder and the agency's engineer's estimate, shall be recorded and be open to public inspection. Electronic bid opening and posting of the required information for public viewing shall satisfy the requirements of this subsection.

(5) The contract shall be awarded by written notice to the responsive and responsible bidder whose bid offers the best value.

(6) Correction or withdrawal of written or reverse auction bids shall be allowed only to the extent permitted by regulations issued by the secretary.

**Effective:** July 15, 2010

**History:** Amended 2010 Ky. Acts ch. 63, sec. 3, effective July 15, 2010. -- Amended 2000 Ky. Acts ch. 509, sec. 1, effective July 14, 2000. -- Amended 1998 Ky. Acts ch. 120, sec. 10, effective July 15, 1998. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 27, effective May 30, 1997. -- Amended 1996 Ky. Acts ch. 60, sec. 2, effective July 15, 1996. -- Amended 1994 Ky. Acts ch. 278, sec. 1, effective July 15, 1994. -- Amended 1982 Ky. Acts ch. 282, sec. 1, effective July 15, 1982. -- Amended 1979 (1st Extra. Sess.) Ky. Acts ch. 9, sec. 1, effective February 10, 1979. -- Created 1978 Ky. Acts ch. 110, sec. 17, effective January 1, 1979.

#### **45A.085 Competitive negotiation.**

(1) When, under administrative regulations promulgated by the secretary or under KRS 45A.180, the purchasing officer determines in writing that the use of competitive sealed bidding is not practicable, and except as provided in KRS 45A.095 and 45A.100, a contract may be awarded by competitive negotiation, which may include the use of a reverse auction.

(2) Adequate public notice of the request for proposals and any reverse auction shall be given in the same manner and circumstances as provided in KRS 45A.080(3).

(3) Contracts other than contracts for projects utilizing an alternative project delivery method under KRS 45A.180 may be competitively negotiated when it is determined in writing by the purchasing officer that the bids received by competitive sealed bidding either are unreasonable as to all or part of the requirements, or were not independently reached in open competition, and for which each competitive bidder has been notified of the intention to negotiate and is given reasonable opportunity to negotiate.

(4) Contracts for projects utilizing an alternative project delivery method shall be processed in accordance with KRS 45A.180.

(5) The request for proposals shall indicate the relative importance of price and other evaluation factors, and any reverse auction procedures.

(6) Award shall be made to the responsible and responsive offeror whose proposal is determined in writing to be the most advantageous to the Commonwealth, taking into consideration price and the evaluation factors set forth in the request for proposals and the reciprocal preference for resident bidders required under KRS 45A.494.

(7) Written or oral discussions shall be conducted with all responsible offerors who submit proposals determined in writing to be reasonably susceptible of being selected for award. Discussions shall not disclose any information derived from proposals submitted by competing offerors. Discussions need not be conducted:

(a) With respect to prices, where the prices are fixed by law, reverse auction, or administrative regulation, except that consideration shall be given to competitive terms and conditions;

(b) Where time of delivery or performance will not permit discussions; or

(c) Where it can be clearly demonstrated and documented from the existence of adequate competition or prior experience with the particular supply, service, or construction item, that acceptance of an initial offer without discussion would result in fair and reasonable best value procurement, and the request for proposals notifies all offerors of the possibility that award may be made on the basis of the initial offers.

**Effective:** July 15, 2010

**History:** Amended 2010 Ky. Acts ch. 63, sec. 4, effective July 15, 2010; and ch. 162, sec. 8, effective July 15, 2010. -- Amended 2003 Ky. Acts ch. 98, sec. 5, effective June 24, 2003. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 28, effective May 30, 1997. -- Amended 1979 (1st Extra. Sess.) Ky. Acts ch. 9, sec. 2, effective February 10, 1979. -- Created 1978 Ky. Acts ch. 110, sec. 18, effective January 1, 1979.

**45A.090 Negotiation after competitive sealed bidding when all bids exceed available funds.**

(1) In the event that all bids submitted pursuant to competitive sealed bidding under KRS 45A.080 result in bid prices in excess of the funds available for the purchase, and the chief purchasing officer determines in writing:

- (a) That there are no additional funds available from any source so as to permit an award to the responsive and responsible bidder whose bid offers the best value; and
- (b) The best interest of the state will not permit the delay attendant to a resolicitation under revised specifications, or for revised quantities, under competitive sealed bidding as provided in KRS 45A.080, then a negotiated award may be made as set forth in subsections (2) or (3) of this section.

(2) Where there is more than one (1) bidder, competitive negotiations pursuant to KRS 45A.085(3) shall be conducted with the three (3) (two (2) if there are only two (2)) bidders determined in writing to be the most responsive and responsible bidders, based on criteria contained in the bid invitation and the reciprocal preference for resident bidders under KRS 45A.494. Such competitive negotiations shall be conducted under the following restrictions:

- (a) If discussions pertaining to the revision of the specifications or quantities are held with any potential offeror, all other potential offerors shall be afforded an opportunity to take part in such discussions; and
- (b) A request for proposals, based upon revised specifications or quantities, shall be issued as promptly as possible, shall provide for an expeditious response to the revised requirements, and shall be awarded upon the basis of best value.

(3) Where, after competitive sealed bidding, it is determined in writing that there is only one (1) responsive and responsible bidder, a noncompetitive negotiated award may be made with such bidder in accordance with KRS 45A.095.

**Effective:** July 15, 2010

**History:** Amended 2010 Ky. Acts ch. 162, sec. 9, effective July 15, 2010. -- Amended 2003 Ky. Acts ch. 98, sec. 6, effective June 24, 2003. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 29, effective May 30, 1997. -- Created 1978 Ky. Acts ch. 110, sec. 19, effective January 1, 1979.

**45A.095 Noncompetitive negotiation.**

(1) A contract may be made by noncompetitive negotiation only for sole source purchases, or when competition is not feasible, as determined by the purchasing officer in writing prior to award, under administrative regulations promulgated by the secretary of the Finance and Administration Cabinet or the governing boards of universities operating under KRS Chapter 164A, or when emergency conditions exist. Sole source is a situation in which there is only one (1) known capable supplier of a commodity or service, occasioned by the unique nature of the requirement, the supplier, or market conditions. Insofar as it is practical, no less than three (3) suppliers shall be solicited to submit written or oral quotations whenever it is determined that competitive sealed bidding is not feasible. Award shall be made to the supplier offering the best value. The names of the suppliers submitting quotations and the date and amount of each quotation shall be placed in the procurement file and maintained as a public record. Competitive bids may not be required:

- (a) For contractual services where no competition exists, such as telephone service, electrical energy, and other public utility services;
- (b) Where rates are fixed by law or ordinance;
- (c) For library books;
- (d) For commercial items that are purchased for resale;
- (e) For interests in real property;

- (f) For visiting speakers, professors, expert witnesses, and performing artists;
  - (g) For personal service contracts executed pursuant to KRS 45A.690 to 45A.725; and
  - (h) For agricultural products in accordance with KRS 45A.645.
- (2) The chief procurement officer, the head of a using agency, or a person authorized in writing as the designee of either officer may make or authorize others to make emergency procurements when an emergency condition exists.
- (3) An emergency condition is a situation which creates a threat or impending threat to public health, welfare, or safety such as may arise by reason of fires, floods, tornadoes, other natural or man-caused disasters, epidemics, riots, enemy attack, sabotage, explosion, power failure, energy shortages, transportation emergencies, equipment failures, state or federal legislative mandates, or similar events. The existence of the emergency condition creates an immediate and serious need for services, construction, or items of tangible personal property that cannot be met through normal procurement methods and the lack of which would seriously threaten the functioning of government, the preservation or protection of property, or the health or safety of any person.
- (4) The Finance and Administration Cabinet may negotiate directly for the purchase of contractual services, supplies, materials, or equipment in bona fide emergencies regardless of estimated costs. The existence of the emergency shall be fully explained, in writing, by the head of the agency for which the purchase is to be made. The explanation shall be approved by the secretary of the Finance and Administration Cabinet and shall include the name of the vendor receiving the contract along with any other price quotations and a written determination for selection of the vendor receiving the contract. This information shall be filed with the record of all such purchases and made available to the public. Where practical, standard specifications shall be followed in making emergency purchases. In any event, every effort should be made to effect a competitively established price for purchases made by the state.

**Effective:** July 15, 2002

**History:** Amended 2002 Ky. Acts ch. 344, sec. 9, effective July 15, 2002. -- Amended 1997 (1st Extra. Sess.) Ky. Acts ch. 4, sec. 30, effective May 30, 1997. -- Amended 1990 Ky. Acts ch. 496, sec. 4, effective July 13, 1990. -- Created 1978 Ky. Acts ch. 110, sec. 20, effective January 1, 1979

#### **45A.100 Small purchases by state governmental bodies.**

- (1) Procurements may be made in accordance with small purchase administrative regulations promulgated by the secretary of the Finance and Administration Cabinet, pursuant to KRS Chapter 13A, as follows:
- (a) Up to ten thousand dollars (\$10,000) per project for construction and one thousand dollars (\$1,000) for purchases by any state governmental body, except for those state administrative bodies specified in paragraph (b) of this subsection; and
  - (b) Up to forty thousand dollars (\$40,000) per project for construction or purchases by the Finance and Administration Cabinet, state institutions of higher education, and the legislative branch of government.
- (2) Procurement requirements shall not be artificially divided so as to constitute a small purchase under this section. Reverse auctions may be used for small purchase procurements. At least every two (2) years, the secretary shall review the prevailing costs of labor and materials and may make recommendations to the next regular session of the General Assembly for the revision of the then current maximum small purchase amount as justified by intervening changes in the cost of labor and materials.
- (3) The secretary of the Finance and Administration Cabinet may grant to any state agency with a justifiable need a delegation of small purchasing authority which exceeds the agency's small purchase limit provided in subsection (1) of this section. Delegations of small purchasing



authority shall be granted or revoked by the secretary of the Finance and Administration Cabinet, in accordance with administrative regulations promulgated by the cabinet pursuant to KRS Chapter 13A. These administrative regulations shall establish, at a minimum, the criteria for granting and revoking delegations of small purchasing authority, including the requesting agency's past compliance with purchasing regulations, the level of training of the agency's purchasing staff, and the extent to which the agency utilizes the Kentucky Automated Purchasing System. The administrative regulations may permit the secretary of the Finance and Administration Cabinet to delegate small purchase procurements up to the maximum amount specified in subsection (1)(b) of this section.

**Effective:** July 15, 2010

**History:** Amended 2010 Ky. Acts ch. 63, sec. 5, effective July 15, 2010. -- Amended 2002 Ky. Acts ch. 320, sec. 2, effective July 15, 2002. -- Amended 2000 Ky. Acts ch. 225, sec. 1, effective July 14, 2000. -- Amended 1996 Ky. Acts ch. 60, sec. 1, effective July 15, 1996. -- Amended 1994 Ky. Acts ch. 323, sec. 1, effective July 15, 1994. -- Amended 1990 Ky. Acts ch. 496, sec. 5, effective July 13, 1990. -- Amended 1986 Ky. Acts ch. 384, sec. 1, effective July 15, 1986. -- Amended 1984 Ky. Acts ch. 384, sec. 1, effective July 13, 1984. -- Amended 1982 Ky. Acts ch. 282, sec. 2, effective July 15, 1982. -- Amended 1980 Ky. Acts ch. 242, sec. 1, effective July 15, 1980; and ch. 250, sec. 19, effective April 9, 1980. -- Created 1978 Ky. Acts ch. 110, sec. 21, effective January 1, 1979.

**NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE  
EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)**

The following excerpts are from 45 FR 65984 (October 3, 1980):

The minority and female goals apply to Federal and federally assisted construction contractors and subcontractors which have covered contracts. The goals are expressed as a percentage of the total hours worked by such a covered or subcontractor's entire onsite construction workforce, which is working on any construction site within a relevant area. The goal applies to each construction craft and trade in the contractor's entire workforce in the relevant area including those employees working on private non-federally involved projects.

Until further notice, the following goals for minority utilization in each construction craft and trade shall be included in all Federal or federally assisted construction contracts and subcontracts in excess of \$10,000 to be performed in the respective geographic area. The goals are applicable to each nonexempt contractor's total onsite construction workforce, regardless of whether or not part of that workforce is performing work on a Federal, federally assisted or non-federally related project, contract or subcontract.

Construction contractors which are participating in an approved Hometown Plan (see 41 CFR 60-4.5) are required to comply with the goals of the Hometown Plan with regard to construction work they perform in the area covered by the Hometown Plan. With regard to all their other covered construction work, such contractors are required to comply as follows:

- Goals for female participation in each trade.....6.9%
- Goals for minority participation in each trade.....Insert goals for each year  
(see Attachment Number 6)

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area.

The following excerpts are from 45 FR 65977 (October 3, 1980):

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

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

4. As used in this Notice, and in the contract resulting from this solicitation, the covered area is (insert description of the geographical areas where the contract is to be performed giving the state, country, and city, if any).

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION  
CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)**

EEO Specifications

Following is the standard language, which must be incorporated into all solicitations for offers and bids on all Federal and Federally assisted construction contracts or subcontracts in excess of \$10,000 to be performed in designated geographical areas:

1. As used in these specifications:
  - (a) Covered Area means the geographical area described in the solicitation from which this contract resulted.
  - (b) Director means Director, Office of Federal Contract Compliance Program, United States Department of Labor, or any person to whom the Director delegates authority;
  - (c) Employer identification number means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
  - (d) Minority includes:
    - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
    - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
    - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
    - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take a good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7-a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. The Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative actions steps at least as extensively as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligation.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources complied under 7-b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, lay-off, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foreman, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative actions obligations (7 a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7 a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example: even though the Contractor has achieved its goal for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables for affirmative action standards to discriminate against any person because of race, color, religion, sex or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation, if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).



**EEO Goals for Economic Areas in Region 4**

Source: Appendix B-80 in 45 FR 65984 (October 3, 1980)

**Kentucky:**

053 Knoxville, TN  
 SMSA Counties:  
 3840 Knoxville, TN ..... 6.6  
 TN Anderson; TN Blount; TN Knox; TN Union.  
 Non-SMSA Counties ..... 4.5  
 KY Bell; KY Harlan; KY Knox; KY Laurel; KY McCreary; KY Wayne; KY Whitley; TN  
 Campbell; TN Claiborne; TN Cocke; TN Cumberland; TN Fentress; TN Grainger, TN Hamblen;  
 TN Jefferson; TN Loudon; TN Morgan; TN Roane; TN Scott;  
 TN Sevier.

054 Nashville, TN:  
 SMSA Counties:  
 1660 Clarksville - Hopkinsville, TN - KY ..... 18.2  
 KY Christian; TN Montgomery.  
 5360 Nashville - Davidson, TN ..... 15.8  
 TN Cheatham, TN Davidson; TN Dickson; TN Robertson; TN Rutherford; TN Sumner; TN  
 Williamson; TN Wilson.  
 Non-SMSA Counties ..... 12.0  
 KY Allen; KY Barren; KY Butler; KY Clinton; KY Cumberland; KY Edmonson; KY Logan; KY  
 Metcalfe; KY Monroe; KY Simpson; KY Todd; KY Trigg; KY Warren; TN Bedford; TN Cannon;  
 TN Clay; TN Coffee; TN DeKalb; TN Franklin; TN Giles; TN Hickman; TN Houston; TN  
 Humphreys; TN Jackson; TN Lawrence; TN Lewis; TN Macon; TN Marshall; TN Maury; TN  
 Moore; TN Overton; TN Perry; TN Pickett; TN Putnam; TN Smith; TN Stewart; TN Trousdale;  
 TN Van Buren; TN Warren; TN Wayne; TN White.

056 Paducah, KY:  
 Non-SMSA Counties ..... 5.2  
 IL Hardin; IL Massac; IL Pope; KY Ballard; KY Caldwell; KY Calloway. KY Carlisle; KY  
 Crittenden; KY Fulton; KY Graves; KY Hickman; KY Livingston; KY Lyon. KY McCracken; KY  
 Marshall.

057 Louisville, KY:  
 SMSA Counties:  
 4520 Louisville, KY-IN ..... 11.2  
 IN Clark; IN Floyd; KY Bullitt; KY Jefferson; KY Oldham.  
 Non-SMSA Counties ..... 9.6  
 IN Crawford; IN Harrison; IN Jefferson; IN Orange; IN Scott; IN Washington; KY Breckinridge;  
 KY Grayson; KY Hardin; KY Hart; KY Henry; KY Larue; KY Marion;  
 KY Meade; KY Nelson; KY Shelby; KY Spencer; KY Trimble; KY Washington.

058 Lexington, KY  
 SMSA Counties  
 4280 Lexington-Fayette, KY ..... 10.8  
 KY Bourbon; KY Clark; KY Fayette; KY Jessamine; KY Scott; KY Woodford.  
 Non-SMSA Counties ..... 7.0  
 KY Adair KY Anderson; KY Bath; KY Boyle; KY Breathitt; KY Casey; KY Clay; KY Estill; KY  
 Franklin; KY Garrard; KY Green; KY Harrison; KY Jackson; KY Knott; KY Lee; KY Leslie; KY  
 Letcher; KY Lincoln; KY Madison; KY Magoffin; KY Menifee; KY Mercer; KY Montgomery;  
 KY Morgan. KY Nicholas; KY Owsley; KY Perry; KY Powell; KY Pulaski; KY Rockcastle; KY  
 Russell; KY Taylor; KY Wolfe.

059 Huntington, WV:  
 SMSA Counties:  
 3400 Huntington – Ashland, WV-KY-OH ..... 2.9  
 KY Boyd; KY Greenup; OH Lawrence; WV Cabell; WV Wayne.  
 Non-SMSA Counties ..... 2.5  
 KY Carter; KY Elliott; KY Floyd; KY Johnson; KY Lawrence; KY Martin; KY Pike; KY Rowan;  
 OH Gallia; WV Lincoln; WV Logan; WV Mason; WV Mingo.

067 Cincinnati, OH:  
 SMSA Counties:  
 1640 Cincinnati, OH-KY-IN ..... 11.0  
 IN Dearborn; KY Boone; KY Campbell; KY Kenton; OH Clermont;

OH Hamilton; OH Warren.	
3200 Hamilton-Middletown, OH .....	5.0
OH Butler.	
Non-SMSA Counties .....	9.2
IN Franklin; IN Ohio; IN Ripley; IN Switzerland; KY Bracken; KY Carroll; KY Fleming; KY Gallatin; KY Grant; KY Lewis; KY Mason; KY Owen; KY Pendleton; KY Robertson; OH Adams; OH Brown; OH Clinton; OH Highland.	
080 Evansville, IN:	
SMSA Counties	
2440 Evansville, IN-KY .....	4.8
IN Gibson; IN Posey; IN Vanderburgh; IN Warrick; KY Henderson.	
5990 Owensboro, KY .....	4.7
KY Daviess.	
Non-SMSA Counties .....	3.5
IL Edwards; IL Gallatin; IL Hamilton; IL Lawrence; IL Saline; IL Wabash; IL White; IN Dubois; IN Knox; IN Perry; IN Pike; IN Spencer; KY Hancock; KY Hopkins; KY McLean; KY Muhlenberg; KY Ohio; KY Union; KY Webster.	

**CHECK LIST OF EEO DOCUMENTATION FOR BIDDERS  
ON GRANT/LOAN CONSTRUCTION  
(Required by Executive Order 11246 as amended)**

The low, responsive responsible bidder must forward the following items, in duplicate, to the owner no later than ten (10) days after bid opening. The owner shall have one (1) copy available for inspection by the Office of Federal Contracts Compliance within 14 days after the bid opening. The web site for the OFCC is [http://www.dol.gov/esa/ofcp\\_org.htm](http://www.dol.gov/esa/ofcp_org.htm).

1. Project Number. Project Location. Type of Construction.
2. Proof of registration with the Joint Reporting Commission. (See Attachment Number 8.)
3. Copy of Affirmative Action Plan of contractor. Indicate company official responsible for EEO.
4. List of current construction contracts, with dollar amount. List contracting Federal Agency, if applicable.
5. Statistics concerning company percent workforce, permanent and temporary, by sex, race, trade, handicapped, and age. 40 CFR Part 7.
6. List of employment sources for project in question. If union sources are utilized, indicate percentage of minority membership within the union crafts.
7. Anticipated employment needs for this project, by sex, race and trade, with estimate of minority participation in specific trades.
8. List of subcontractors (name, address and telephone) with dollar amount and duration of subcontract. Subcontractor contracts over \$10,000 must submit items 1- 8. The following information must be provided for all supplier contracts regardless of contract size: name of company, contact person, address, telephone number, dollar value of the contract, and a list of the materials to be supplied to the prime contractor.
9. List of any subcontract work yet to be committed with estimate of dollar amount and duration of contract.
10. Contract Price. Duration of prime contract.
11. DBE Documents - See special instructions regarding use of Minority, and Women Owned, and Small Businesses.

## Employer Information Report EEO-1

Under the direction of the US Equal Employment Opportunity Commission, the Joint Reporting Committee is responsible for the full-length, multi-phase processing of employment statistics collected on the Employer Information Report EEO-1. This report, also termed Standard Form 100, details the sex and race/ethnic composition of an employer's work force by job category.

The Employer Information EEO-1 survey is conducted annually under the authority of Public Law 88-352, Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972. All employers with 15 or more employees are covered by Public Law 88-352 and are required to keep employment records as specified by Commission regulations. Based on the number of employees and federal contract activities, certain large employers are required to file an EEO-1 Report on an annual basis.

The EEO-1 Report must be filed by:

(A) All private employers who are: (1) subject to Title VII of the Civil Rights Act of 1964 (as amended by the Equal Employment Opportunity Act of 1972) with 100 or more employees EXCLUDING State and local governments, primary and secondary school systems, institutions of higher education, Indian tribes and tax-exempt private memberships clubs other than labor organizations; OR (2) subject to Title VII who have fewer than 100 employees if the company is owned or affiliated with another company, or there is centralized ownership, control or management (such as central control of personnel policies and labor relations) so that the group legally constitutes a single enterprise and the entire enterprise employs a total of 100 or more employees.

(B) All federal contractors (private employers), who: (1) are not exempt as provided for by 41 CFR 60-1.5, (2) have 50 or more employees, and (a) are prime contractors or first-tier subcontractors, and have a contract, subcontract, or purchase order amounting to \$50,000 or more; or (b) serve as depository of Government funds in any amount, or (c) is a financial institution which is an issuing an paying agent for U.S. Savings Bonds and Notes.

Only those establishments located in the District of Columbia and the 50 states are required to submit the EEO-1 Report. No Reports should be filed for establishments in Puerto Rico, the Virgin Islands or other American Protectorates.

When filing for the EEO-1 Report for the first time, go to the web site at: <http://www.mimdms.com/jrc.html> and select "Filing for the first time" from the box labeled INFORMATION. File out the electronic questionnaire to enter your company into Joint Reporting Committee (JRC) system. Once you have completed the registration process, you will be contacted on how to proceed with the EEO-1 Report. If you have previously registered with the JRC, follow their instructions to update your information.

**Labor Standards Provisions for Federally Assisted Construction**

Labor standards provisions applicable to contracts covering federally financed and assisted construction (29 CFR 5.5, Contract Provisions and Related Matters) that apply to EPA Special Appropriations Projects grants are:

(a)(4)(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(a)(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

(a)(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5 (a) (1) through (10) and such other clauses as the U.S. Environmental Protection Agency may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(a)(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(b) Contractor Work Hours and Safety Standards Act. The Administrator, EPA shall cause or require the contracting officer to insert the following clauses set forth in paragraph (b)(1),(2),(3), and (4) of this section in full in any contract subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by \*Section 5.5(a) of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he or she is employed on such work to in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b) (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for unliquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The U.S. Environmental Protection Agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally- assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such liabilities of such contractor or

subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) (2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in section 5.1, the Administrator of EPA shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly worked, deductions made, and actual wages paid. Further, the Administrator of EPA shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the U.S. Environmental Protection Agency and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job. (Approved by the Office of Management and Budget under OMB control numbers 1215-0140 and 1215-0017.)

## **CERTIFICATIONS**

### **Debarred Firms**

All prime Construction Contractors shall certify that Subcontractors have not and will not be awarded to any firm that is currently on the EPA Master List of Debarred, Suspended and Voluntarily Excluded Persons in accordance with the provisions of 40 CFR 32.500(c). Debarment action is taken against a firm for noncompliance with Federal Law.

All bidders shall complete the attached certification (Attachment Number 10) and submit to the owner with the bid proposal.

### **Anti-lobbying Certification**

All prime Construction Contractors must certify (Attachment Number 11) that no appropriated funds were or will be expended for the purpose of lobbying the Executive or Legislative Branches of the Federal Government or Federal Agency concerning this contract (contract in excess of \$100,000). If the Contractor has made or agreed to make payment to influence any member of Congress in regard to award of this contract, a Disclosure Form must be completed and submitted to the owner with the bid proposal.

All prime Contractors must require all Subcontractors to submit the certification, which must also be submitted to the owner.

**CERTIFICATION REGARDING DEBARMENT,  
SUSPENSION AND OTHER RESPONSIBILITY MATTERS**

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to \$10,000 or imprisonment for up to 5 years, or both.

\_\_\_\_\_  
Typed Name & Title of Authorized Representative

\_\_\_\_\_  
Signature of Authorized Representative

\_\_\_\_\_  
Date

\_\_\_\_\_ I am unable to certify to the above statements. My explanation is attached.



**CERTIFICATION REGARDING LOBBYING**  
**Certification for Contracts, Grants,**  
**Loans, and Cooperative Agreements**

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

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

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

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

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

\_\_\_\_\_  
Typed Name & Title of Authorized Representative

\_\_\_\_\_  
Signature of Authorized Representative

\_\_\_\_\_  
Date

\_\_\_\_\_ I am unable to certify to the above statements. My explanation is attached.

## EPA DISADVANTAGED BUSINESS ENTERPRISE PROGRAM

EPA's Disadvantaged Business Enterprise Program rule applies to contract procurement actions funded in part by EPA assistance agreements awarded after May 27, 2008. The rule is found at Federal regulation Title 40, Part 33. Specific responsibilities are highlighted below.

### Grant recipient responsibilities:

- Conduct an Availability Analysis and negotiate fair share objectives with EPA (§33.411), or adopt the fair share objectives of the oversight state agency revolving loan fund for comparable infrastructure. (§33.405(b)(3)).
- Include the Appendix A term and condition in each contract with a primary contractor (§3.106). The term and condition is included in the EPA Region 4 contract specifications insert *FEDERAL REQUIREMENTS AND CONTRACT PROVISIONS FOR SPECIAL APPROPRIATION ACT PROJECTS US ENVIRONMENTAL PROTECTION AGENCY, Region III, June 2008*.
- Employ the six Good Faith Efforts during prime contractor procurement (§33.301).
- Require prime contractor to comply with the following prime contractor requirements of Title 40 Part 33:
  - To employ the six Good Faith Efforts steps in paragraphs (a) through (e) of §33.301 if the prime contractor awards subcontracts (§33.301(f)).
  - To provide EPA form 6100-2 – *DBE Subcontractor Participation Form* to all DBE subcontractors (§33.302(e)).
  - To submit EPA forms 6100-3 – *DBE Program Subcontractor Performance Form* and 6100-4 – *DBE Program Subcontractor Utilization Form* with bid package or proposal. (§33.302 (f) and (g)).
  - To pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient (§33.302(a)).
  - To notify recipient in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor (§33.302(b)).
  - To employ the six good faith efforts described in §33.301 if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason. (§33.302(c)).
  - To employ the six good faith efforts described in §33.301 even if the prime contractor has achieved its fair share objectives under subpart D of Part 33. (§33.302(d)).

- Semiannually complete and submit to Charles Hayes, EPA Region 4 DBE Coordinator EPA form 5700-52A summarizing DBE participation achieved during the previous six months (§33.502).
- Maintain records documenting its compliance with the requirements of Title 40 Part 33, including documentation of its, and its prime contractors', good faith efforts (§33.501(a)).

**Prime Contractor Responsibilities:**

- Employ the six Good Faith Efforts steps in paragraphs (a) through (e) of §33.301 if the prime contractor awards subcontracts (§33.301(f)).
- Provide EPA form number 6100-2 – *DBE Program Subcontractor Participation Form* and form number 6100-3 – *DBE Program Subcontractor Performance Form* to each DBE subcontractor prior to opening of the contractor's bid or proposal (§33.302(e) and (f)).
- Complete EPA form number 6100-4 – *DBE Program Subcontractor Utilization Form* (§33.302(g)).
- Submit to recipient with it bid package or proposal the completed EPA form number 6100-4, plus an EPA form number 6100-3 for each DBE subcontractor used in the contractor's bid or proposal (§33.302(f) and (g)).
- Pay subcontractors for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient (§33.302(a)).
- Notify the recipient in writing prior to prime contractor termination of a DBE subcontractor for convenience (§33.302(b)).
- Employ the six good faith efforts described in §33.301 if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason. (§33.302(c)).
- Employ the six good faith efforts described in §33.301 even if the prime contractor has achieved its fair share objectives under subpart D of Part 33. (§33.302(d)).
- Semiannually inform recipient of DBE participation achieved (§33.502).
- Maintain records documenting its compliance with the requirements of Title 40 Part 33, including documentation of its, and its prime contractors', good faith efforts (§33.501(a)).

**Subcontractor Responsibilities:**

- May submit EPA form 6100-2 – *DBE Subcontractor Participation Form* to Charles Hayes, EPA Region 4 DBE Coordinator (§33.302(e)).
- Must complete EPA form 6100-3 – *DBE Program Subcontractor Performance Form*, and submit it to the prime contractor soliciting services from the subcontractor prior to the opening of bids for the prime contract.

**SPAP Requirements:**

<b>Form</b>	<b>Requirement</b>	<b>Provided By:</b>	<b>Completed By:</b>	<b>Submitted To:</b>
EPA Form 6100-2	Grant Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	EPA Region 4 DBE Coordinator Charles Hayes
EPA Form 6100-3	Grant Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Grant Recipients as part of a bid or proposal package
EPA Form 6100-4	Grant Recipients required to have prime contractors complete the form	Grant Recipients	Prime Contractors	Grant Recipients as part of a bid or proposal package

**SRF Requirements:**

<b>Form</b>	<b>Requirement</b>	<b>Provided By:</b>	<b>Completed By:</b>	<b>Submitted To:</b>
EPA Form 6100-2	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	DOW Project Administrator
EPA Form 6100-3	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Dow Project Administrator w/ATA Package
EPA Form 6100-4	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	DOW Project Administrator w/ATA Package
Pay Request DBE Form	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	DOW Project Administrator w/EACH PAYMENT

**DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION POLICY**

**PROJECT NAME:** \_\_\_\_\_

**BID DATE:** \_\_\_\_\_

**1. Name, address and telephone number of contact person on all DBE matters:**

Prime Contractor's Name: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Cell Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Total Contract Amount: \_\_\_\_\_

**2. Total dollar amount/percent of contract of MBE participation:** \_\_\_\_\_

**3. Total dollar amount/percent of contract of WBE participation:** \_\_\_\_\_

**4. Are certifications\* for each MBE/WBE/DBE subcontractor enclosed; if no, please explain:**  Yes  No  
\_\_\_\_\_

**5. Are MBE/WBE/DBE subcontracts or letters of intent signed by both parties enclosed; if no, please explain:**  Yes  No  
\_\_\_\_\_

**6. List of MBE Subcontractors:**

Name: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Cell Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Type of Contract: \_\_\_\_\_

Work to be Done: \_\_\_\_\_

Amount: \_\_\_\_\_

**7. List of WBE Subcontractors:**

Name: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Cell Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Type of Contract: \_\_\_\_\_

Work to be Done: \_\_\_\_\_

Amount: \_\_\_\_\_

Attach Additional Sheets, If Necessary

\*Self-certification: Self certification of MBE/WBE/DBE firms will NOT be accepted as a valid form of certification of MBE/WBE/DBE status.

**8. Information and documentation concerning efforts taken to comply with EPA’s “six good faith efforts”**

(i). Ensure DBE construction firms or material suppliers are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities; including placing DBEs on solicitation lists and soliciting them whenever they are potential sources. A good source for a list of DBEs is the Kentucky Transportation’s website: <http://transportation.ky.gov/Civil-Rights-and-Small-Business-Development/Pages/Certified-DBE-Directory.aspx>.

The prime contractor certifies that a bidders list (see example sheet below) of qualified vendors, including DBEs, was developed for current and future solicitations and that the list will be maintained. *Submit a copy of the list as documentation.*

(ii). Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process; including, whenever possible, posting solicitation for bids or proposals for a sufficient amount of time as to receive a competitive bid or proposal pool.

The prime contractor certifies that every opportunity was provided to a number of DBEs to encourage their participation in the competitive process and that an adequate amount of time was provided for response.

a. List each DBE construction firm or material supplier to which a solicitation was attempted. *Submit copies of letters, emails, faxes, telecommunication logs, certified mail receipts, returned envelopes, certified mail return receipts, etc. as documentation.*

Company name and phone number: \_\_\_\_\_

Area of work expertise: \_\_\_\_\_

Date of any follow-ups and person spoke to: \_\_\_\_\_

b. Advertisements, if applicable: List each publication in which an announcement or notification was placed. *Submit a tear sheet of each announcement from each publication as documentation.*

Name of publication: \_\_\_\_\_

Date(s) of advertisement: \_\_\_\_\_

Specific subcontract areas announced: \_\_\_\_\_

c. Other, if applicable: List each notification method in which an announcement or outreach was used; list serve, public meeting, etc. *Submit applicable information to document effort.*

Method of notification: \_\_\_\_\_

Date(s) of notification: \_\_\_\_\_

(iii). Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs; including dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

The prime contractor certifies that the project was broken into its basic elements (i.e., dirt hauling, landscaping, painting, pipe installation, material supplies, etc.) and that a determination was made whether it’s economically feasible to bid the elements separately and that the analysis of this effort was documented with a short memo to the project file.

- (iv). Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women’s business enterprises.
  - The prime contractor certifies that they established delivery schedules which would allow DBEs to participate in the projects.
- (v). Use the services and assistance of the Small Business Administration (SBA) and the Minority Business Development Agency (MBDA) of the U.S. Department of Commerce. The easiest way to utilize the services of SBA and MBDA is to visit their websites: [www.sba.gov](http://www.sba.gov) and [www.mbda.gov](http://www.mbda.gov) and use the electronic tools available there or you may send the nearest SBA and MBDA office a certified letter that generally describes the solicitation, the dates it will be open, the types of vendors you are seeking and applicable SIC or NAIC codes if known. You may also use the services and assistance of the Kentucky Procurement Assistance Program (KPAP). The easiest way to utilize the services of KPAP is to send an email: [ced.kpap@ky.gov](mailto:ced.kpap@ky.gov) and provide information on forthcoming opportunities available to DBEs.
  - The prime contractor certifies that the assistance of the SBA, MBDA, and/or KPAP was utilized. *Submit pages printed off the SBA and MBDA websites which evidence efforts to register a solicitation on those sites or submit copies of the letter sent and certified mail receipt as documentation; submit copies of emails with KPAP as documentation.*
- (vi). If a subcontractor awards any subcontracts, require the subcontractor to take the steps in numbers (i) through (v) above.
  - The prime contractor certifies that subcontractors used for this project will be required to follow the steps of the “six good faith efforts” as listed above.

**9. Signature and date:**

To the best of my knowledge and belief, all “six good faith efforts” have been met and the information contained in this document is true and correct; the document has been duly authorized by the legal representative.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print name and title

\_\_\_\_\_  
Date

**BIDDER'S LIST FORM**

**OWNER:** \_\_\_\_\_

**LOAN NO:** \_\_\_\_\_

**PROJECT TITLE:** \_\_\_\_\_

**BID DATE:** \_\_\_\_\_

Instructions:

- 1. This list must include all firms that were solicited for participation, bid on, or quoted for a prime contract or subcontracts under EPA assisted projects, included both DBE's and non DBE's.
- 2. SRF loan participants must keep the Bidder's List until the project period for the identified loan has ended and no funds are remaining.
- 3. This list must be submitted to DOW in the ATA Package. Contract Award Approval cannot be given until this form has been received by DOW.
- 4. The following information must be obtained from all prime and subcontractors. Please complete the form below:

<b>ENTITY'S NAME</b>	<b>MAILING ADDRESS</b>	<b>CONTACT PERSON</b>	<b>PHONE#</b>	<b>E-MAIL ADDRESS</b>	<b>M/WBE?</b>



**BONDS AND INSURANCE**

The minimum requirements shall be as follows:

Bonding requirements for contracts of \$100,000 or less are contained in 40 CFR 31.36(h).

Bond requirements for contracts in excess of \$100,000 are:

- Bid guarantee equivalent to five percent of the bid price. The bid guarantee shall consist of a firm commitment such as a certified check or bid bond submitted with the bid;
- Performance bond equal to 100 percent of the contract price, and
- Payment bond equal to 100 percent of the contract price. Bonds must be obtained from companies holding Certificates of Authority as acceptable sureties, issued by the U.S. Treasury.

Insurance requirements are contained in the General Conditions of the contract. In addition to the other required insurance, the owner or the contractor, as appropriate, must acquire any flood insurance made available by the Federal Emergency Management Agency as required by 44 CFR Parts 59-79, if construction will take place in a flood hazard area identified by the Federal Emergency Management Agency. The owner's requirements on Flood Insurance are contained in the Special Conditions Section of the Contracts Documents.

**NOTICE OF INTENT**

All construction projects with surface disturbance of more than 1 acre during the period of construction must have a KPDES Storm Water General Permit. The permit can be found at the following web address:

<https://dep.gateway.ky.gov/eForms/default.aspx?FormID=7>.

If you have any questions regarding the completion of this form call the Surface Water Permits Branch, at (502) 564-3410.

**Davis-Bacon Wage Rate Requirements**

CWSRF: The recipient agrees to include in all agreements to provide assistance for the construction of treatment works carried out in whole or in part with such assistance made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.), or with such assistance made available under section 205(m) of that Act (33 U.S.C. 1285(m)), or both, a term and condition requiring compliance with the requirements of section 513 of that Act (33 U.S.C. 1372) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions. All contracts and subcontracts for the construction of treatment works carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of \$2,000 the contract clauses as set forth below titled “Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)”. This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

DWSRF: The recipient agrees to include in all agreements to provide assistance for any construction project carried out in whole or in part with such assistance made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12), a term and condition requiring compliance with the requirements of section 1450(e) of the Safe Drinking Water Act (42 U.S.C.300j-9(e)) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions All contracts and subcontracts for any construction project carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of \$2,000 the contract clauses as set forth below entitled “Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)”. This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

**Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)**

**Preamble**

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients’ compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A),

below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

**I. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) For Subrecipients That Are Governmental Entities:**

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. The recipient or subrecipient may also obtain additional guidance from DOL's website at <http://www.dol.gov/whd/>

**1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.**

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

**2. Obtaining Wage Determinations.**

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State

recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from [www.wdol.gov](http://www.wdol.gov) into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

### **3. Contract and Subcontract provisions.**

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona

bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's website, [www.dol.gov](http://www.dol.gov).

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the

State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and

mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;



(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages

of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any

lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

#### **4. Contract Provision for Contracts in Excess of \$100,000.**

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

## **5. Compliance Verification.**

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent

documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractor's use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/contacts/whd/america2.htm>.

## **II. Requirements Under The Consolidated and further Continuing Appropriations Act, 2013 (P.L. 113-6) For Subrecipients That Are Not Governmental Agencies**

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2013 Continuing Resolution with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/whd/>.

**Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.**

**1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.**

Under the FY 2013 Continuing Resolution, Davis-Bacon prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

**2. Obtaining Wage Determinations.**

(a) Subrecipients must obtain proposed wage determinations for specific localities at [www.wdol.gov](http://www.wdol.gov). After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to (insert contact information for State recipient DB point of contact for wage determination) for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official).

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from [www.wdol.gov](http://www.wdol.gov) into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

### 3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

#### (1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3) ), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and

mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, [www.dol.gov](http://www.dol.gov).

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of



receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

### **(3) Payrolls and basic records.**

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency

recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

#### **4. Contract Provision for Contracts in Excess of \$100,000.**

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

## **5. Compliance Verification.**

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB . In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/whd/america2.htm> or its successor site.

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**Disadvantaged Business Enterprise (DBE) Program  
DBE Subcontractor Participation Form**

An EPA Financial Assistance Agreement Recipient must require its prime contractors to provide this form to its DBE subcontractors. This form gives a DBE<sup>1</sup> subcontractor<sup>2</sup> the opportunity to describe work received and/or report any concerns regarding the EPA-funded project (e.g., in areas such as termination by prime contractor, late payments, etc.). The DBE subcontractor can, as an option, complete and submit this form to the EPA DBE Coordinator at any time during the project period of performance.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Received from the Prime Contractor Involving Construction, Services , Equipment or Supplies	Amount Received by Prime Contractor

<sup>1</sup> A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

<sup>2</sup> Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



**Disadvantaged Business Enterprise (DBE) Program  
DBE Subcontractor Performance Form**

This form is intended to capture the DBE<sup>1</sup> subcontractor's<sup>2</sup> description of work to be performed and the price of the work submitted to the prime contractor. An EPA Financial Assistance Agreement Recipient must require its prime contractor to have its DBE subcontractors complete this form and include all completed forms in the prime contractor's bid or proposal package.

Subcontractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Prime Contractor Name		Issuing/Funding Entity:	

Contract Item Number	Description of Work Submitted to the Prime Contractor Involving Construction, Services, Equipment or Supplies	Price of Work Submitted to the Prime Contractor
DBE Certified By: ___ DOT ___ SBA ___ Other: _____		Meets/ exceeds EPA certification standards? ___ YES ___ NO ___ Unknown

<sup>1</sup> A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

<sup>2</sup> Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**Disadvantaged Business Enterprise (DBE) Program  
DBE Subcontractor Performance Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

<b>Prime Contractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

<b>Subcontractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

### Disadvantaged Business Enterprise (DBE) Program DBE Subcontractor Utilization Form

This form is intended to capture the prime contractor's actual and/or anticipated use of identified certified DBE<sup>1</sup> subcontractors<sup>2</sup> and the estimated dollar amount of each subcontract. An EPA Financial Assistance Agreement Recipient must require its prime contractors to complete this form and include it in the bid or proposal package. Prime contractors should also maintain a copy of this form on file.

Prime Contractor Name		Project Name	
Bid/ Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact	
Address			
Telephone No.		Email Address	
Issuing/Funding Entity:			

I have identified potential DBE certified subcontractors	__ YES	__ NO
--	--------	-------

If yes, please complete the table below. If no, please explain:

Subcontractor Name/ Company Name	Company Address/ Phone/ Email	Est. Dollar Amt	Currently DBE Certified ?

Continue on back if needed

<sup>1</sup> A DBE is a Disadvantaged, Minority, or Woman Business Enterprise that has been certified by an entity from which EPA accepts certifications as described in 40 CFR 33.204-33.205 or certified by EPA. EPA accepts certifications from entities that meet or exceed EPA certification standards as described in 40 CFR 33.202.

<sup>2</sup> Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

**Disadvantaged Business Enterprise (DBE) Program  
DBE Subcontractor Utilization Form**

I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to utilize the subcontractors above. I am aware of that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302 (c).

<b>Prime Contractor Signature</b>	<b>Print Name</b>
<b>Title</b>	<b>Date</b>

The public reporting and recordkeeping burden for this collection of information is estimated to average three (3) hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

\* Filled out by borrower and prime contractor.

\* Submitted after opening bids.

**BIDDER'S LIST FORM**

**OWNER** \_\_\_\_\_

**LOAN NO:** \_\_\_\_\_

**PROJECT TITLE** \_\_\_\_\_

**BID DATE:** \_\_\_\_\_

Instructions:

- 1. This list must include all firms that bid or quote on prime or subcontracts under EPA assisted projects (i.e. SRF Projects), included both DBE's and non DBE's.
- 2. SRF loan participants must keep the Bidder's List until the project period for the identified loan has ended and no funds are remaining.
- 3. This list must be submitted to DOW in the ATA Package. Contract Award Approval cannot be given until this form has been received by SRF.
- 4. The following information must be obtained from all prime and sub-contractor's. Please complete the form below:

<b>ENTITY'S NAME</b>	<b>MAILING ADDRESS</b>	<b>CONTACT PERSON</b>	<b>PHONE#</b>	<b>E-MAIL ADDRESS</b>	<b>M/WBE?</b>

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**GRW SUPPLEMENTAL GENERAL  
CONDITIONS TO EJCDC GENERAL  
CONDITIONS**

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# GRW SUPPLEMENTAL GENERAL CONDITIONS TO EJCDC GENERAL CONDITIONS

These Supplemental General Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplemental General Conditions which are defined in the Standard General Conditions of the Construction Contract have the meanings assigned to them in the General Conditions.

## **SGC-3.01**

**Add the following new paragraph immediately after Paragraph 3.01C:**

If there is any conflict between the provisions of the Contract Documents and any referenced provisions within the Contract Specifications, the language of the Contract Documents will take precedence over that of any standard specification, manual, or code.

## **SGC-4.04**

**Add the following new paragraphs immediately after Paragraph 4.04 B.2:**

Special precautions shall be taken by the Contractor to avoid damage to existing overhead and underground utilities owned and operated by the Owner or by public or private utility companies.

The available information concerning the location of existing underground utilities is shown on the Drawings. While it is believed that the locations shown are reasonably correct, neither the Engineer nor the Owner can guarantee the accuracy or adequacy of this information.

Before proceeding with the work, the Contractor shall confer with all public or private companies, agencies or departments that own and operate utilities in the vicinity of the construction work. The purpose of the conference, or conferences, shall be to notify said companies, agencies or departments of the proposed construction schedule, verify the location of, and possible interference with, the existing utilities that are shown on the Drawings, arrange for necessary suspension of service, and make arrangements to locate and avoid interference with all utilities (including house connections) that are not shown on the Drawings. The Engineer and Owner have no objection to the Contractor arranging for the said utility companies, agencies, or departments to locate and uncover their own utilities; however, the Contractor shall bear the entire responsibility and cost of locating and avoiding, or repairing damage to said existing utilities.

The Contractor shall locate all unknown metallic hazards, namely buried pipe, metals, etc., by using a pipe locator. The pipe locator shall immediately precede the trench ditching and all hazards located shall be marked in such manner as to notify the machine operator of such hazard.

Where existing utilities or appurtenant structures either underground or above ground, are encountered, they shall not be displaced or molested unless necessary, and in such case shall be replaced in as good or better condition than found as quickly as possible. Relocation and/or replacement of all utilities and appurtenant structures to accommodate the construction work shall be at the Contractor's expense, unless such relocation and/or replacement is by statute agreement the responsibility of the owner of the utility.

## **SGC-5.01**

### **Add the following new paragraph immediately after Paragraph 5.01C:**

The Performance Bond shall remain in full force and effect throughout the Guaranty period referred to in SGC 6.03. 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.

## **SGC-6.02**

### **Add the following new paragraphs immediately after Paragraph 6.02A:**

The Contractor shall employ workmen skilled in their various duties and shall remove from the project, at the request of the Engineer, any person employed in, about, or upon the work, who misconducts himself or is incompetent or negligent in the performance of the duties assigned to him.

No person under the age of eighteen (18) years and no convict labor shall be employed to perform any work under this Contract. No person whose age or physical condition is such as to make its employment dangerous to its health or safety or to the health or safety of others shall be employed to perform any work under this Contract, provided that this shall not operate against the employment of physically handicapped persons, otherwise employable, where such persons may be safely assigned to work which they can ably perform. There shall be no discrimination because of race, creed, color or political affiliation in the employment of persons for work under this Contract.

With respect to additional skilled, semi-skilled and unskilled workers employed to perform work on the project, preference in employment shall be given first to persons who reside in the city in which the work is to be performed, and second to persons residing in the county in which the work is to be performed.

## **SGC-6.03**

### **Add the following new paragraph immediately after Paragraph 6.03B:**

The Contractor agrees that it 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 of the Engineer is formally approved by the Owner or other established date as set forth herein (such as the substantial completion date), it shall make the necessary arrangements and assume all cost for extending this guarantee for the required period.

## **SGC-6.17**

### **Delete Paragraph 6.17 D.3 in its entirety and insert the following in its place.**

ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.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 approval, or has issued a Change Order that authorizes the deviation. CONTRACTOR shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the ENGINEER'S approval thereof.

**Add the following new paragraph immediately after Paragraph 6.17 D.3:**

ENGINEER'S review of submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment of systems, all of which remain the responsibility of the Contractor as required by the Contract Documents.

**SGC-10.03**

**Add the following new paragraph immediately after Paragraph 10.03:**

B. A sample Change Order form is included as Section 00 63 63.

**SGC-13.06**

**Add a new paragraph immediately after Paragraph 13.06 of the General Conditions which is to read as follows:**

When the repairs or replacements involve one or more items of installed equipment, Contractor shall provide the services of qualified factory-trained servicemen in the employ of the equipment manufacturers to perform or supervise the repairs or replacements.

**SGC-13.09**

**Add the following new paragraph immediately after Paragraph 13.09D:**

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 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 to Contractor.

**SGC-14.01**

**Add the following to Paragraph 14.01:**

The Application for Payment form shall be exactly as shown in Section 00 62 76.

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SECTION 007343 - PREVAILING WAGE RATE REQUIREMENTS AND LABOR PROVISIONS - KENTUCKY

PART 1 - GENERAL

1.1 HOURS OF WORK

- A. The Contractor shall comply in every respect to all provisions of the Kentucky Revised Statutes 337.505 to 337.550.
- B. Current Prevailing Wage Rates are attached as part of this section. Any revised Wage Rates will be issued by addendum.
- C. Contractor shall be aware that there is be a Federal Prevailing Wage Rate Schedule and a State Prevailing Wage Rate schedule included in this contract. Contractor is responsible for determining and using the higher wage rate in each individual wage category that is used under this contract.
- D. Contractor is responsible for determining the appropriate staffing necessary to perform the contract work. Contractors are also responsible for complying with the minimum wage and benefits requirements for each classification performing work on the contract. If a classification considered necessary by the contractor for performance of the work is not listed on the applicable wage determination, the Contractor must initiate a request for approval of an additional classification along with the proposed wage and benefit rates for that classification.
- E. Hours of work shall be as set out in KRS 337.550; that is, not more than eight (8) hours in one calendar day, nor more than forty (40) hours in one week, except in case of emergency caused by fire, flood or damage to life or property.
- F. The provisions included under KRS 337.540 concerning a 10-hour workday may be allowed if Owner is in agreement.
- G. Any laborer, workman, mechanic, helper, assistant or apprentice working in excess of eight (8) hours per day or forty (40) hours in one week except in case of emergency, shall be paid not less than 1-1/2 times the base rate.

1.2 OVERTIME WORK – OWNER’S REPRESENTATIVE

- A. Any overtime work (greater than 40 hours in one week) shall require the Contractor to reimburse the Owner for additional engineering project representative costs at an hourly rate of \$75.00 per hour.

1.3 CONTRACTOR WORK HOURS AND SAFETY STANDARDS ACT

- A. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any work week in which he or she is employed on such work to in excess of forty hours in such workweek unless such laborer or mechanic receives

compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

- B. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b) (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for unliquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.
- C. Withholding for unpaid wages and liquidated damages. The U.S. Environmental Protection Agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally- assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) (2) of this section.
- D. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

#### 1.4 PREVAILING WAGE REQUIREMENT

- A. In accordance with Kentucky Revised Statutes 337.510, Kentucky State Prevailing Wage Rates shall be in effect for all contracts with an estimated value in excess of \$250,000, regardless of the actual bid or contract amount.
- B. Required Wage Rates are included in these specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 007343



# **STATE WAGE RATES**

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**Steven L. Beshear**  
Governor

**KENTUCKY LABOR CABINET**  
DEPARTMENT OF WORKPLACE STANDARDS  
DIVISION OF EMPLOYMENT STANDARDS,  
APPRENTICESHIP & MEDIATION  
1047 US Hwy 127 S - Suite 4  
Frankfort, Kentucky 40601  
Phone: (502) 564-3534  
Fax (502) 696-1897  
[www.labor.ky.gov](http://www.labor.ky.gov)

**Larry Roberts**  
Secretary

**Anthony Russell**  
Commissioner

July 13, 2015

Adalyn Haney  
Project Engineer  
9701 Bunsen Parkway  
Louisville KY 40299

Re: Northern KY Water District, Lumley Tank Replacement

Advertising Date as Shown on Notification: July 16, 2015

Dear Adalyn Haney:

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

I am enclosing a copy of the current prevailing wage determination number CR 2-024, dated December 22, 2014 for CAMPBELL County. This schedule of wages shall be attached to and made a part of the specifications for the work, printed on the bidding blanks, and made a part of the contract for the construction of the public works between the public authority and the successful bidder or bidders.

The determination number assigned to this project is based upon the advertising date contained in your notification. There may be modifications to this wage determination prior to the advertising date indicated. In addition, if the contract is not awarded within 90 days of this advertising date or if the advertising date is modified, a different set of prevailing rates of wages may be applicable. It will be the responsibility of the public authority to contact this office and verify the correct schedule of the prevailing rates of wages for use on the project. Your project number is as follows: 019-H-00559-14-2, Heavy/Highway

Sincerely,

Anthony Russell  
Commissioner



An Equal Opportunity Employer M/F/D

KENTUCKY LABOR CABINET  
PREVAILING WAGE DETERMINATION  
CURRENT REVISION  
LOCALITY 24

**BRACKEN, CAMPBELL & PENDLETON COUNTIES**

Determination No. CR 2-024 2014

Date of Determination: December 22, 2014

**PROJECT NO. 019-H-00559-14-2**

**\_\_\_\_\_ BLDG \_\_\_x\_\_\_ HH**

This schedule of the prevailing rate of wages for Bracken, Campbell & Pendleton Counties has been determined in accordance with the provisions of KRS 337.505 to 337.550. This determination shall be referred to as Prevailing Wage Determination No. CR 2-024 2014.

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

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

Fringe benefit amounts are applicable for all hours worked except when otherwise noted. Welders will receive rate for craft in which welding is incidental.

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

**BUILDING CONSTRUCTION**

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

**HIGHWAY CONSTRUCTION**

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

**HEAVY CONSTRUCTION**

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

---

Anthony Russell, Commissioner  
Department of Workplace Standards  
Kentucky Labor Cabinet

Determination No. CR 2-024 2014  
December 22, 2014

**ASBESTOS/INSULATION WORKERS:**

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

	BASE RATE	\$29.05
	FRINGE BENEFITS	14.27

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

	BASE RATE	\$23.60
	FRINGE BENEFITS	9.80

-----  
**BOILERMAKERS:**

	BASE RATE	\$35.79
	FRINGE BENEFITS	16.71

-----  
**BRICKLAYERS:**

BRACKEN, CAMPBELL & PENDLETON COUNTIES:

Bricklayers:	BUILDING		BASE RATE	\$21.86
			FRINGE BENEFITS	4.75

Tile Setters:	BUILDING		BASE RATE	\$25.54
			FRINGE BENEFITS	11.64

Tile Finishers:	BUILDING		BASE RATE	\$22.90
			FRINGE BENEFITS	10.87

CAMPBELL & PENDLETON COUNTIES:

Bricklayer:	HEAVY HIGHWAY		BASE RATE	\$26.50
			FRINGE BENEFITS	11.17

BRACKEN COUNTY:

Bricklayer	HEAVY HIGHWAY		BASE RATE	26.57
			FRINGE BENEFITS	10.26

-----  
**CARPENTERS / BUILDING:**

BRACKEN, CAMPBELL & PENDLETON COUNTIES:

Drywall Hanging & Metal Stud Installation Only:	BUILDING		BASE RATE	\$21.58
			FRINGE BENEFITS	13.41

**CARPENTERS / BUILDING:**

BRACKEN & PENDLETON COUNTIES:

(Excludes Drywall Hanging & Metal Stud Installation):

	BASE RATE	\$18.86
	FRINGE BENEFITS	6.71

**CARPENTERS / BUILDING:**

CAMPBELL COUNTY:

(Excludes Drywall Hanging & Metal Stud Installation)

	BASE RATE	\$14.00
	FRINGE BENEFITS	.54

**CARPENTERS / HEAVY/HIGHWAY:**

CAMPBELL & PENDLETON COUNTIES:

Carpenters & Piledrivermen:	HEAVY & HIGHWAY		BASE RATE	\$27.05
			FRINGE BENEFITS	9.69

Divers:	HEAVY & HIGHWAY		BASE RATE	\$40.58
			FRINGE BENEFITS	9.69

**CARPENTERS / HEAVY HIGHWAY:**  
**BRACKEN COUNTY:**

Carpenter:	HEAVY HIGHWAY	BASE RATE	\$27.50
		FRINGE BENEFITS	14.96
Diver:	HEAVY HIGHWAY	BASE RATE	\$41.63
		FRINGE BENEFITS	14.96
Piledriver:	HEAVY HIGHWAY	BASE RATE	27.75
		FRINGE BENEFITS	14.96

**CEMENT MASONS / CONCRETE FINISHERS:**

BUILDING	BASE RATE	\$22.00
	FRINGE BENEFITS	12.55
HEAVY & HIGHWAY	BASE RATE	\$25.75
	FRINGE BENEFITS	8.60

**ELECTRICIANS:**

Electricians:	BASE RATE	\$26.74
	FRINGE BENEFITS	16.45

**LINE CONSTRUCTION:**

Lineman:	BUILDING	BASE RATE	\$30.50
		FRINGE BENEFITS	11.15

Equipment Operator:	BUILDING	BASE RATE	\$27.45
		FRINGE BENEFITS	10.51

Groundman:	BUILDING	BASE RATE	\$19.83
		FRINGE BENEFITS	8.92

SOUND & COMMUNICATION TECHNICIAN:	BASE RATE	\$22.50
	FRINGE BENEFITS	9.51

**ELEVATOR MECHANICS:**

BASE RATE	\$37.47
FRINGE BENEFITS	20.035

**GLAZIERS:**

BASE RATE	\$15.45
FRINGE BENEFITS	0.00

**IRONWORKERS:**

Ornamental & Structural:	BASE RATE	\$25.00
	FRINGE BENEFITS	18.40

Fence Erector:	BASE RATE	\$22.70
	FRINGE BENEFITS	18.40

**REINFORCING:**

BASE RATE	\$26.25
FRINGE BENEFITS	18.45

**LABORERS / BUILDING:**  
CAMPBELL COUNTY:

Common or General:	BUILDING	BASE RATE	\$22.90
		FRINGE BENEFITS	9.20
Mason Tender-Cement/Concrete:			
	BUILDING	BASE RATE	\$14.45
		FRINGE BENEFITS	0.00
Pipelayer and Screw Operator:	BUILDING	BASE RATE	\$23.00
		FRINGE BENEFITS	9.20
LABORER	MASON TENDER-BRICK	BASE RATE	\$14.75
		FRINGE BENEFITS	2.04

**LABORERS / HEAVY HIGHWAY:**  
CAMPBELL COUNTY:

GROUP 1 - Asphalt Laborer; Carpenter Tender; Concrete Curing Applicator; Dump Man (Batch Truck); Guardrail and Fence Installer; Joint Setter; Laborer (Construction); Landscape Laborer; Mesh Handlers & Placer; Right-of-way Laborer; Riprap Laborer & Grouter; Scaffold Erector; Seal Coating; Surface Treatment or Road Mix Laborer; Sign Installer; Slurry Seal; Utility Man; Bridge Man; Handyman; Waterproofing Laborer; Flagperson; Hazardous Waste (level D); Diver Tender; Zone Person & Traffic Control:

HEAVY & HIGHWAY	*BASE RATE	\$27.72
	FRINGE BENEFITS	9.80

GROUP 2 - Skid Steer; Asphalt Raker; Concrete Puddler; Kettle Man (Pipeline); Machine Driven Tools (Gas, Electric, Air); Mason Tender; Brick Paver; Mortar Mixer; Power Buggy or Power Wheelbarrow; Sheeting & Shoring Man; Surface Grinder Man; Plastic Fusing Machine Operator; Pug Mill Operator; & Vacuum Devices (wet or dry); Rodding Machine Operator; Diver; Screwman or Paver; Screed Person; Water Blast, Hand Held Wand; Pumps 4" & Under (Gas, Air or Electric) & Hazardous Waste (level C); Air Track and Wagon Drill; Bottom Person; Cofferdam (below 25 ft. deep); Concrete Saw Person; Cutting with Burning Torch; Form Setter; Hand Spiker (Railroad); Pipelayer; Tunnel Laborer (without air) & Caisson; Underground Person (working in Sewer and Waterline, Cleaning, Repairing & Reconditioning); Sandblaster Nozzle Person; & Hazardous Waste (level B):

HEAVY & HIGHWAY	*BASE RATE	\$27.89
	FRINGE BENEFITS	9.80

GROUP 3 - Blaster; Mucker; Powder Person; Top Lander; Wrencher (Mechanical Joints & Utility Pipeline); Yarner; Hazardous Waste (level A); Concrete Specialist; Concrete Crew in Tunnels (With Air-pressurized - \$1.00 premium); Curb Setter & Cutter; Grade Checker; Utility Pipeline Tapper; Waterline; and Caulker:

HEAVY & HIGHWAY	*BASE RATE	\$28.22
	FRINGE BENEFITS	9.80

GROUP 4 - Miner (With Air-pressurized - \$1.00 premium); & Guniting Nozzle Person:

HEAVY & HIGHWAY	*BASE RATE	\$28.67
	FRINGE BENEFITS	9.80

\*Signal Person will receive the rate equal to the rate paid the laborer classification for which he or she is signaling.

**LABORERS / BUILDING:**  
BRACKEN & PENDLETON COUNTIES:

GROUP 1: Common or General and Landscape Laborer:			
	BUILDING	BASE RATE	\$23.36
		FRINGE BENEFITS	10.70
GROUP 2: Grade Checker and Mason Tender-Cement/Concrete, Mason Tender-Brick (Hod), Pipelayer and Screw Operator:			
	BUILDING	BASE RATE	\$23.76
		FRINGE BENEFITS	10.70
LABORER	MASON TENDER-BRICK	BASE RATE	\$14.75
		FRINGE BENEFITS	2.04
LABORER	MASON TENDER – CEMENT/CONCRETE	BASE RATE	\$14.45
		FRINGE BENEFITS	0.00

**LABORERS/HEAVY HIGHWAY:**  
BRACKEN & PENDLETON COUNTIES:

GROUP 1 - Aging & Curing of Concrete; Asbestos Abatement Worker; Asphalt Plant; Asphalt; Batch Truck Dump; Carpenter Tender; Cement Mason Tender; Cleaning of Machines; Concrete; Demolition; Dredging; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level D; Flagperson; Grade Checker; Hand Digging & Hand Back Filling; Highway Marker Placer; Landscaping, Mesh Handler & Placer; Puddler; Railroad; Rip-rap & Grouter; Right-of-Way; Sign, Guard Rail & Fence Installer; Signal Person; Sound Barrier Installer; Storm & Sanitary Sewer; Swamper; Truck Spotter & Dumper; Wrecking of Concrete Forms; General Cleanup:

HEAVY & HIGHWAY	BASE RATE	\$21.80
	FRINGE BENEFITS	11.96

GROUP 2 - Batter Board Man (Sanitary & Storm Sewer); Brickmason Tender; Mortar Mixer Operator; Scaffold Builder; Burner & Welder; Bushhammer; Chain Saw Operator; Concrete Saw Operator; Deckhand Scow Man; Dry Cement Handler; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Level C; Forklift Operator for Masonary; Form Setter; Green Concrete Cutting; Hand Operated Grouter & Grinder Machine Operator; Jackhammer; Pavement Breaker; Paving Joint Machine; Pipelayer; Plastic Pipe Fusion; Power Driven Georgia Buggy & Wheel Barrow; Power Post Hole Digger; Precast Manhole Setter; Walk-Behind Tamper; Walk-Behind Trencher; Sand Blaster; Concrete Chipper; Surface Grinder; Vibrator Operator; Wagon Driller:

HEAVY & HIGHWAY	BASE RATE	\$22.05
	FRINGE BENEFITS	11.96

GROUP 3 - Asphalt Luteman & Raker; Gunnite Nozzleman; Gunnite Operator & Mixer; Grout Pump Operator; Side Rail Setter; Rail Paved Ditches; Screw Operator; Tunnel (Free Air); Water Blaster:

HEAVY & HIGHWAY	BASE RATE	\$22.10
	FRINGE BENEFITS	11.96

GROUP 4 - Caisson Worker (Free Air); Cement Finisher; Environmental - Nuclear, Radiation, Toxic & Hazardous Waste - Levels A & B; Miner & Driller (Free Air); Tunnel Blaster; & Tunnel Mucker (Free Air); Directional & Horizontal Boring; Air Track Driller (All Types); Powderman & Blaster; Troxler & Concrete Tester if Laborer is Utilized:

HEAVY & HIGHWAY	BASE RATE	\$22.70
	FRINGE BENEFITS	11.96

**MILLWRIGHTS:**

BASE RATE	\$27.55
FRINGE BENEFITS	15.39



**OPERATING ENGINEERS / BUILDING:**

CAMPBELL & PENDLETON COUNTIES:

GROUP 1: Boom & Jib 250' & Over:			
	BUILDING	BASE RATE	\$33.49
		FRINGE BENEFITS	13.90
GROUP 2: Boom & Jib Over 180' through 249':			
	BUILDING	BASE RATE	\$33.24
		FRINGE BENEFITS	13.90
GROUP 3: Boom & Jib 150' through 180':			
	BUILDING	BASE RATE	\$32.74
		FRINGE BENEFITS	13.90
GROUP 4: Master Mechanic:	BUILDING	BASE RATE	\$32.49
		FRINGE BENEFITS	13.90
GROUP 5: Crane (Compact track or rubber over 4,000 lbs capacity, self erecting, stationary, track or truck (all configurations), elevating grader, forklift (rough terrain with winch/hoist), backhoe, backhoe track, trackhoe, hoist (2 or more drums), horizontal directional drill, rotary drill, slip form paver:			
	BUILDING	BASE RATE	\$32.24
		FRINGE BENEFITS	13.90
GROUP 6: Asphalt paver, bobcat-type and/or skid steer loader with how attachment greater than 7,000 lbs, bulldozer, endloader, power grader, power scraper:			
	BUILDING	BASE RATE	\$32.12
		FRINGE BENEFITS	13.90
GROUP 7: Forklift (except Masonry), highway drills-all types, hoist (1 drum):			
	BUILDING	BASE RATE	\$31.08
		FRINGE BENEFITS	13.90
GROUP 8: Roller (except asphalt), self propelled sub grader, tractor (pulling sheep foot roller or grader):			
	BUILDING	BASE RATE	\$29.90
		FRINGE BENEFITS	13.90
GROUP 9: Allen Screed Paver (concrete); Crane-Compact, Track or Rubber under 4,000 lbs.; Masonry Forklift; Oiler:			
	BUILDING	BASE RATE	\$24.44
		FRINGE BENEFITS	13.90
OPERATOR	BOBCAT/SKID LOADER	BASE RATE	\$20.77
		FRINGE BENEFITS	5.38
OPERATOR	COMPACTOR	BASE RATE	\$24.53
		FRINGE BENEFITS	0.00
OPERAOR	EXCAVATOR	BASE RATE	\$19.18
		FRINGE BENEFITS	5.16
OPERATOR	HIGHLIFT	BASE RATE	\$25.00
		FRINGE BENEFITS	0.00

**OPERATING ENGINEERS / BUILDING (CONTINUED):**  
**BRACKEN COUNTY:**

GROUP 1: Elevating Grader, Extendable Boom Forklift, Forklift (regardless of lift height), Loader, Motor scraper, Bulldozer, Backhoe/Excavator/Trackhoe, Mechanic, Power Blade, Motor Grader, Core Drill, Hoist, Rotary Drill:

BUILDING	BASE RATE	\$30.46
	FRINGE BENEFITS	14.15

GROUP 2: Crane (including Overhead, Truck, Tower & Hydraulic), hoist (1 drum), Hoisting Engine (2 or more drums):

BUILDING	BASE RATE	\$31.31
	FRINGE BENEFITS	14.15

GROUP 3: Form Grader, Tractor (50 HP & Over), Farm Tractor with Attachments (Except Backhoe, Highlift & End Loader), Elevator (when used for hoisting), Hoisting Engineer (1 Drum or Buck Hoist):

BUILDING	BASE RATE	\$25.92
	FRINGE BENEFITS	14.15

GROUP 4: Tractor (under 50 HP), Oiler, Truck Crane Oiler:

BUILDING	BASE RATE	\$24.60
	FRINGE BENEFITS	14.15

**OPERATING ENGINEERS / HEAVY HIGHWAY**  
**CAMPBELL & PENDLETON COUNTIES:**

Master Mechanic & Boom from 150 to 180:

HEAVY & HIGHWAY	BASE RATE	\$32.69
	FRINGE BENEFITS	13.90

Boom from 180 & over:

HEAVY & HIGHWAY	BASE RATE	\$32.94
	FRINGE BENEFITS	13.90

GROUP 1: Air Compressor on Steel Erection; Barrier Moving Machine; Boiler Operator on Compressor or Generator when mounted on a Rig; Cableway; Combination Concrete Mixer & Tower; Concrete Plant (over 4 yd. Capacity); Concrete Pump; Crane (All Types, Including Boom Truck, Cherry Picker); Crane-Compact, Track or Rubber over 4,000 lbs. capacity; Cranes-Self Erecting, Stationary, Track or Truck (All Configurations); Derrick; Dragline; Dredge (Dipper, Clam or Suction); Elevating Grader or Euclid Loader; Floating Equipment (All Types); Grade-All; Helicopter Crew (Operator-Hoist or Winch); Hoe (all types); Hoisting Engine on Shaft or Tunnel Work; Horizontal Directional Drill (over 500,000 ft. lbs. thrust); Hydraulic Gantry (Lifting System); Industrial-Type Tractor; Jet Engine Dryer (D8 or D9) Diesel Tractor; Locomotive (Standard Gauge); Maintenance Operator Class A; Mixer, Paving (Single or Double Drum); Mucking Machine; Multiple Scraper; Piledriving Machine (All Types); Power Shovel; Prentice Loader; Quad 9 (Double Pusher); Rail Tamper (with auto lifting & aligning device); Refrigerating Machine (Freezer Operation); Rotary Drill, on Caisson work; Rough Terrain Fork Lift with Winch/Hoist; Side-Boom; Slip-Form Paver; Tower Derrick; Tree Shredder; Trench Machine (Over 24" wide); Truck Mounted Concrete Pump; Tug Boat; Tunnel Machine and/or Mining Machine; & Wheel Excavator:

HEAVY & HIGHWAY	BASE RATE	\$32.44
	FRINGE BENEFITS	13.90

GROUP 2 - Asphalt Paver; Automatic Subgrader Machine, Self-Propelled (CMI Type); Bobcat Type and/or Skid Steer Loader with Hoe Attachment Greater than 7,000 lbs.; Boring Machine More than 48"; Bulldozer; Endloader; Hydro Milling Machine; Kolman-type Loader (production type-Dirt); Lead Greaseman; Lighting & Traffic Signal Installation Equipment (includes all groups or classifications); Material Transfer Equipment (Shuttle Buggy) Asphalt; Pettibone-Rail Equipment; Power Grader; Power Scraper; Push Cat; Rotomill (all), Grinders & Planers of All types; Trench Machine (24" wide & under); & Vermeer type Concrete Saw:

HEAVY & HIGHWAY	BASE RATE	\$32.32
	FRINGE BENEFITS	13.90

**OPERATING ENGINEERS / HEAVY HIGHWAY (CONTINUED):**  
CAMPBELL & PENDLETON COUNTIES:

GROUP 3: A-Frame; Air Compressor on Tunnel Work (low pressure); Asphalt Plant Engineer; Bobcat-type and/or Skid Steer Loader with or without Attachments; Highway Drills (all types); Locomotive (narrow gauge); Material Hoist/Elevator; Mixer, Concrete (more than one bag capacity); Mixer, one bag capacity (Side Loader); Power Boiler (Over 15 lbs. Pressure) Pump Operator installing & operating Well Points; Pump (4" & over discharge); Roller, Asphalt; Rotovator (lime soil stabilizer); Switch & Tie Tampers (without lifting & aligning device); Utility Operator (Small equipment); & Welding Machines:

HEAVY & HIGHWAY	BASE RATE	\$31.28
	FRINGE BENEFITS	13.90

GROUP 4 - Backfiller; Ballast Re-locator; Bars, Joint & Mesh Installing Machine; Batch Plant; Boring Machine Operator (48" or less); Bull Floats; Burlap & Curing Machine; Concrete Plant (capacity 4 yd. & under); Concrete Saw (Multiple); Conveyor (Highway); Crusher; Deckhand; Farm-type Tractor with attachments (highway) except Masonry); Finishing Machine; Fireperson, Floating Equipment (all types); Fork Lift (highway); Form Trencher; Hydro Hammer; Hydro Seeder; Pavement Breaker; Plant Mixer; Post Driver; Post Hole Digger (Power Auger); Power Brush Burner; Power Form Handling Equipment; Road Widening Trencher; Roller (Brick, Grade & Macadam); Self-Propelled Power Spreader; Self-Propelled Power Subgrader; Steam Fireperson; Tractor (Pulling Sheepfoot, Roller or Grader); & Vibratory Compactor with Integral Power:

HEAVY & HIGHWAY	BASE RATE	\$30.10
	FRINGE BENEFITS	13.90

GROUP 5: Compressor (Portable, Sewer, Heavy & Highway); Drum Fireperson (Asphalt); Generator; Masonry Fork Lift; Inboard-Outboard Motor Boat Launch; Masonry Fork Lift; Oil Heater (asphalt plant); Oiler; Power Driven Heater; Power Sweeper & Scrubber; Pump (under 4" discharge); Signalperson; Tire Repairperson; & VAC/ALLS:

HEAVY & HIGHWAY	BASE RATE	\$24.64
	FRINGE BENEFITS	13.90

**OPERATING ENGINEERS / HEAVY HIGHWAY**  
BRACKEN COUNTY:

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

HEAVY & HIGHWAY	*BASE RATE	\$28.85
	FRINGE BENEFITS	14.15

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

HEAVY & HIGHWAY	*BASE RATE	\$26.24
	FRINGE BENEFITS	14.15

**OPERATING ENGINEERS / HEAVY HIGHWAY (CONTINUED):**  
**BRACKEN COUNTY:**

GROUP 3: All Off Road Material Handling Equipment, Including Articulating Dump Trucks; Greaser on Grease Facilities servicing Heavy Equipment:

HEAVY & HIGHWAY	*BASE RATE	\$26.65
	FRINGE BENEFITS	14.15

GROUP 4: Bituminous Distributor; Burlap & Curing Machine; Cement Gun; Concrete Saw; Conveyor; Deckhand Oiler; Grout Pump; Hydraulic Post Driver; Hydro Seeder; Mud Jack; Oiler; Paving Joint Machine; Power Form Handling Equipment; Pump; Roller (Earth); Steersman; Tamping Machine; Tractor (Under 50 HP); & Vibrator:

HEAVY & HIGHWAY	*BASE RATE	\$25.95
	FRINGE BENEFITS	14.15

**\*Cranes with booms 150 ft. & over (including jib) \$1.00 premium.**  
**Employees assigned to work below ground level are to be paid 10% above basic wage rate.**  
**This does not apply to open cut work.**

**PAINTERS / BUILDING:**

Brush & Roller Only:	BUILDING	BASE RATE	\$21.52
		FRINGE BENEFITS	5.30
Spray Only:	BUILDING	BASE RATE	\$23.89
		FRINGE BENEFITS	8.71
Sign Painter & Erector:	BUILDING	BASE RATE	\$20.23
		FRINGE BENEFITS	3.25

**PAINTERS / HEAVY/HIGHWAY**

BRACKEN, CAMPBELL & PENDLETON COUNTIES:

Bridge/Equipment Tender and/or Containment Builder:	HEAVY & HIGHWAY	BASE RATE	\$20.73
		FRINGE BENEFITS	8.71
Brush & Roller:	HEAVY & HIGHWAY	BASE RATE	\$23.39
		FRINGE BENEFITS	8.71
Spray:	HEAVY & HIGHWAY	BASE RATE	\$23.89
		FRINGE BENEFITS	8.71
Sandblasting; Waterblasting:	HEAVY & HIGHWAY	BASE RATE	\$24.14
		FRINGE BENEFITS	8.71
Bridge:	HEAVY & HIGHWAY	BASE RATE	\$24.39
		FRINGE BENEFITS	8.71

**PLASTERERS:**

BUILDING	BASE RATE	\$22.00
	FRINGE BENEFITS	10.10

**PLUMBERS & PIPEFITTERS:**

(Including HVAC Pipe & System Installation):	BASE RATE	\$29.80
	FRINGE BENEFITS	17.79

**ROOFERS:** (excluding metal roofs):

(Including built up roof, modified bitumen roof, rubber roof, shake & shingle roof, single ply roof):

	BASE RATE	\$26.31
	FRINGE BENEFITS	12.30

**SHEETMETAL WORKERS**

**CAMPBELL COUNTY:**

(HVAC duct installation only):

	BASE RATE	\$26.86
	FRINGE BENEFITS	17.08

Excluding HVAC duct installation:

	BASE RATE	\$15.50
	FRINGE BENEFITS	1.06

**SHEETMETAL WORKERS**

**BRACKEN & PENDLETON COUNTIES:**

(including metal roofs & HVAC duct installation):

	BASE RATE	\$28.66
	FRINGE BENEFITS	18.03

**SPRINKLER FITTERS:**

(Fire Sprinklers)

	BASE RATE	\$30.14
	FRINGE BENEFITS	17.12

**TRUCK DRIVERS / BUILDING:**

**BRACKEN, CAMPBELL & PENDLETON COUNTIES:**

10 Yard Truck: BUILDING

	BASE RATE	\$16.27
	FRINGE BENEFITS	1.50

Dump Truck: BUILDING

	BASE RATE	\$15.47
	FRINGE BENEFITS	2.74

**TRUCK DRIVERS / HEAVY/HIGHWAY:**

**CAMPBELL & PENDLETON COUNTIES:**

Driver: HEAVY & HIGHWAY

	BASE RATE	\$15.85
	FRINGE BENEFITS	4.60

Euclid Wagon; End Dump; Lowboy; Heavy Duty Equipment; Tractor-Trailer Combination; & Drag:  
 HEAVY & HIGHWAY

	BASE RATE	\$16.29
	FRINGE BENEFITS	4.60

**TRUCK DRIVERS / HEAVY/HIGHWAY:**

**BRACKEN COUNTY:**

Mobile Batch Truck Tender: HEAVY & HIGHWAY

	BASE RATE	\$16.57
	FRINGE BENEFITS	7.34

Greaser, Tire Changer, & Mechanic Tender:  
 HEAVY & HIGHWAY

	BASE RATE	\$16.68
	FRINGE BENEFITS	7.34

Single Axle Dump & Flatbed; Semi-Trailer or Pole Trailer when used to pull building materials & equipment;  
 Tandem Axle Dump; Distributor; Mixer & Truck Mechanic:  
 HEAVY & HIGHWAY

	BASE RATE	\$16.86
	FRINGE BENEFITS	7.34

**TRUCK DRIVERS / HEAVY/HIGHWAY (CONTINUED):**  
**BRACKEN COUNTY:**

Euclid, Other Heavy Earthmoving Equipment & Lowboy; Articulator Cat Truck, 5 Axle Vehicle; Winch & A-Frame when used in transporting materials; Ross Carrier; Forklift when used to transport building materials; & Pavement Breaker:

HEAVY & HIGHWAY	BASE RATE	\$16.96
	FRINGE BENEFITS	7.34

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**End of Document**  
**CR 2-024 2014**  
**December 22, 2014**

# **FEDERAL WAGE RATES**

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General Decision Number: KY150144 06/19/2015 KY144

Superseded General Decision Number: KY20140144

State: Kentucky

Construction Type: Heavy

County: Campbell County in Kentucky.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/02/2015
1	01/23/2015
2	05/01/2015
3	06/05/2015
4	06/19/2015

ASBE0008-007 03/01/2015

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR.....	\$ 28.80	14.52

ELEC0369-008 05/28/2014

	Rates	Fringes
ELECTRICIAN.....	\$ 29.88	14.78

ENGI0018-016 05/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR (Backhoe/Excavator/Trackhoe).....	\$ 32.44	13.90

ENGI0181-016 06/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR GROUP 1.....	\$ 27.66	14.15

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - Crane; Forklift

Operators on cranes with boom 150 feet and over, including jib, shall receive \$0.75 above Group 1. All cranes with piling leads will receive \$0.50 above Group 1 rate regardless of boom length. Combination rate shall mean \$0.50 per hour above the basic hourly rate of pay.

Employees assigned to work below ground level are to be paid 10% above basic wage rate. This does not apply to open cut work.

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 ENGI0181-019 07/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
GROUP 1.....	\$ 28.85	14.15
GROUP 2.....	\$ 26.24	14.15
GROUP 3.....	\$ 26.65	14.15
GROUP 4.....	\$ 25.95	14.15

OPERATING ENGINEER CLASSIFICATIONS

GROUP 1 - Drill; Pumpcrete; Roller (Bituminous)

GROUP 2 - Bobcat/Skid Steer/Skid Loader; Concrete Pump; Roller (Rock)

GROUP 3 - Articulating Truck Operator

GROUP 4 - Pump; Roller (Earth)

Operators on cranes with booms 150 feet and over (including jib) shall receive \$1.00 above Group 1 rate; 250 feet and over including jib shall receive \$1.50 above Class 1 rate. Combination Rate: All crane operators operating cranes, where the length of the boom in combination with the length of the piling leads equal or exceeds 150 feet, shall receive \$1.00 above the Group 1 rate.

Employees assigned to work below ground level are to be paid 10% above basic wage rate. This does not apply to open cut work.

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 IRON0044-005 06/01/2015

	Rates	Fringes
IRONWORKER (STRUCTURAL AND REINFORCING).....	\$ 26.40	19.15

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 \* IRON0070-011 06/01/2015

	Rates	Fringes
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IRONWORKER, ORNAMENTAL.....\$ 27.56 20.30  
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LABO0189-016 07/01/2014

	Rates	Fringes
LABORER		
Concrete Worker & Grade		
Checker.....	\$ 21.80	11.96
Tammer (Hand Held/Walk		
Behind).....	\$ 22.05	11.96

LABO0265-005 05/01/2015

	Rates	Fringes
LABORER		
Concrete Saw (Hand		
Held/Walk Behind) &		
Pipelayer.....	\$ 28.89	9.85
Flagger & Landscape.....	\$ 28.72	9.85

SUKY2011-021 06/25/2014

	Rates	Fringes
CARPENTER (Form Work Only).....	\$ 24.80	8.76
LABORER: Common or General.....	\$ 22.24	9.63
LABORER: Concrete Finishing.....	\$ 25.75	8.60
OPERATOR: Bulldozer.....	\$ 28.04	13.00
OPERATOR: Loader.....	\$ 26.68	13.00
OPERATOR: Mechanic.....	\$ 28.60	11.83
OPERATOR: Oiler.....	\$ 24.34	13.00
OPERATOR: Trencher.....	\$ 26.27	12.37
TRUCK DRIVER: Dump Truck.....	\$ 17.82	3.26

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====  
Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).  
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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date

for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

**DIVISION 01**

**GENERAL REQUIREMENTS**

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## SECTION 011100 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK PERFORMED UNDER THIS CONTRACT

This project consists of the demolition of the existing 275,000 gallon multi-column elevated Lumley water storage tank, construction of a new 500,000 gallon elevated water tank, altitude valve, and associated site piping, instrumentation and electrical work.

#### 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-0-002 Drawing Index

Specifications

See Table of Contents

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011100

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## 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 they (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 their 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 them. 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.

<u>Age of Concrete, Days*</u>	<u>Maximum Permissible Particle Velocity, IPS**</u>
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 their 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 their 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 final completion of the Contract. The date of final completion shall be that date upon which the final estimate is approved by the Owner or the date of substantial completion as defined in Section 01 77 00 of the technical Specifications. In case any date but the date of final completion is established to govern the time of the Guaranty, such date shall be duly recorded together with the terms and conditions of such agreement.
- B. The Contractor agrees that they 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, they 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

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## SECTION 011410 - SPECIAL PROVISIONS

### PART 1 - GENERAL

#### 1.1 SUBSURFACE DATA

- A. 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.
- B. Copies of reports entitled "Geotechnical Exploration Report, Lumley Tank Replacement" will be provided as Appendix "A" of these specifications and are also available for inspection at the offices of GRW Engineers, Inc., 9710 Bunsen Parkway, Louisville, KY 40299.
- C. 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 they have made whatever investigation of subsurface conditions they have deemed necessary for the purposes of bidding. The Contractor is urged to make such investigations as they deem necessary to ascertain the subsurface conditions to be encountered in the work.

#### 1.2 BUY AMERICAN REQUIREMENTS

- A. Under the requirements of the "Consolidated Appropriations Act, 2014" pertaining to Clean Water and Drinking Water State Revolving Loan Funds, all products made primarily of iron or steel shall be produced in the United States.

#### 1.3 EXISTING TANK DEMOLITION

- A. The existing 275,000 gallon multi-column elevated water storage tank shall be demolished and properly disposed of as part of this project. See specification section 024100 – Demolition and Salvage for tank demolition details. Also see the existing tank inspection report in Appendix B for tank details. Note that test results from the exterior coating indicated the exterior is a lead bearing coating. Existing tank shall be removed in its entirety before new tank construction begins.

1.4 SAFETY ZONE EASEMENT

- A. NKWD has obtained temporary safety zone easements from the adjoining property owners. This safety zone easement is not to be used for any construction type uses. All construction equipment, materials and work shall not be located in the safety zone.

1.5 WORKING HOURS

- A. Contractor will be allowed to work six days per week, Monday through Saturday. Working hours shall be limited to 7:00 a.m. to 8:00 p.m. Monday through Friday and 8:00 a.m. to 7:00 p.m. on Saturdays.

1.6 CONTAMINATED SOIL REMOVAL

- A. Contaminated soil, as indicated on the drawings, shall be removed and disposed of in accordance with specification section 024121 – Contaminated Soil Removal and Replacement.

1.7 FAA LIGHTING

- A. Elevated water tower shall be provided with obstruction lighting per the requirements of FAA as given in Appendix C – FAA Obstruction Marking and Lighting.

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.
- C. The following allowances shall be included in the Contractors bid:
1. Parking lot repair and asphalt paving of the City of Fort Thomas property - \$35,000 (in accordance with Spec Section 321216).
    - Based on the potential damage that may occur from delivery of materials and work trucks entering the project site from N. Fort Thomas Avenue, the Owner would like to see proposals from Asphalt Paving subcontractors to complete repairs and repaving, if any, as determined by the Owner.
  2. City of Fort Thomas parking lot entrance repair - \$10,000 (in accordance with Spec Section 033100).
    - Based on the potential damage that may occur from delivery of materials and work trucks entering the project site from N. Fort Thomas Avenue, the Owner would like to see proposals to repair the existing brick soldier course and concrete entrance, if any, as determined by the Owner.
  3. Any amount of the allowance not used will be removed from total contract price during the final adjusting change order.

#### 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 the 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 the Owner's request, obtain proposals for each allowance for use in making final selections and include recommendations that are relevant to performing the Work.
- C. Coordinate execution of the allowance work by the Sub-contractor selected by the Owner.

#### 1.4 SUBMITTALS

- A. Contractor shall submit three (3) separate proposals from qualified local Asphalt Paving Companies for parking lot repair for the Owner to review and choose from.
- B. Contractor shall submit proposals for parking entrance repair for the Owner to review and choose from.
- C. Submit invoices or purchase orders to show actual work completed in fulfillment of the allowance.
- D. 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 ALLOWANCES

- A. In accordance with Paragraph 11.02 of the General Conditions, the Contractor's costs for overhead, profit, and other expenses in relation to the cash allowances have been included in the Contract Price and not in the allowances.

#### 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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 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

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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 they have examined the site of the Work and informed themselves fully in regard to all conditions pertaining to the place where the Work is to be done; that they have 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 they have further satisfied themselves 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 or about the 30th day of each month 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 2.07 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 14.02A of the General Conditions.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012213

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## SECTION 012300 - ALTERNATES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF REQUIREMENTS

- A. Definition: An alternate is an amount proposed by Bidders and stated on the Bid Form which will be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in the Contract Documents.
- B. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project. The Contractor shall be responsible for all such costs.
- C. Notification: Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.
- D. Schedule: A Bid Alternates schedule has been incorporated into the Bid Form for preparation by the Bidders. Individual Specification sections contain requirements for materials and methods necessary to achieve the work described for each alternate. Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

#### 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 BASE BID OPTIONS AND DEDUCTIVE ALTERNATES

- A. The Bid Form indicates two (2) base bid options – a Multi-Column Elevated Tank (Base Bid Option No. 1) and a Pedosphere Elevated Tank (Base Bid Option No. 2). The Contractor shall select which tank construction option they have based their bid on when submitting the Bid Form. The base bid options are described in more detail below and in the project drawings. Two (2) deductive bid alternates are also listed on the Bid Form for smaller capacity tanks.
- B. The project drawings in general reflect the construction of Base Bid Option No. 1 - a new 500,000 gallon multi-column elevated water storage tank. Note that Base Bid Option No. 2 (Pedosphere style tank) shall not require the underground concrete altitude valve vault and prefabricated instruments building shown in the drawings and detailed in the specifications. In Base Bid Option No. 2, the equipment to be located in these two structures shall be located inside the pedestal base cone instead. The Contractor shall make allowances in their base bid price to adjust the construction plans and specifications to accommodate a 500,000 gallon

Pedesphere style tank, if selected, excluding the valve vault and instruments building. The tank center point indicated on Sheet C-0-101 shall be maintained for both base bid options.

- C. The Contractor shall include in their deductive bid alternate price(s) any adjustments in the construction plans and specifications to accommodate a 400,000 gallon and 300,000 gallon multi-column elevated tank and/or a 400,000 gallon and 300,000 gallon Pedesphere style tank. The tank center point indicated on Sheet C-0-101 shall be maintained for all deductive alternates.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012300



## 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 the 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 damaged, 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

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## 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 their 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 their work including Architectural and Structural Drawings, to the end that complete coordination between trades will be effected. 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 - CONTRACTORS SEQUENCE OF CONSTRUCTION SCHEDULE

### PART 1 - GENERAL

#### 1.1 CONTRACTOR'S CONSTRUCTION SEQUENCE, SCHEDULE & PROVISIONS

- A. The Contractor shall be responsible for all planning, coordination and execution of the work. The sequence of work shall provide assurances that reliable 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.
- B. The Contractor shall coordinate with the Owner for the removal of the existing Lumley tank from service.
- C. 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 their work effort to minimize and/or eliminate disruptions in service.

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013213

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## 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 their forces in a manner that will allow for the completion of the work within the contractual period.

##### B. Construction Hours:

1. Working hours shall be limited to 7:00 a.m. to 8:00 p.m. Monday through Friday and 8:00 a.m. to 7:00 p.m. on Saturdays. No work shall be done on 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 their convenience and at their own expense, should desire to carry on their 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 their 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 ten (10) 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, they 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 they intend 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 they intend 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 their 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 their submittals with those of their 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, they 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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013216

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## 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 four (4) 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.

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.

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 their 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 their 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 which is not applicable to the project, and shall be supplemented to provide additional information applicable to the project. Each copy of descriptive literature shall be

clearly marked to identify pertinent information as it applies to the project.

- C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.
- D. 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 their work, but shall in no way relieve the Contractor of their 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 their work in a safe and satisfactory manner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

## 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

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## 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 they are working in the state highway right-of-way or in City or County streets. They 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 their 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. They 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 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 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 their own arrangements at their 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 015213.

## 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.

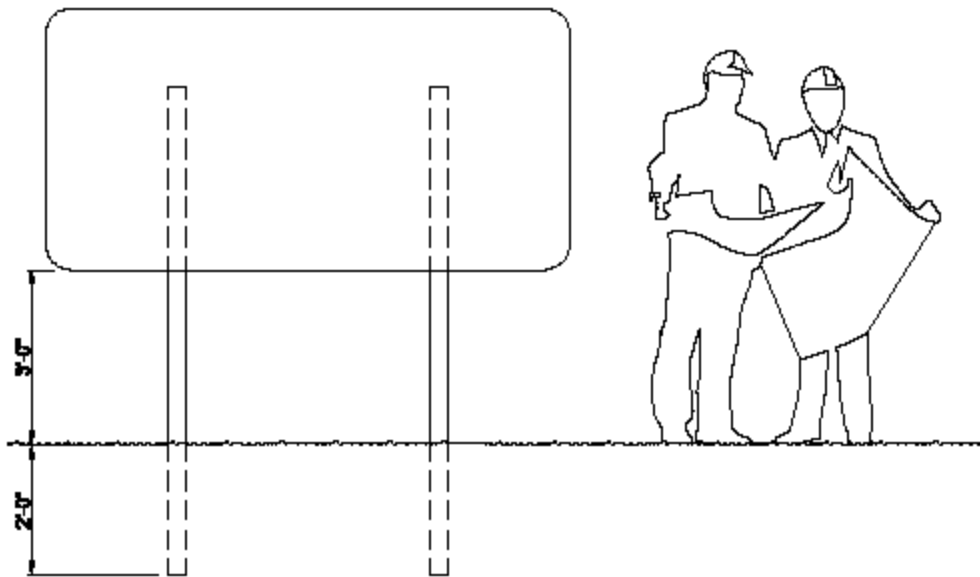
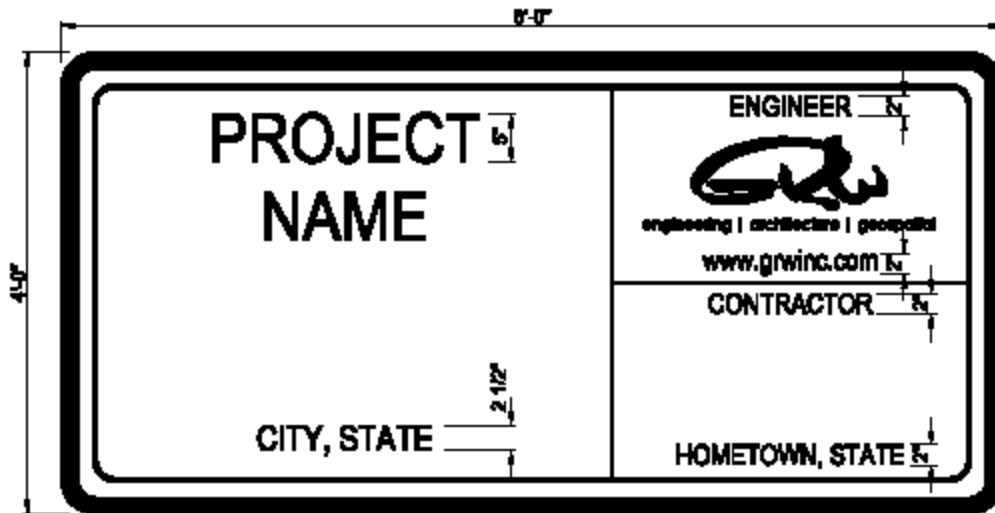
### 3.2 REMOVAL

- 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



Figure 1: Typical Project Sign



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## 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

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## 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

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## 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. They 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. They 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, they shall request Contractor to make Project Closeout submittals.
- D. Should Engineer consider that work is not finally complete:
1. They 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

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## 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

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## 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 their Authorized Representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017839

**DIVISION 02**  
**EXISTING CONDITIONS**

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## SECTION 024100 - DEMOLITION & SALVAGE

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment and services required for demolition and proper disposal of the existing 275,000 gallon elevated water storage tank and associated items as shown on the Drawings and specified herein, in compliance with all applicable federal, state and local laws and regulations.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Contaminated Soil Removal and Replacement: Section 024121
- B. Earthwork: Section 312000
- C. Geotechnical Exploration Report: Appendix A
- D. Existing Lumley Tank Inspection Report: Appendix B

#### 1.3 REFERENCES

- A. The publications listed below (latest edition) form a part of this section to the extent referenced. The publications are referenced in the text by basic designation only.

##### CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910-1025	Occupational Safety and Health Standards (Lead)
29 CFR 1926-55	Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926-62	Safety and Health Regulations for Construction (Lead)
29 CFR 1926-353	Ventilation and Protection in Welding, Cutting, and Heating
40 CFR 260	Hazardous Waste Management Systems: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 171	Standards for Transportation of Hazardous Materials
40 CFR 172	Hazardous Materials Tables and Hazardous Materials Communications Regulations

#### 1.4 SUBMITTALS

- A. General Submittal Requirements are included in Section 013323.
- B. A Work Plan, as detailed below, shall be submitted to the Engineer within two weeks prior to planned demolition work.
- C. Documentation shall be submitted of acceptance of waste and demolition materials by permitted facilities capable to dispose of said materials. Documentation of all manifests, chain of custodies, etc. shall be provided to the Engineer within 7 days of delivery to the permitted facility.

#### 1.5 WORK PLAN

- A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted in the form of a Work Plan for review. The Work Plan shall detail all proposed methods and sequences of operation including but not limited to tank appurtenance removal, removal and disposal of waste, dismantling procedures, transportation and disposal of water tank and contents, protection of existing structures and utilities and a site safety plan. 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 themselves with the amount of Work that is included under this Section.

#### 1.6 SPECIAL CONDITIONS

- A. The existing Lumley tank inspection report included in Appendix "B" shall be reviewed prior to tank demolition. Note that the inspection report indicates that test results from the exterior coating indicated the exterior is a lead bearing coating.



- B. The Contractor shall take all necessary precautions to prevent any environmental contamination of the surrounding area due to the presence of lead paint on the storage tank to be removed.
- C. The Contractor shall follow all federal, state and/or local regulations governing clean up and disposal of all materials contaminated with lead paint.

#### 1.7 REGULATORY REQUIREMENTS

##### A. Permits and Licenses

- 1. The Contractor shall obtain local, state, and/or federal permits and licenses that directly impact the Contractor's ability to perform the work specified prior to commencing demolition operations.

##### B. Statutes and Regulations

- 1. Tank closures shall be carried out in accordance with 40 CFR 262, 40 CFR 264, and 40 CFR 265 as well as the applicable local and State of Kentucky regulations. Hazardous material/waste shall be transported in accordance with State and Federal Regulations.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 DEMOLITION OF WATER TANK

- A. The procedures to remove from service and demolish the existing water storage tank shall include, but not be limited to:
  - 1. Notify the Owner within one week prior to the planned date to remove the tank from service.
  - 2. Remove all electrical conduit and appurtenances from the tank prior to dismantling.
  - 3. Remove all water that may be present that is not capable of being pumped out.
  - 4. Drain, wash out and clean of all sediments in the interior surfaces of the tank.
  - 5. Drain or flush all water from piping into the tank.
  - 6. Disconnect and cap all piping.
  - 7. Remove water tank in accordance with the approved Work Plan.
- B. Existing tank foundations shall be removed as necessary for construction of the new tank. Removed foundations shall be removed down to a depth of two feet below grade. Contractor shall be responsible for backfill of foundations abandoned in place.

### 3.2 DISPOSAL OF TANK CONTENTS AND DEMOLISHED MATERIALS

- A. All removed tank materials shall be loaded and hauled away from the site in a manner as to not cause any hazard for passersby or damage to any existing facility. Any damage shall be repaired by the Contractor at no additional cost to the Owner.
- B. Contractor shall properly and legally dispose of existing structures, fencing, driveways, miscellaneous and other accessories not specifically mentioned or shown but otherwise required for a complete project.
- C. All waste materials shall be disposed of in accordance with all federal, state and/or local regulations.
- D. All waste materials shall become the responsibility of the Contractor and the Contractor shall be responsible for the safe and proper removal and disposal of all waste materials.
- E. Storage of waste materials will not be permitted on site.
- F. All fees and transportation costs shall be the responsibility of the Contractor. The Contractor shall bear full responsibility for any and all fines against the project resulting from the improper handling and disposal of the waste materials.
- G. Steel Disposal:

Steel waste disposal shall be the responsibility of the Contractor. The Contractor shall collect, store, remove and dispose of the lead contaminated scrap steel as follows:

- 1. All scrap shall be properly disposed of at a facility approved by EPA and state or local regulatory authorities for the disposal/recycling of lead contaminated scrap steel.
- 2. The lead contaminated scrap steel shall not be sold for re-use.
- 3. Disposal of the lead contaminated scrap steel shall be accomplished by re-smelting at an EPA approved facility.
- 4. Proper disposal shall be documented by written evidence that the lead contaminated scrap steel has been delivered for disposal to an approved disposal facility. Submit one (1) copy of the completed manifest, signed and dated by the initial transporter in accordance with 40 CER262 to the Engineer.

### 3.3 WASTE CONTAINERS:

- A. Contractor shall have waste containers, drums, or dumpsters on site prior to the start of work.
- B. All debris shall be contained and stored in drums, roll-off or other proper containers at a minimum of every day and as work progresses.

- C. All containers shall be properly labeled, prepared, stored and covered with weatherproof tarps on site.
- D. Liquid disposals, where encountered, shall include pallets to keep containers off the ground, employ leak proof linings and utilize separate plastic tarp ground cover to contain any accidental spills.

### 3.4 ANALYTICAL TESTING

- A. All testing required by regulations or by the selected waste hauler or disposal facility, including any follow-up analytical testing and collection of samples, shall be the responsibility of the Contractor.
- B. All materials classified as hazardous, as determined by Toxicity Characteristics Leaching Procedure Testing (TCLP) or subsequent testing, shall be transported to an approved recycling facility or hazardous waste landfill. The hauler shall obtain the necessary insurance, permits, EPA and local identification numbers, licenses and spill contingency plans and transportation.
- C. All disposal costs, regardless of classification, including hazardous and non-hazardous materials, shall be paid for and arranged by the Contractor.

### 3.5 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.

### 3.6 PAPERWORK

- A. No material shall leave the site unless all paperwork and documentation has been properly executed by all parties including hauler and disposal facility.
- B. Copies of all manifests, chain of custodies, analytical testing results, bills of lading, and/or treatment procedure documents shall be sent to the Owner. Obtaining all required signatures shall be the responsibility of the Contractor.

### 3.7 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.

3.8 EROSION PREVENTION AND SEDIMENT CONTROL (EPSC)

- A. Contractor shall provide erosion control measures to prevent erosion or displacement of soils and discharge of soil bearing water runoff or airborne dust to adjacent properties and storm drainage facilities in accordance with local and state regulations.

3.9 DISCONNECTION OF UTILITY SERVICES

- A. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.

3.10 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.

3.11 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.

3.12 BACKFILL OF STRUCTURES

- A. 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. It is the responsibility of the Contractor to dispose of all excess demolition material from the site as soon as practicable.

3.13 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 the Owner. 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.
- B. The Owner has indicated that they would like to salvage all existing valves, including the altitude valve, and the existing pressure transducer from the existing Lumley tank. Contractor shall take care in removing these items.

3.14 SOIL QUALITY

- A. Prior sampling of the soil around the existing tank site shows that lead exists in the soil. See soils sampling results contained in the Geotechnical Report in Appendix B. Existing water storage tank shall be demolished and completely removed from the project site prior to soil remediation.
- B. The soil remediation shall be accomplished in accordance with spec section 024121 Contaminated Soil Removal and Replacement and with local, state and federal regulations.

END OF SECTION 024100

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## SECTION 024121 - CONTAMINATED SOIL REMOVAL AND REPLACEMENT

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. This specification covers the requirements for removal and disposal of soil that may have been contaminated with lead or other hazardous wastes.
- B. Included in this Scope of Work is the excavation and disposal of all contaminated soils and associated materials.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Demolition and Salvage: Section 024100
- B. Earthwork: Section 312000
- C. Erosion and Sedimentation Control: Section 312400
- D. Excavation Support and Protection: Section 315000

#### 1.3 REFERENCES

- A. The publications listed below (latest edition) form a part of this section to the extent referenced. The publications are referenced in the text by basic designation only.

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1556	Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2167	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910-1025	Occupational Safety and Health Standards (Lead)
29 CFR 1926-55	Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926-62	Safety and Health Regulations for Construction (Lead)
29 CFR 1926-353	Ventilation and Protection in Welding, Cutting, and Heating
40 CFR 260	Hazardous Waste Management Systems: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 263	Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR 268	Land Disposal Restrictions
40 CFR 171	Standards for Transportation of Hazardous Materials
40 CFR 172	Hazardous Materials Tables and Hazardous Materials Communications Regulations

1.4 SUBMITTALS

- A. General Submittal Requirements are included in Section 013323.
- B. Documentation shall be submitted of acceptance of soil materials by permitted facilities capable to dispose of said materials. Documentation of all manifests, chain of custodies, etc. shall be provided to the Engineer within 7 days of delivery to the permitted facility.

1.5 QUALIFICATIONS

- A. The Contractor shall be certified by the State of Kentucky for specified work.



## 1.6 REGULATORY REQUIREMENTS

### A. Permits and Licenses

1. The Contractor shall obtain local, state, and/or federal permits and licenses that directly impact the Contractor's ability to perform the work prior to commencing soil removal operations.

### B. Statutes and Regulations

1. Soil removal and disposal shall be carried out in accordance with 40 CFR 262 and 40 CFR 264 as well as the applicable local, State of Kentucky and federal regulations. Hazardous material/waste shall be transported in accordance with State and Federal Regulations.

## 1.7 PROJECT/SITE CONDITIONS

- A. The work shall consist of removal and disposal of soil around the project site, as indicated on the Project Drawings and discussed below. The Contractor shall verify the actual site conditions prior to submitting a bid.

## PART 2 - PRODUCTS

### 2.1 BACKFILL MATERIAL

- A. Backfill material shall be obtained from off-site. Backfill shall be classified in accordance with ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, MH, CL, or CH and shall be free from roots and other organic matter, trash, debris, snow, ice or frozen materials. If off-site materials are used, soil classification test results shall be approved prior to bringing the material onsite. The testing frequency for backfill material shall be 1 per 1000 cubic meters yards or a minimum of 1 test.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

#### A. Protection of Existing Structures and Utilities

1. The Contractor shall take all necessary precautions to avoid damage to existing structures, their appurtenances, or utilities that may be affected by work activities. Any damage to utilities resulting from the Contractor's operations shall be repaired at no expense to the Owner. The Contractor shall locate underground utilities prior to beginning construction.

### 3.2 REMOVAL OF CONTAMINATED SOIL

- A. The Contractor shall remove the top 3-inches of existing soil from within the proposed permanently fenced project area. This is approximately 7,000 square feet (65 CY). This soil shall be hauled off-site and properly disposed of in accordance with provisions stated herein.
- B. Existing water storage tank shall be demolished and completely removed from the project site prior to soil remediation.

### 3.3 BACKFILLING

- A. The excavations shall be backfilled as soon as possible after contaminated soil removals have been completed. The excavation shall be dewatered if necessary.

### 3.4 DISPOSAL REQUIREMENTS

- A. Disposal of hazardous or special wastes shall be in accordance with all local, State, and Federal solid and hazardous waste laws and regulations; the RCRA; and conditions specified herein. This work shall include all necessary personnel, labor, transportation, packaging, detailed analyses (if required for disposal, manifesting or completing waste profile sheets), equipment, and reports. Product and pumpable liquids removed from the area shall be recycled to the greatest extent practicable.
- B. Transportation shall be provided in accordance with Department of Transportation (DOT) Hazardous Material Regulations and State and local requirements, including obtaining all necessary permits, licenses, and approvals. Evidence that a State licensed hazardous waste transporter is being used shall be included in the SUBMITTALS.
- C. Records shall be maintained of all waste determinations, including appropriate results of analyses performed, substances and sample location, the time of collection, and other pertinent data as required by 40 CFR 262 Subpart D. Transportation, treatment, disposal methods and dates, the quantities of waste, the names and addresses of each transporter and the disposal or reclamation facility, shall also be recorded and available for inspection, as well as copies of the following documents:
  - 1. Manifests.
  - 2. Waste analyses or waste profile sheets.
  - 3. Certifications of final treatment/disposal signed by the responsible disposal facility official.
  - 4. Land disposal notification records required under 40 CFR 268 for hazardous wastes.

Following contract close out, the records shall become the property of the Owner.

- D. The wastes shall be taken to a treatment, storage, or disposal facility which has EPA or appropriate state permits and hazardous or special waste identification numbers and complies with the provisions of the disposal regulations. Documentation of acceptance of special waste by a facility legally permitted to treat or dispose of those materials shall be furnished to the Owner not later than 5 working days following the delivery of those materials to the facility. A statement of agreement from the proposed treatment, storage or disposal facility and certified

transporters to accept hazardous or special wastes shall be furnished to the Owner not less than 14 days before transporting any wastes.

### 3.5 COMPLETION REPORT

- A. Completion Report shall be submitted to the Engineer and shall include the following information at a minimum:
1. A cover letter signed by a responsible company official certifying that all services involved have been performed in accordance with the terms and conditions of this specification.
  2. Copies of all certifications of final disposal signed by the responsible disposal installation official.
  3. Information on who transported and accepted all wastes encountered, including copies of manifests, waste profile sheets, land disposal restriction, notification and certification forms, certificates of disposal, and other pertinent documentation.

END OF SECTION 024121

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DIVISION 03

CONCRETE

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## 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
- B. Geotechnical Exploration Report: Appendix A

#### 1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer's review in accordance with Section 013323.

- 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. 4,000 psi compressive for strength at 28 days. An exception shall be the cast in place concrete valve vault which shall be 4,500 psi, as noted on the Drawings.
    - b. Type II cement plus supplementary cementitious materials.
    - c. Max. water-cementitious materials ratio = 0.45.
    - d. Min. cement content = 584 lbs.
    - e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max.). Walls with architectural treatment shall use No. 67 (3/4" max.).
    - f. Air content = 6% plus or minus 1% by volume.
    - g. Slump = 3" - 4" 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. Max. water-cementitious materials ratio = 0.45.
- d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
- e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max). Walls with architectural treatment shall use No. 67 (3/4" max.).
- f. Air content = 6% plus or minus 1% by volume.
- g. Slump = 3" - 4" 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 their 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 80oF. 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<br>ASTM D 638     | 3,000 psi min. @<br>14 days 73oF. cure   |
| b. | Tensile Elongation<br>ASTM D 638   | 2 - 2% at 14<br>modified days 73oF. cure |
| c. | Compressive Strength<br>ASTM D 695 | 12,500 psi min. at<br>73o F. cure        |
| d. | Compressive Modules<br>ASTM D 695  | 470,000 psi min. @<br>28 days, 73oF cure |
| e. | Compressive Strength<br>ASTM D 695 | 5,500 psi min. @<br>24 days 73oF cure    |
| f. | Water Pick-up<br>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 Embecco 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. Patching 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 procured by the Owner.
- B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Owner's expense but shall be coordinated by the Contractor. 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. At least three cylinders shall be molded and cured for each tank foundation pier that is poured.
- C. Additional testing services in accordance with ACI Section 1.6.4.4 shall be paid for by the Contractor.

### 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 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg 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 cu. m) or smaller, continue mixing at least 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 cu. Yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd.
  - 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 Waterplug 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 shimmed 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 their 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" 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, Concreseive 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

DIVISION 09

FINISHES

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## SECTION 099720 – STEEL 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 D102-11 “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. Steel Structures Painting Council (SSPC)
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. ASTM D5161-01 – Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coatings on Metallic 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 MSDS, 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-61 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. A containment system as defined by SSPC – Guide 6 shall be used and shall include cover panels, screens, tarps, scaffolds, supports, and shrouds used to enclose the entire work area. Tarps shall be resistant or impermeable, solid, flame-resistant, reinforced with a fiber mesh and allow as much light to pass through the material as possible.
- 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

Coat	Tnemec	Dry Mils	Induron	Dry Mils	Carboline	Dry Mils
Primer	Aromatic Zinc Rich Urethane 94H20 Zinc	2.5 – 3.5	Organic Zinc Rich Aromatic Urethane Indurazinc MC67	2.5 – 3.5	High Solids Polyamine Epoxy Carboguard 891	4.0-6.0
Intermediate “Stripe Coat”	Polyamide Epoxy Pota-Pox Series 20HS-15BL	4.0 – 6.0	High Solids TL 70 Ceramic Epoxy	3.0 – 5.0	High Solids Polyamine Epoxy Carboguard 891	2.0-3.0
Intermediate	Polyamide Epoxy Pota-Pox Series 20HS-1255	5.0 – 8.0	---	---	---	---
Finish	Polyamide Epoxy Pota-Pox Series 20HS-11WH	5.0 – 8.0	High Solids TL 70 Ceramic Epoxy	12.0 – 15.0	High Solids Polyamine Epoxy Carboguard 891	4.0-6.0
Total DFT Range (excluding Stripe Coat)	---	12.5 -19.5	---	14.5 – 18.5	---	8.0 – 12.0

INTERIOR COATINGS - DRY

Coat	Tnemec	Dry Mils	Induron	Dry Mils	Carboline	Dry Mils
Primer	Polyamide Epoxy Hi-Build Epoxoline Series 66HS	5.0 – 8.0	Organic Zinc Rich Aromatic Urethane Indurazinc MC67	2.5 – 3.5	Organic Zinc-Rich Epoxy Carbozinc 859	3.0 - 5.0
Intermediate “Stripe Coat”	Polyamide Epoxy Hi-Build Epoxoline Series 66HS	3.0 – 5.0	High Solids TL 70 Ceramic Epoxy	3.0 – 5.0	Polyamide Epoxy Carboguard 893 SG	2.0 – 3.0
Finish**	Polyamide Epoxy Hi-Build Epoxoline Series 66HS	5.0 – 8.0	High Solids TL 70 Ceramic Epoxy	6.0 – 10.0	Polyamide Epoxy Carboguard 893 SG	2.0 – 3.0
Total DFT Range DFT(excluding Stripe Coat)	---	10.0 – 18.0	---	8.5 – 13.5	---	5.0 – 8.0

\*\* Note: Interior Dry Finish coatings shown above shall also be applied to all interior piping and valves.



**EXTERIOR COATINGS**

Coat	Tnemec	Dry Mils	Induron	Dry Mils	Carboline	Dry Mils
Primer	Aromatic Zinc Rich Urethane 94H20 Zinc	2.5 – 3.5	Organic Zinc Rich Aromatic Urethane MC67 or DF 67	2.5 – 3.5	Organic Zinc-Rich Epoxy Carbozinc 859	3.0 - 5.0
Intermediate “Stripe Coat”	Polyamide Epoxy Hi-Build Epoxoline Series 66HS	3.0 – 5.0	Organic Zinc Rich Aromatic Urethane MC67 or DF 67	2.4 – 3.5	Polyamide Epoxy Carboguard 893 SG	2.0 – 3.0
Intermediate	Polyamide Epoxy Hi-Build Epoxoline Series 66HS	5.0 – 8.0	Hi-Build, Epoxy Induramastic 85	2.5 – 3.0	Polyamide Epoxy Carboguard 893 SG	2.0 – 3.0
Finish	High Build Acrylic Polyurethane Series 740	2.0 – 3.0	Acrylic Polyurethane Indurethane 6600 Plus	2.0 – 3.0	Acrylic, Aliphatic Polyurethane Carbothane 134 HG	2.0 – 3.0
Total DFT Range (excluding Stripe Coat)	---	9.5 – 14.5	---	7.0 - 9.5	---	7.0 – 11.0
Lettering and Logo	Fluoropolymer, HydroFlon Series 700	3.0 – 4.0	Perma-Gloss Fluorourethane	2.5 – 3.0	Fluorourethane Carboxane 950	2.0 – 3.0

- Notes: 1. All completed painted areas shall be holiday tested with NACE RPO 188-99 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
2. An 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 to match Pantone 287 and Pantone 629. 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: The Society for Protective Coatings SSPC-SP 10 "Near-White Metal Blast Cleaning." Create a blast profile of 1.5 to 2.5 mils. After blast cleaning, all surfaces shall be thoroughly and completely cleaned of all traces of residue and dust.
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 to a near-white grade in accordance with the procedures specified in SSPC-SP 10 "Near-White Metal Blast Cleaning," and the shop primed surfaces shall be cleaned of all dirt and foreign matter. 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 quality 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 Standard 61.

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 60 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 60° 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%. 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 preceding 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 Steel Structures Painting Council (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 10**  
**SPECIALTIES**

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SECTION 107445 – ACCESS HATCHES

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment, and service required for the complete installation of the access hatch as specified herein and shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-in-Place Concrete: Section 033300

1.3 SUBMITTALS

- A. Submit manufacturer’s data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.
- B. 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.
- C. 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.
- 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
Access Hatches	X	X		X						X		

1.4 ACCEPTABLE MANUFACTURERS

- A. Access hatches shall be as manufactured by the Bilco Company, New Haven, Connecticut; Babcock-Davis Associates, Inc., Arlington, Massachusetts; Milcor Division Inryco, Inc., Milwaukee, Wisconsin; or equal.

## PART 2 – PRODUCTS

### 2.1 ACCESS HATCH FOR VALVE VAULT

- A. Access hatch shall be double leaf as indicated on the Contract Drawings, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand a live load of 300 pounds per sq. ft. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe.
- B. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.
- C. Doors and frames shall be mill finish with bituminous coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.
- D. Size of hatch shall be 48" x 72".

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. Installation shall be in accordance with manufacturer's instructions.
- B. Manufacturer shall guarantee against defects in material of workmanship for a period of five years.
- C. Unit shall be set with slight pitch toward drain. Furnish and install 1" diameter schedule 80 PVC plastic drainage pipe and fittings to connect to gutter drainage coupling and run to valve vault drain pipe.

END OF SECTION 107445

SECTION 107450 – PREFABRICATED INSTRUMENTS BUILDING (BASE BID OPTION NO. 1)

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Provide all labor, materials, equipment, and service required for the complete installation of the prefabricated Instruments Building as specified herein and shown on the Drawings, in accordance with all applicable local building codes.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-in-Place Concrete: Section 033300

1.3 SUBMITTALS

- A. Submit manufacturer’s data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.
- B. 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.
- C. 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.
- 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
Prefabricated Building	X	X		X		X				X		

1.4 ACCEPTABLE MANUFACTURERS

- A. Prefabricated building shall be as manufactured by Panel Built Incorporated, P.O. Box 2658, Blairsville, GA or Engineer approved equal.

## PART 2 – PRODUCTS

### 2.1 WALLS

#### A. STEEL EXTERIOR / VINYL COVERED GYPSUM INTERIOR (S/BS)

The walls shall be 3" thick 8 foot tall composite panels. The exterior facing shall be 26 gage stucco embossed steel. The interior facing shall be 26 gage stucco embossed steel, bonded to a 1/8" tempered hardboard shock plate. The gypsum shall have a vinyl finish of light cream, white or grey. The core shall be of 2.375" thick 1 lb. polystyrene. Panel division/finish strips shall consist of color coordinated vinyl "H" connectors that shall not protrude more than 1/16" beyond the finished wall panel.

The entire panel shall be laminated together using a solvent free two-part polyurethane adhesive and pressure. The panels shall have formed edge connectors that are capable of being friction locked without mechanical fasteners using a full length joint without through metal connectors. The joint shall allow lateral expansion and contraction. This shall result in a structural panel that shall not require support columns every 4 feet.

### 2.2 1/12 PITCH PANELIZED SHED ROOF W/ 9" OVERHANG

#### A. POLYSTYRENE ROOF

The roof shall be 3" thick 3-Ply composite sandwich panels. Both sides shall be stucco-embossed aluminum pre-painted white. The core shall be of 1 lb. density polystyrene foam. The entire panel shall be laminated together using a solvent free two-part polyurethane adhesive and pressure. The panels shall have formed edge connectors that are capable of being friction locked without mechanical fasteners using a full-length joint without through metal connectors. The joint shall allow lateral expansion and contraction.

### 2.3 WALL & ROOF CORE

#### A. POLYSTYRENE

The polystyrene core shall have the following mechanical properties;

Shear strength (flatwise)	18 -22 PSI
Shear Modulus (flatwise)	280 - 320 PSI

The water absorption rate shall be less than 4%.

#### B. INSULATION

All wall and roof panels shall be insulated to a minimum R value of 11.



## 2.4 CEILING

### A. SUSPENDED CEILING

The ceiling system shall consist of a complete Class "A" suspension system and acoustical material. The ceiling suspension system shall consist of a concealed assembly of structural members and such hardware and wall moldings as required to support the ceiling system with a maximum deflection of L/360 of the span. The ceiling shall be capable of incorporating lighting, heating, ventilation, air conditioning, electronic and electrical system components, as necessary. The system shall be completely integrated with the structural and mechanical elements, and shall be coordinated with the interior partitions. The ceiling system shall consist of white "T" grid system with 2' X 4' pattern. Ceiling tile shall be Armstrong "Minatex" Model #775 24" X 48" X 5/8" Lay-in or equal.

### B. FIBERGLASS INSULATION

Rolls of R-19 Kraft faced Fiberglass insulation batts shall also be included. The rolls shall be 23" wide x 6" thick x 75 square feet.

## 2.5 DOORS

### A. 20 GAUGE INSULATED STEEL FLUSH DOOR W/ CLOSER

The door shall be 36"w X 84"h X 1 3/4" thick and shall be constructed of 20 gauges hot dipped galvanized steel, mill treated for proper paint adherence. The door shall have top and bottom channel of 16 gauge steel projection welded to door skins on no less than 2" centers. The top channel shall be flush while the bottom channel shall be inverted. The hinge preparations shall be 9-gauge steel reinforcement's projection welded to the door skins in six places each. Hinge preparation shall be cut through the doors and provided with reversible filler plates to allow building site handling. Standard hinge preparation shall be 4-1/2" regular weight .134" hinge, conforming to ANSI A1567, three preparations. The doorframe shall be 16-gauge single "rabbit" commercial quality steel. The frame shall be pre-mortised for application of matching hinges and striker set of the door. The door shall be supplied with all necessary hardware as to meet local and state code requirements.

## 2.6 ELECTRICAL

### A. ELECTRICAL PACKAGE – CONCEALED – NO WIRING INCLUDED: 1 EACH

The electrical package shall consist of 1/2" EMT cable concealed in the panel and attached to flush mounted 2x4 boxes at receptacle and switch locations. There shall be (1) wall switch, (4) duplex receptacles, (2) telephone/computer prep, (1) fluorescent fixtures (100 foot candles at desk height). This package shall meet NEC (current edition). Wiring shall not be included.

### B. 125 AMP SINGLE PHASE 8 SPACE MAIN LUG BREAKER BOX: 1 EACH

The electrical service shall include an indoor load center of sufficient amperage and circuit capacity as to handle all lighting loads, receptacles and HVAC systems. NOTE: The entire electrical system for the modular building shall be in accordance with the National Electrical

Code and shall meet all N.E.C requirements

2.7 CLIMATE CONTROL

A. AIR CONDITIONING - COOLING & HEATING (HEAT PUMP): 1 EACH

The heat pump shall be 9,000 BTU's of cooling and 11,200 BTU's of heating. The unit shall be a through-the-wall type with panel preparation included. The unit shall be 230/208V, 60HZ, 20 AMP.

PART 3 – EXECUTION

3.1 GENERAL

- A. Installation shall be in accordance with manufacturer's instructions.
- B. Manufacturer shall include a full one year warranty on the product and the workmanship.

END OF SECTION 107450

DIVISION 26  
ELECTRICAL

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## SECTION 260000 - BASIC ELECTRICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1 CONTRACTOR'S UNDERSTANDING

- A. Contractors 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.

#### 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, inspection 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, except where a new motor is to be provided for an item of existing equipment (a replacement motor), then it shall be provided under this Division of the Specifications.
- 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 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, conductors, duct, and cables.
  - 6. Furnish, install, and connect all telephone boxes, outlets, etc.
  - 7. Furnish, install, and connect all utility poles, line wire, and hardware.
  - 8. Furnish, install, and connect all power distribution equipment.
  - 9. Remove all existing wiring and materials not to be reused in the renovated plant, as shown on the Contract Drawings.
  - 10. All HVAC wiring.
  - 11. Furnish and install communications system equipment.
  - 12. Furnish and install all fiber optic system cables, conduits and accessories.
- J. All raceways and wiring shall be fire stopped where required by code and/or indicated in the Contract Drawings, as specified in Section 078400.

### 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 by electronic means 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. Wiring devices.
  - 4. Device plates.
  - 5. Metal framing system (framing channel).
  - 6. Conduit fittings, expansion joints, support hardware.
  - 7. Motor control equipment - including individually mounted items and pole top items.
  - 8. Power distribution equipment - including individually mounted items.
  - 9. Adjustable speed equipment and accessories.
  - 10. Miscellaneous spare parts and hardware, i.e. terminators, lugs, etc.

11. Wire - all types and sizes.
12. Luminaires – all types.
13. Wire markers, signs, and labels.
14. Lightning/transient suppressors.
15. Motors
16. IPS and/or units.
17. Transformers.
18. Occupancy controls.
19. Communications equipment.
20. Security System.

- 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 than 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.	National Fire Protection Association	NFPA
6.	National Electrical Manufacturers Association	NEMA
7.	Occupational Safety and Health Administration	OSHA
8.	Insulated Cable Engineers Association, Inc.	ICEA
9.	Illuminating Engineering Society of North America	IES

10.	Instrument Society of America	ISA
11.	Institute of Electrical and Electronic Engineers, Inc.	IEEE
12.	American National Standards Institute, Inc.	ANSI
13.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.	ASHRAE
14.	Federal Communications Commission	FCC
15.	American Society for Testing and Materials	ASTM
16.	American Wood Preservers Association	AWPA

#### 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 luminaires, 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 luminaires 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 to set quality standards. However, each Contractor has the right to substitute other material and equipment in lieu of that specified. Providing such material and equipment meets all of the requirements of those specified and is accepted, in writing by the Engineer.
- C. The reuse of salvaged electrical equipment and/or wiring will not be permitted unless specified herein or indicated on the Contract Drawings.
- D. All salvaged or abandoned electrical materials shall become the property of the Contractor and shall be removed from the job site upon completion of the project, unless otherwise noted on the Contract Drawings or specified herein.

## 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 final 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/repared 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. Luminaires 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 receptacles, 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 luminaires diffusers shall be clean and the interior of all motor controls, etc., shall be free of dust, dirt, wire strippings, 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 clean sand. Conduit shall be laid in straight lines between pull boxes and/or structures unless otherwise notes 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 in 6 inch lifts and compacted to 98 percent standard proctor. This material shall be free of rocks over 3/4 inch in diameter.

#### 1.16 SLEEVES, CHASES AND OPENINGS

- ##### A.
- Sleeves shall be required at all points where conduits pass through 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.
- 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 with other utilities.

- ##### B.
- 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 TRAINING

- A. All manufacturers supplying equipment for this division shall provide the Owner’s operations staff with training in the operation and maintenance on the equipment being furnished. The training shall be conducted at the project site by a qualified representative of the manufacturer.
- B. The cost of this training shall be included in the bid price.
- C. The required training shall consist of both classroom and hands-on situation. Classroom training shall include instruction on how the equipment works its relationship to all accessories and other related units, detailed review of shop drawings, detailed presentation of written O & M instructions, troubleshooting and record-keeping recommendations. Hands-on-training shall include a review of the manufacturer’s O & M instructions, check out of each operator to identifying key elements of the equipment, tear down as appropriate, calibration, adjustment, greasing and oiling points, and operating manipulations of all electrical and mechanical controls.
- D. The training shall be scheduled through the Contractor with the Owner. The timing of the training shall closely coincide with startup of the equipment, but no training shall be conducted until the equipment is operational.
- E. The minimum number of hours to be provided by manufacturers supplying equipment on this project shall be in accordance with the following table:

Item	Training Hours	
	Classroom	Hands-on
Security System	1	1
Automatic Level/Pressure Control System	1	1
Solid State Motor Control	2	2

- F. At least 60 days prior to the training the manufacturer shall submit through the Contractor to the Engineer an outline of the training proposed for the Engineer’s review and concurrence.
- G. The Owner reserves the right to videotape all training sessions.

1.21 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.

#### 1.22 MAINTAINING CONTINUOUS ELECTRICAL SYSTEM AND SERVICE

- A. Existing services continuity shall be maintained at all times. In no way shall the installation and/or alteration of the electrical work interfere with or stop the normal operation of the existing facilities, except where prior arrangements have been made
- B. When additions and taps to existing services require electrical outages of any duration, arrangements shall be made in advance for such outages. All outages shall be held to an acceptable minimum with none exceeding 8 hours continuous duration. If necessary, cuts shall be performed on premium time. If performed at night, requiring a general outage, the Contractor shall furnish an auxiliary source of light and power as required. Under no circumstances shall an electrical outage of any duration be initiated until the Owner and Engineer have concurred, and as far as possible in advance.

#### 1.23 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.

#### 1.24 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 08 – Openings
- Division 09 – Finishes
- Division 10 – Specialties
- Division 11 – Equipment
- Division 13 – Special Construction
- Division 23 – Heating, Ventilating, and Air Conditioning
- Division 27 – Communications
- Division 28 – Electronic Safety and Security
- Division 31 – Earthwork
- Division 33 – Utilities
- Division 46 – Water and Wastewater Equipment

## 1.25 SERVICE ENTRANCE

- A. Conductors and terminations for service entrances shall be furnished and installed by the Contractor. Voltage, phase, and number of wires shall be as shown on the Drawings. Clearances for overhead entrance wires shall be per Power Company, NEC, and NESC requirements.
- B. Any details not shown on the Drawings or written in the Specifications pertaining to the service entrance shall be per power company requirements. It is the Contractor's responsibility to contact the utility prior to bidding and obtain any special requirements or costs they will be imposing. Those costs shall be included in the bid.
- C. On underground service entrances from pad mounted transformers, the Contractor shall be responsible for furnishing and installing all secondary and metering conduits, as well as secondary service/metering conductors.

## 1.26 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.

## 1.27 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 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.

#### 1.28 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.	Medium height wall outlet	44"	To bottom
4.	Wall type buzzers, horns, etc.	8'-0" Max.	Top 2" below ceiling
5.	Wall type exit signs	8'-0" Max.	Top of sign 2" below ceiling
6.	Fire alarm manual pull station	42"	To the handle
7.	Push-button or control stations	4'-0"	
8.	Top of panelboards or control panels	6'-0"	Maximum (except for handicapped areas)
9.	Top of local disconnect switch	6'-0"	Maximum
10.	Wall mounted outlets above a counter	4'-2"	
11.	Wall outlets over workbench	3'-6"	Coordinate with workbench
12.	Wall mount exterior luminaires	8'-0"	Except as noted on Drawings
13.	Wall mount emergency light fixtures	6'-6"	Maximum to test button
14.	Wall thermostats	4'-0"	

In situations where there appears to be a conflict with Americans with Disabilities Act (ADA) legislation, utilize the ADA requirements.

1.29 RECEIPTS

- A. Some sections of the Specifications call for equipment, materials, accessories, etc. to be provided and “turned over to the Owner” or like requirements. The Contractor shall obtain a receipt for each item turned over, signed by the Owner or his representative. A copy of this receipt shall be transmitted to the Engineer.
- B. When a question arises concerning whether items have been turned over to the Owner, and there is no signed receipt, it may be assumed that the items were not provided.

1.30 BUY AMERICAN

- A. The Contractor is responsible for compliance with any “Buy American” legislation that may apply to this project due to State, Federal, and local laws or funding agency requirements. Necessary certifications of the sourcing of materials shall be part of the submittals.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION 260000



## SECTION 260100 - ELECTRICAL DEMOLITION

### PART 1 – GENERAL

#### 1.1 SCOPE OF WORK

- A. Furnish all labor, equipment, materials, and supplies necessary for and reasonably incidental to demolition of work hereinafter specified, indicated on drawings, required or intended for completion of the work.
- B. Major items included under demolition work include, but are not limited to:
  - 1. Electrical systems in the existing facility.
  - 2. Site underground raceway for lighting, power, communications, controls, instrumentation, and security in the existing facility.
- C. Repair those areas damaged under demolition work once new services and systems have been installed.

#### 1.2 SUBMITTALS

- A. No submittals are anticipated under this Section.

#### 1.3 JOB CONDITIONS

- A. Provide adequate protection to persons and property. Execute work in such a manner as to avoid interference with required operations and use of or passage to and from adjoining buildings and facilities.
- B. Demolition work of equipment necessary for the operation of the power and control systems to be coordinated with the installation of new equipment. The demolition and installation work is to be done as quickly as possible to minimize any burdens on the Owner.

#### 1.4 CONDITION OF EXISTING FACILITIES

- A. Contractor shall verify the areas, conditions and features necessary to tie new work into existing construction. This verification shall be done prior to submittal of shop drawings, fabrication or erection, construction, or installation. The Contractor shall be responsible for the accurate tie-in of the new work to existing facilities.

### PART 2 – PRODUCTS

NOT APPLICABLE

## PART 3 – EXECUTION

### 3.1 SCHEDULES

- A. Schedule all demolition work as to cause minimal interference with existing facility operations. Refer to Specification Divisions 0 and Division 01 for additional requirements.
- B. Obtain prior approval of the Owner at least seven days in advance before starting demolition of any equipment. Under no circumstances will demolition work be approved until new equipment is ready for installation.

### 3.2 PREPARATION

- A. Disconnect or arrange for disconnection of utility service connections to equipment and areas to be demolished before starting demolition.
- B. Preserve in operating condition all active utilities transversing the project site. Protect all equipment that remains (electrical and mechanical) during demolition, and repair all damage caused by this work to satisfaction of Engineer.

### 3.3 APPLICATION

- A. All existing switchgear, luminaires, receptacles, control equipment and switches being removed shall be disposed of by the Contractor. Refer to 260000 for more details.
- B. Conduits, wire and wood products that are not salvageable shall be disposed of legally.

### 3.4 STORAGE AND HANDLING

- A. The Owner reserves the right to save materials that are a part of the demolition work. Contractor shall turn over and store any such materials at the Owner's direction.
- B. All materials not turned over to Owner shall become property of Contractor and removed promptly from project site at no additional cost to the Owner. Any permits or fees for disposal shall be the responsibility of the Contractor.

### 3.5 CLEANUP

- A. Burn no materials or debris on premises.
- B. Remove from site rubbish and debris. Leave site in safe and clean condition.

END OF SECTION 260100

## 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° C temperature rise. Building wire larger than #1 may be applied at its 75° 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/THWN –cu.) – American, Carol, Collyer, Rome, Southwire, or equal.
- B. Flexible Cords and Cables (Types SO (600V), SJO - 300V) American, Carol, Collyer, or equal.
- C. Control Cables (Shielded or unshielded) 600V max. – Belden, Eaton-Dekoron, Okonite, or equal.
- D. Instrumentation Cables (Shielded) 600V mx. – American, Belden, Eaton-Dekoron, Manhattan, 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 THHN/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 NUMBER 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 luminaires 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 where 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	Blue
Phase B	Red
Phase C	
Neutral (Grounded)	White
3-Way Tracers	Violet
Grounding	Green
Remote Energized Conductors (Control)	Yellow

3. Conductors shall be pulled into raceways in strict accordance with manufacturer's recommendations.
4. Ample slack in 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. Conductors shall not be pulled 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 C.
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.

B. Low Voltage Feeders

1. All low voltage feeders shall be 240 volt as noted in 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 splices in 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 inch). 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 - #22 AWG for multi-pair cable runs under 5,000 feet in length.
- c. Insulation resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.
- d. 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.

3. Signal and Shield Grounding

- a. All shields must be grounded at one point only as close as possible to the signal source.
- b. Analog signals, if grounded, should be grounded as near the signal source as possible.

4. Signal and Wiring Separation

- a. High level analog signals may share the same conduit or run with contact or pulse signals.
- b. A minimum separation of 12 inches between analog signal leads and a/c power conductors should be maintained. For a/c power conductors carrying 100 amps or greater, a 24 inch separation should be maintained. Perpendicular runs may be as close as 6 inches.

END OF SECTION 260519

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## 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, Thomas and Betts Blackburn, Connector Castings, Inc., Copperweld Bimetallics Group, Cathodic Engineering Equipment Co., Harger, 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 by 10 feet 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, Article 250. Main grounding electrode system shall include foundation reinforcing steel, buried metal water pipe, structural steel, rods, 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. 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, 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

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## 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, luminaires, 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.
- B. All mounting brackets and struts used inside shall be galvanized or aluminum. If galvanized is used, 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 within three feet (3') of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed ten feet (10') for 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, luminaires, 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. Support all luminaires from the structure as detailed on the drawings to comply with seismic requirements for the specified area.
- H. Use of chains, perforated iron, bailing wire, or tie wire for supporting conduit runs will not be permitted.

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, sleeves for conduits, 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. Rigid Metal Conduit (RMC), Heavy-Wall, Threaded – Allied Tube & Conduit Corp., Triangle, Wheatland Tube Co., or equal.
  - 2. 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); Schedule 40 or Schedule 80 – 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.
- B. Surface Metal raceways
  - 1. Iso-duct, Wiremold, Walker, or equal.
- C. Wireways
  - 1. Square-D, Hoffman, or equal.
- D. Raceway Fittings
  - 1. Conduit fittings – Appleton, Crouse-Hinds, OZ Gedney, or equal.
  - 2. Non-metallic conduit fittings – Carlon, Robin-Tech, Scepter, or equal.

3. Surface metal raceway fittings and fasteners shall be provided by the manufacturer of the raceway.
4. PVC coated rigid steel fittings shall be provided by the conduit manufacturer.
5. 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 Metal Conduit (RMC)

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 shall 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 Conduit (PVC)

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 Celsius minimum UL rated, have a tensile strength of 7,000 psi @ 73.4 degrees Fahrenheit, 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. Surface Metal Raceway

1. Surface metal raceway shall be 2 piece type, base mounted with snap-on cover. Raceway installation shall be in accordance with manufacturer's instruction, using adapters and fittings specifically designed and manufactured for the raceway used.

F. Flexible Conduit

1. Flexible metallic conduit shall be constructed from flexibly or spirally wound electro-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.

G. Conduit Fittings

1. Rigid Metal 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.
- f. Fittings for PVC coated rigid conduit shall be manufactured by the maker of the conduit.

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 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. 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 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. The final section of conduit connecting each motor or piece of utilization equipment subject to vibration shall be of the flexible type. Flexible conduit to space heaters shall be long enough to allow swivel action.
7. All underground conduits entering a building shall be sealed against water/condensate entering around the conductors. Sealant may be silicone rubber based caulk.
8. 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.
9. PVC conduit installed underground for low voltage application shall be schedule 40 without encasement.
10. Aluminum conduit shall not be used underground, in chlorine storage/feed areas, or placed in concrete slabs, unless it is UL listed for the purpose and factory pre-coated.
11. 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.
12. Minimum conduit size shall be 3/4 inch. The following table shows the minimum burial depth required for all exterior conduit or cable:

Rigid Metal Conduit	24"
Schedule 40 PVC	24"

13. 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.
14. All conduits entering and leaving instrument enclosures shall be sealed around the wires with silicone caulk.
15. Areas of use for each type of conduit:

Buildings – Interior	Schedule 40 PVC	EMT	RMC	Aluminum
Building Interior (Concealed)		X	X	X
Building Interior (Exposed)		X	X	X
Exterior Underground	X			

16. Underground raceways (conduit) shall be provided with steel sleeves where they pass over or under obstructions, such as: sidewalks; roadways; piping; etc.
17. All conduit shall have an insulated ground wire pulled to all equipment and receptacles.
18. EMT conduit fittings shall be compression type.
19. 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.

20. Assure conduit installation does not encroach into the ceiling height head room, walkways, or doorways.
21. Conduit may be run inside concrete slabs as long as the slab is at least 6-inches thick and conduit will have at least 12-inches of cover on both sides.

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, Spring City, Sedco, Wiegmann, or equal.
- B. Floor Boxes, Fittings, Poke-throughs –Hubbell, OZ Gedney, 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 outdoor use, not mounted in concrete may be sheet metal, NEMA 3R, rain and sleetproof, with hinged covers and latches, provided with a means of locking.
- D. NEMA 4X junction and/or pull boxes may be stainless steel, non-metallic, or cast aluminum.

### PART 3 – NOT USED

END OF SECTION 260534

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## SECTION 260553 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 EQUIPMENT LABELING

- A. All 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 end. In no way shall the installation of mounting screws void the NEMA enclosure rating of the equipment in which they are installed. If there is more than one identical unit, they shall be given consecutive numbers or other descriptions as designated by the Engineer. Nameplate background color shall be black, with white engraved letters, unless otherwise noted.
- B. Branch circuits in 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 and indicate the load served.
- C. Panels and disconnect switches shall be labeled with vinyl self-adhesive signs that warn of "High Voltage" (state the specific voltage). Other major equipment shall be labeled. The type of labels to be used shall have orange as the basic color to conform with OSHA requirements, letters shall be black. The labels shall be of proper size to fit flatly on the surface of the enclosure to make a neat appearance and not interfere with the operating function of the device. 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 the main service disconnect.

#### 1.2 LOCATING UNDERGROUND UTILITIES

- A. Plastic, red warning ribbon bearing the general notation of "buried electric service" or "buried high voltage cable" shall be placed in trenches with backfill about 12 inches below finished grade on all medium 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

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## SECTION 262416 – ELECTRIC PANEL

### 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 distribution panel as hereinafter specified and as shown on the Contract Drawings.
- B. The panel for installation under this Contract shall be selected from the following types with the panel voltage and main sizes the determining factors.
- C. Circuit breakers of size and type shown on Contract Drawings and described herein shall be provided with the panel.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Square D, General Electric, Eaton or equal.

#### 2.2 EQUIPMENT

- A. Rating
  - 1. Panel ratings shall be as shown on the Contract Drawings. Panel shall be rated for the intended voltage.
- B. Standards
  - 1. Panel shall be in accordance with the Underwriter Laboratories, Inc. “Standard for Panel” and “Standard for Cabinets and Boxes” and shall be so labeled where procedures exist. Panel shall also comply with NEMA Standard for Panel and the National Electrical Code.
- C. Panel Construction (NEMA 3R)
  - 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. Busbars for the mains shall be of copper with full sized neutral bar. 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 panel. 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.
3. Can
- a. Surface mounted boxes shall have an internal and external finish as hereinafter specified. Surface mounted boxes shall be field punched for conduit entrances.
  - b. At least 4 interior mounting studs shall be provided.
4. 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 panel 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.

D. Overcurrent Protective Devices (Circuit Breakers)

- 1. Panel 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 shall have an interrupting capacity of not less than 10,000 amperes, RMS symmetrical, unless otherwise shown in the panel 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 shall be F frame or larger.
10. All breakers shall be UL listed, and conform to requirements of NEMA Standards.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION/APPLICATION/ERECTION

- A. Circuit directories shall be typed giving location and nature of load served.
- B. Panel shall be nameplated with plastic engraved nameplate stating panel name and voltage. Nameplate shall be secured by use of stainless steel screws.

END OF SECTION 262416

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## 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. - T & B, Anderson, Burndy, or equal.
- B. Ties and Servings - T & B, Panduit, or equal.
- C. Termination and splice connectors - 3M Scotchlok, Anderson, T & B, Burndy, or equal.

#### 2.2 MATERIALS

- A. Wire Splicing and Terminations (600 Volts)
  - 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 from 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, alkalis, 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

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## 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 EQUIPMENT

##### A. General

1. Air conditioners shall be equipped with the proper cord and plug for receptacles. Range cord shall be 50 amp, 6 foot, 2#6, 2#8, Leviton No. 5436-6, or equal.
2. 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.
3. See Section 260534 for flush floor box specifications.

##### B. Receptacles

1. Duplex Receptacle (interior) – Hubbell cat. no. 5362, or equal.
2. Duplex Receptacle (exterior) – Hubbell cat. no. 5362 with Taymac Corporation or Intermatic, Inc. safety outlet enclosure.
3. Special purpose outlet - Per equipment requirements.
4. Ground fault interrupting receptacles shall be required where shown on the Contract Drawings, and shall be indicated by the abbreviation “GFI” 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 feed through but to the faceplate as well. Receptacle shall be “Hubbell”, Cat. GF20LA or equal.
5. 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.
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 plates on flush mounted boxes shall be gray nylon. 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 stainless steel drilled for conduit. Gaskets shall be required as well as all special adapters for mounting.

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.
3. 3-way switches (interior) – Hubbell cat. no. 1223, or equal.

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. Receptacles 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, minimum wire size shall be AWG No. 10.
4. The minimum free length of conductor at each box for the connection of luminaires, 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, gray 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 shall be mounted so that the grounding slot is below the neutral and hot.
7. Duplex receptacles that are located in wet locations 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

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## 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 General Electric, Square D Company, Eaton, or equal.
- B. For 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 250 volt.
- D. All switches shall be capable of interrupting locked rotor current of motor which it serves.
- E. Enclosures shall be NEMA-3R for exterior use.
- 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 UL listed and shall conform to NEMA Standards. NEMA 4X enclosed safety switches where called for shall be stainless steel, or fiberglass.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Provide fusible disconnects at package A/C units, fused as specified on unit nameplate.
- B. 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.

C. 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 per water tank manufacturer 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.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. AC Erico, Thompson Lightning Protection, Inc., Harger Lightning & Grounding, Inc., Independent Protection Co., Inc., 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 1/2 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 the water tank 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.
- K. An approved bimetal transition fitting shall be used at the roof level to change from aluminum roof conductor to copper downlead cable.

### 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 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.
- C. 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 electrical. Ensure that proper arresters have been installed on the power service.
- D. Downlead conductors from top of tank to ground shall be protected from mechanical damage from a point 8 feet above to 1 foot below grade by conduit or other means.
- E. The lightning protection installer shall secure and deliver a UL Master Label to the Engineer for the Owner upon completion of the installation.
- F. 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 33.
- D. Type 1 SPD, Secondary Power Arrestors, 240/120 Volts
  - 1. Type 1 Surge Protective Devices shall be furnished and installed on all control equipment.
- E. Type 2 SPD, Transient Voltage Surge Suppressors, 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 included, but not be limited to, computer systems, level control systems, and/or variable speed equipment.
- 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 Third 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  $8 \times 20^{\mu s}$  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 3rd edition or current safety standard for transient voltage surge suppressors)
  - 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 panel)
- B. National electrical code latest edition - (NEC Article 285 SPD and 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  $10 \times 1,000 \mu\text{sec}$  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  $10 \times 1,000 \mu\text{sec}$  test
  - 2. IEEE C62.45 – 2002 rev. - (system shall be tested to meet the C62.45)
  - 3. Category A & B - ( $0.5 \mu\text{s} \times 100 \text{ kHz}$  ring wave)
  - 4. Category B3 bi-wave - ( $8 \times 20 \mu\text{s}$  at 3,000 amperes and  $1.2 \times 50 \mu\text{s}$  at 6,000 volts)
  - 5. Category C3 bi-wave - ( $8 \times 20 \mu\text{s}$  at 10,000 amperes and  $1.2 \times 50 \mu\text{s}$  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 Protective Devices

1. Atlantic Scientific Corporation, LEA International, Current Technology, Advanced Protection Technologies, 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 overvoltages 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, Transient Voltage Surge Suppressors

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 3rd 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 3rd 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 3 <sup>rd</sup> Edition Voltage Protection Ratings (VPR)				
System Voltage	Mode of Protection			
	L-N	L-G	N-G	L-L
240/120	700	700	900	1000

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  $\pm 10$  percent.
10. Service Entrance Suppressors
- Equipment shall be a multi-stage parallel protector rated for 240/120 volts. Panel 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).
  - 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.
  - 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.
  - 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).
  - The system shall be modular with field replaceable modules. Modular units shall contain a minimum of one module per phase.
  - Equipment shall utilize a NEMA 3R enclosure.
11. Panel Suppressors & Auxiliary Panel Suppressors
- Device shall meet all specification requirements for service entrance suppressors

except as follows:

- 1) Equipment shall be a multi-stage parallel protector rated for 240/120 volts. See panel 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 3R enclosure.

## 12. Accessories

### a. 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 panel units unless otherwise recommended by manufacturer.
- B. The specified SPD system shall be installed with #10 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 panel 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 LIGHTING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. LED lamps
- B. LED Drivers

#### 1.2 REFERENCE STANDARDS

- A. National Energy Policy Act of 2005, Public Law No. 109-58.
- B. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
- D. IESNA LM-79-08 IESNA - Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products; 2008
- E. IESNA LM-80-08 IESNA - Approved Method for Measuring Lumen Maintenance of LED Light Sources
- F. IESNA TM-21-2011 – Projecting Long Term Lumen Maintenance of LED Light Sources
- G. UL 1310 and 8750 – Light Emitting Diode (LED) Equipment for Use in Lighting Products
- H. OSHA 29CFR1910.7 – luminaires shall be listed by national recognized testing laboratory approved by United States Department of Labor, Occupational Safety and Health Administration (OSHA)
- I. ANSI C82.11 – Performance requirement for high frequency ballasts
- J. ANSI/IES RP-16-10 – Nomenclature and definitions for illuminating engineering
- K. ANSI E1.20 - Remote Device Management Over DMX512 Networks
- L. ANSI C62.41 – Recommended practice in low power circuits
- M. IEC 61347-1 – General and safety requirements for lamp control gear
- N. IEC 61347-2-13 – Particular requirements for electronic control gear for LED modules
- O. IEC 62384 - DC or AC supplied electronic control gear for LED modules – performance requirements

- P. IEC 61000-3-2 - Harmonic current emissions
- Q. IEC 61547 - EMC immunity requirements
- R. IEC 62386-101/102/207 – Digital addressable lighting interface (DALI)
- S. Federal Communications Commission (FCC) rules – Part 15 Class B: Radio Frequency Devices.
  - 1. Commercial rated
- T. Entertainment Services and Technology Association
  - 1. ESTA E1.3 - Entertainment Technology - Lighting Control System - 0 to 10V Analog Control Protocol

### 1.3 SUBMITTALS

- A. See Section 013000 – Administrative Requirements, for submittal procedures
- B. Shop drawings: Clearly indicate luminaire type and name of the job. Contractor shall endeavor to submit all luminaire, driver and integral controls shop drawings at one time, in one package. Any re-submittals shall include all luminaire, driver and integral controls previously rejected or requiring further information. Specialty SSL, custom, or modified fixtures may be submitted as a separate package.
- C. Shop Drawings: Reproductions of the contract drawings are not acceptable as shop drawing.
- D. Product Data: Provide dimensions, ratings and specific catalog number and identification of items and accessories and performance data.
- E. Shop Drawings: Indicate any dimensions and components for each luminaire that are not a standard product of the manufacturer.
- F. Wiring Diagrams – as needed for special operation or interaction with other system(s)
- G. Photometric Data: Where indicated below or for substitutions, supply complete photometric data for the fixture, including optical performance, rendered by NVLAP approved laboratory developed according to the methods of the Illuminating Engineering Society of North America. Submit electronically, in IESNA LM-63 standard format.
- H. Submit photometric data for all substitute luminaires. Photometric reports are not required from specified manufacturer unless noted in 1.5.7 above.
- I. Specification Sheets: If lacking sufficient detail to indicate compliance with contract documents, standard specification sheets will not be accepted. This includes, but is not limited to, luminaire type designation, manufacturer's complete catalog number, voltage, LED type, CCT, CRI, specific driver information, system efficacy, L70 life rating, and any modifications necessary to meet the requirements of the contract documents.

- J. Substitutions shall include complete photometric data as outlined in paragraph 1.5.7 above, and point by point calculations for the specific conditions on the project. Samples shall be required for consideration of any substitutions and must be submitted in accordance with the terms outlined in paragraph 1.6.10 below.
- K. Working Samples of all substitutions: Samples shall be 120 volt with cord and plug attached, and shall include specified LEDs and all modifications necessary to meet the requirements specified in the Contract Documents.

## PART 2 - PRODUCT REQUIREMENTS

### 2.1 MANUFACTURERS

- A. Approved Manufacturers: Provide products of firms regularly engaged in the manufacture of recessed lighting fixtures and components of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years. The manufacturer of the lighting fixtures and components shall comply with the provisions of the appropriate code and standards. All fixtures shall be pretested before shipping.
- B. Conformance: Fixtures shall be manufactured in strict accordance with the Contract Drawings and Specifications.
- C. Codes: Materials and installation shall be in accordance with the latest revision of the National Electrical Code and any applicable Federal, State, and local codes and regulations.
- D. UL or CSA US Listing: All fixtures shall be manufactured in strict accordance with the appropriate and current requirements of the "Standards for Safety" to UL 8750 or others as they may be applicable. A listing shall be provided for each fixture type, and the appropriate label or labels shall be affixed to each fixture in a position concealing it from normal view.
- E. Luminaire shall be DLC Certified (Design Lights Consortium). Low lumen decorative luminaires are excluded.
- F. Specifications and scale drawings are intended to convey the salient features, function and character of the fixtures only, and do not undertake to illustrate or set forth every item or detail necessary for the work.
- G. Base Bid Manufacturers: Are listed on fixture schedule and specification. Manufacturers listed without accompanying catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.
- H. Alternate Manufacturers: Identification by means of manufacturer's names and catalog numbers is to establish basic features, quality and performance standards. Any substitutions must meet or exceed these standards.
- I. Luminaire shall carry the Lighting Facts label, verified based on LM-79 test reports. [www.lightingfacts.com](http://www.lightingfacts.com)

## 2.2 LUMINAIRES

- A. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.
- B. Each luminaire shall be designed to operate at an average operating temperature of 25°C.
- C. The operating temperature range shall be 0°C to +25°C.
- D. Each luminaire shall meet all parameters of this specification throughout the minimum operational life of 50,000 hours when operated at the average operating temperature (see 2.2.2).
- E. Led Sources
  - 1. LED's shall be manufactured by a manufacturer who has produced commercial LEDs for a minimum of five (5) years.
  - 2. Lumen Output – minimum initial delivered lumen output of the luminaire shall be as follows for the lumens exiting the luminaire in the 0-360 degree zone - as measured by IESNA Standard LM-79-08 in an accredited lab. Exact tested lumen output shall be clearly noted on the shop drawings.
  - 3. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours at the rated ambient operating temperature (see 2.2.2)
  - 4. 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
  - 5. LED Boards shall be suitable for field maintenance and have with plug-in connectors. LED boards shall be upgradable.
  - 6. Light Color/Quality-
    - a. Correlated Color temperature (CCT) range as per specification, between 3000K, 3500K and 4000K shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2-D CIE chromaticity chart.
    - b. Color shift over 6,000 hours shall be <0.007 change in u' v' as demonstrated in IES LM80 report.
    - c. The color rendition index (CRI) shall be 80 or greater.
    - d. LED boards to be tested for color consistency and shall be within a space of 2.5 MacAdam ellipses on the CIE chromaticity chart.
- F. Power Supply and Drive
  - 1. Driver: Acceptable manufacturer: eldoLED, Sylvania, or Philips that meet or exceed the criteria herein:
  - 2. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
  - 3. Driver should be UL Recognized under the component program and shall be modular for simple field replacement.
  - 4. Electrical characteristics: 120 – 277 volt, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.



5. Dimming: Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100 percent to 0.1 percent of rated lumen output with a smooth shut off function.
6. Dimming shall be controlled by a 0-10V signal, or if require “DMX”.
7. Driver shall include ability to provide no light output when the control signal drops below 0.5 V, and shall consume 0.5 watts or less in this standby.
8. Driver shall be capable of configuring a linear or logarithmic dimming curve.
9. Drivers shall track evenly across multiple fixtures at all light levels, and shall have an input signal to output light level that allows smooth adjustment over the entire dimming range regardless of the controller type.
10. Flicker: Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100-0.1 percent luminaire shall have:
  11. Less than 1 percent flicker index at frequencies below 120 Hz.
  12. Less than 12 percent flicker index at 120 Hz, and shall not increase at greater than 0.1 percent per Hz to a maximum of 80 percent flicker index at 800Hz.
  13. Driver disconnect shall be provided where required to comply with codes.
  14. The electronics/power supply enclosure shall be internal to the SSL luminaire and be accessible per UL requirements
  15. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.

G. Electrical

1. Efficiency shall be:
  - a. A minimum of 110 lumens per watt.
2. Operation Voltage - The luminaire shall operate from at 60 HZ  $\pm$ 3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage of plus or minus 10% shall have no visible effect on the luminous output.
3. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
4. 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 and meet ANSI C82.11 maximum allowable THD requirements.
5. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A. To reduce false circuit breaker tripping due to turn on inrush, the following statement ensures that electronic dimming driver will meet NEMA inrush recommendations.
6. In Rush Current: Meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 Amps<sup>2</sup> – seconds.
7. 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.
8. Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
9. Adjustment of forward LED voltage, supporting 3V through 60V.

10. Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA
11. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.
12. 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.
13. All electrical components shall be RoHS compliant.

#### H. 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 (Section 2.2.4).
  - 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.
  - d. The ratio of the peak-to-zenith maximum candela ratios shall be – 1.94:1 @ 127.5 degrees.
2. The luminaire may be determined to be compliant photometrically, if:
  - a. The initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern
  - b. The measurements shall be calibrated to standard photopic calibrations.

#### I. 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 (Section 2.2.7 (c)).
2. The LED manufacturer's maximum junction temperature for the expected life (Section 2.2.7 (c)) shall not be exceeded at the average operating ambient (Section 2.2.2).
3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient (Section 2.2.3).
4. The luminaire shall have an UL 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.

#### J. Optics

1. Optics shall consist of a high performance lens, diffusers and metal reflector.
2. Optics shall eliminate source image.

#### K. Luminaire Identification

1. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside the each unit and the outside of each packaging box.
2. The following operating characteristics shall be permanently marked inside each unit: rated voltage and rated power in Watts and Volt-Ampere.

L. Quality Assurance

1. The luminaires shall be manufactured in accordance with a manufacturer quality assurance (QA) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of the modules built to meet this specification. These tests shall include: CCT, CRI, Lumen output and wattage. Tests shall be recorded, analyzed and maintained for future reference.
2. LED luminaire designs not satisfying design qualification testing and the production quality assurance testing performance requirements described below shall not be labeled, advertised, or sold as conforming to this specification.

M. Design Qualification Testing

1. Design Qualification Testing shall be performed by a National Voluntary Laboratory Accreditation Program (NVLAP) testing facility. Such testing may be performed by the manufacturer or an independent testing lab hired by the manufacturer on new luminaire designs, and when a major design change has been implemented on an existing design. A major design change is defined as a design change (electrical or physical) which changes any of the performance characteristics of the luminaire, results in a different circuit configuration for the power supply, or changes the layout of the individual LED's in the module.
2. A quantity of two units for each design shall be submitted for Design Qualification Testing.
3. Product submittals shall be accompanied by product specification sheets or other documentation that includes the designed parameters as detailed in this specification. These parameters include (but not limited to):
  - a. Maximum power in Watts
  - b. L80 in hours, when extrapolated for the worse case operating temperature (section 2.2.3). TM21 report shall be submitted to demonstrate this.
  - c. Product submittals shall be accompanied by performance data that is derived in accordance with appropriate IESNA testing standards and tested in a laboratory that is NVLAP accredited for Energy Efficient Lighting Products.
4. Luminaire shall be tested per IESNA LM 79-08.

2.3 WARRANTY

- A. The manufacturer shall provide a single source, 5 year limited warranty against loss of performance and defects in materials and workmanship for all components of the luminaire. Warranty is from the time of acceptance of the Luminaires. All warranty documentation shall be provided to customer prior to the first shipment.

- B. Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Refer to <http://www.eldoled.com/termsandconditionsus> for detailed information.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 501.
- B. Luminaires shall be mounted straight and plumb. Contractor shall obtain all required mounting hardware.
- C. Install all required hardware and mounting brackets to secure luminaires to structure per local code requirements.

### 3.2 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 014000.
- B. Operate each luminaire after installation and connection. Inspect for improper connections and operation.
- C. Test and calibrate all controls associated with luminaires, i.e. integral photo cells and occupancy sensors.

### 3.3 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from lens and enclosures
  - 1. For cleaning acrylic lenses or diffusers, use a feather duster or dry cotton cheesecloth to rid the lens/diffuser of any minor dust. For fingerprints, smudges, or other dirt present, use an ammonia-based cleaner (such as Windex) and wipe carefully with cotton cheesecloth (so as to avoid injury from any prismatic texture of the lens).
  - 2. Job site contamination may not necessarily be removed using the above recommendations. In that case the lens would need to be replaced.
- C. Clean photometric control surfaces as recommended by manufacturer.

### 3.4 CLOSEOUT ACTIVITIES

- A. Replace any luminaire components or associated controls which is not function per specifications.

END OF SECTION 265100

**DIVISION 31**  
**EARTHWORK**

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## 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. Contaminated Soil Removal and Replacement: Section 024121
- D. Erosion and Sedimentation Control: Section 312500
- E. Excavation Support and Protection: Section 315000
- F. The report of geotechnical exploration titled "Geotechnical Exploration Report, Lumley Tank Replacement" by Thelen Associates., 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 their 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 from 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 within 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 31 25 00, 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. 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 recompactd 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" 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 insure 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 their 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 their 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: Section 312000
- B. Erosion and Sedimentation Control Section 312500

### 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

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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: Section 312319
- B. Final erosion protection measures where required are included in this Section.

PART 2 – PRODUCTS

2.1 SEED

A. The seed mixture to be sown shall be in the following proportions:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>% of Purity</u>	<u>% of Germination</u>
Kentucky 31 Tall Fescue	75	90	85
Italian Rye Grass	10	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" before lifting, and shall be of uniform thickness with not over 1-1/2" 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" loose depth).

C. Mulch on slopes greater than 4:1 shall be held in place with erosion control netting.

D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with erosion control netting.

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 greater than 4:1 and in all ditches and drainage channels, and where otherwise indicated on the Contract Drawings or directed by regulatory agencies.

2.6 TURF REINFORCEMENT MAT

- A. Where indicated on the Contract Drawings or as described in the Specifications, Turf Reinforcement Mat shall be installed for permanent 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.
- 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” X 2” X 48” tall hardwood stakes.
  - 1. Fabric shall be 48” tall, with top being even with top of stakes. Bottom 12” 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” X 4” grid.
  - 3. Stakes shall be 5” 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" to 6" 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" 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 streams 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 within 14 days after disturbance.

### 3.2 SEEDING

- A. The areas to be seeded shall be thoroughly tilled to a depth of at least 4" 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 mulch 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.
- B. 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.

#### 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

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DIVISION 32

EXTERIOR IMPROVEMENTS

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## SECTION 321216 – ASPHALT PAVING (KENTUCKY)

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. The hot-mix asphalt paving work includes the construction of an aggregate base course, asphalt base and wearing courses as specified herein. This work is to replace paving disturbed by the construction and any damages to paving by Contractor's operations, as well as new pavement and driveways, within the limits shown on the plans.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. The general provisions of the Contract, including General Conditions and General Requirements apply to the work specified in this section.
- B. Allowances:                      Section 012100
- C. Earthwork:                        Section 312000

#### 1.3 APPLICABLE STANDARDS

- A. All references in this section to the Standard Specifications shall refer to the most recent Edition of Standard Specifications for Road and Bridge Construction with all amendments thereto as published by the Kentucky Transportation Cabinet (KYTC).

#### 1.4 SUBMITTALS

- A. Job-Mix Designs: For each job mix proposed for the Work.
- B. Comply with the requirements of Section 013323.

#### 1.5 QUALITY ASSURANCE

- A. Hot Mix Asphalt Producer Qualifications: Engage a firm experienced in producing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.
- B. Producer firms shall be qualified through the Kentucky Transportation Cabinet as an approved Asphalt Mix Producing Firm.
- C. Testing and inspection: The Contractor shall retain a qualified testing laboratory for testing and inspection.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp. Comply with the provisions of KYTC Standard Specifications Section 403.03.01 for temperature requirements.
- B. Grade Control: Establish and maintain required lines and elevations.

## PART 2 – PRODUCTS

### 2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Aggregate Base Course: Dense Graded Aggregate Base (DGA) complying with Section 302 and 805 of the Standard Specifications.
- C. Coarse Aggregate: Sound, angular crushed stone, or crushed gravel, complying with Standard Specifications Section 805.

### 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO MP 1, Performance Graded Binder PG 64-22 for general applications.
- B. Tack Coat: Comply with provisions in KYTC Standard Specifications Section 406.

### 2.3 MIXES

- A. Hot-Mix Asphalt: Hot-laid, hot-mix asphalt plant mixes meeting the requirements of the Standard Specifications of the Kentucky Transportation Cabinet (KYTC) or Asphalt Institute (AI) MS-2 and complying with the following requirements:
  - 1. Base Course: Produce KYTC mixture designation Class 2 Base. There shall be no restrictions on polish resistant aggregates (utilize KYTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with Standard Specifications Section 409.
  - 2. Surface Course: KYTC mixture designation Class 2 Surface. The mixture gradation may pass through the restricted zone and there shall be no restriction on polish resistant aggregates (utilize KYTC Type “D” aggregates). Recycled Asphalt Pavement (RAP) may be utilized in accordance with Standard Specifications Section 409.
- B. Hot-Mix Asphalt: Hot-laid, hot-mix asphalt plant mixes designed according to procedures established by the Kentucky Transportation Cabinet (KYTC) and complying with the following requirements.

1. Provide mixes complying with composition, grading, and tolerance requirements Standard Specifications for the following nominal, maximum aggregate sizes:
  - a. Base Course: Mixture with a nominal maximum aggregate size of 0.75 inch with a minimum Voids in the Mineral Aggregate (VMA) of 12 percent.
  - b. Surface Course: Mixture with a nominal maximum aggregate size of 0.38 inch with a minimum VMA of 14 percent.

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Pavement installer must examine the areas excavated and backfilled and conditions under which pavement is to be constructed. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory embankments and subgrade have been established to a uniform line, properly shaped and compacted.
- B. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- C. Proof-roll subbase using loaded dump trucks or heavy rubber-tired construction equipment to locate areas that are unstable or that require further compaction.
- D. Proceed with paving only after unsatisfactory conditions have been corrected.
- E. Repairs to Base Course: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
- F. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

### 3.2 AGGREGATE BASE COURSES

- A. Place aggregate base course on subgrades free of mud, frost, snow, or ice in accordance with Section 302 of the Standard Specifications.
- B. On prepared subgrade, place base course as follows:
  1. Shape base course to required crown elevations and cross-slope grades.
  2. Place base course that exceeds 9 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  3. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D698 or in accordance with Section 302.03.04 of the Standard Specifications.

### 3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Tack Coat: Comply with provisions in Standard Specifications Section 406. Apply to the surface of concrete surfaces, existing asphalt surfaces and, when necessary, to newly constructed asphalt surfaces.

### 3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Comply with applicable provisions of KYTC Standard Specifications Section 403 for delivery, placement, spreading and compaction of the mixture.
  - 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent.

### 3.5 FIELD QUALITY CONTROL

- A. Thickness Tolerances: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Aggregate and asphalt base Course: Plus or minus 1/2 inch.
  - 2. Asphalt surface course: Plus or minus 1/4 inch.
  - 3. Provide a minimum fall of 2% to facilitate drainage unless otherwise indicated on the Drawings.
- B. Surface Smoothness: Compact each course to produce a surface smoothness with the following tolerances as determined using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Aggregate base course: 3/8 inch.
  - 2. Asphalt base course: 1/4 inch.
  - 3. Asphalt surface course: 1/8 inch.
  - 4. Crowned surfaces: Test with crowned template centered and at a right angle to crown. Maximum allowable variance from template is 1/4 inch.
- C. In-Place Density: Field density test of in-place compacted aggregate base will be determined by nuclear method in accordance with ASTM D 2940. Field density of in-place compacted pavement will be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726. Test will be made for every 1,000 square yards or less of installed pavement.
- D. Core Sampling: If required to confirm either thickness tolerances or compaction of asphalt



courses, core samples shall be taken and tested according to ASTM D 3549 for thickness and ASTM D 1188 or ASTM D 2726 for compaction. Determination of need for core samples will be made by the Engineer.

END OF SECTION 321216

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## SECTION 323113 - CHAIN LINK SECURITY FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and service required to furnish and install chain link fencing and gates according to the layout shown on the Contract Drawings. Height of the fencing fabric shall be seven (7) feet.

#### 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Finish Grading: Section 312000
- B. Cast-In-Place Concrete: Section 033100

#### 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. Framework shall conform to one of the following:

1. Steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to ASTM F1043 - Group IA; external coatings per F1043 paragraph 7.1.1 and internal coatings per F1043 paragraph 7.2.1.
2. High strength steel pipe triple coated per ASTM F1043 - Group IC; external coatings per F1043 paragraph 7.1.2, and internal coatings per F1043 paragraph 7.2.4.
  - a. All coatings to be applied after welding.
  - b. Pipe shall be straight, true to section and shall conform to the following weights:

Pipe Size Outside Diameter	Group 1A Weight (Lbs per Ft.)	Group 1C Weight (Lbs per Ft.)
1-5/8"	2.27	1.84
2"	2.72	2.28
2-1/2"	3.65	3.12
3"	5.79	4.64
3-1/2"	7.58	5.71
4"	9.11	6.56

- B. Fabric: Fabric shall be aluminized fabric manufactured in accordance with ASTM A-491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A-817. Fabric shall be 9 gauge, woven in a 2" diamond mesh. Top selvage to be twisted and barbed. Bottom selvage to be knuckled.
  1. The aluminum coated wire shall have a tensile strength of at least 80,000 pounds per square inch.

## 2.2 COMPONENTS

Components of the fencing system shall be in accordance with the following requirements:

- A. Fence Posts:

Fabric Height	Group IA or Group IC	
	Line Post O.D.	Terminal Post O.D.
Under 6"	2"	2-1/2"
6' to 9'	2-1/2"	3"
9' to 12'	3"	4"

B. Gate Posts:

Single Gate Width	Double Gate Width	Group IA or Group IC Post O.D.
Up to 6'	Up to 12'	3"
7' to 12'	13' to 25'	4"

C. Rails and Braces: 1-5/8" O.D.

D. Fittings:

1. Post Caps: Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for line posts. All fittings to conform to ASTM F-626.
2. Rail and Brace Ends: Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.
3. Top Rail Sleeves: Tubular steel, 0.051 thickness x 7" long, expansion type.
4. Tension Bars: Steel strip, 5/8" wide x 3/16" thick.
5. Tension Bands: Pressed steel, 14 gauge thickness x 3/4" wide.
6. Brace Bands: Pressed steel, 12 gauge thickness x 3/4" wide.
7. Truss rods: Steel rod, 3/8" diameter merchant quality with turnbuckle.
8. Barbed Wire Arms: Pressed steel, cast iron or cast aluminum alloy fitted with clips or slots for attaching three strands of barbed wire. Arms shall be set outward on a 45 degree angle and be capable of supporting a 250 pound load at outer barbed wire connecting point without causing permanent deflection.

E. Tension Wire: Marcellled 7 gauge steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A-824.

F. Tie Wires: Aluminum, 9 gauge, alloy 1100-H4 or equal.

G. Hog rings: Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface.

H. Barbed Wire: Commercial quality steel, 12-1/2 gauge, three strand twisted line wire with 4 point barbs at 5-inch spacing. Coating shall consist of a minimum of 0.80 ounces of zinc per square foot of wire surface conforming to ASTM A-121 or a minimum of 0.30 ounces of aluminum per square foot of wire surface conforming to ASTM A-585.

2.3 CONCRETE MIX

A. Concrete for footings shall be ASTM C-94 Portland Cement concrete with maximum 3/4" 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. Frames:
  - 1. Swing gate frames shall be of 2" outside diameter galvanized Group IA or Group IC, having corners fitted with rigid watertight heavy malleable castings or electrically welded joints. Internal bracing shall be of 1-5/8" outside diameter galvanized steel pipe, Group IA or Group IC.
- C. Hinges:
  - 1. Gate hinges shall be double clamping offset type allowing gates to swing back parallel with line of fence. They shall be malleable iron and forged steel heavily galvanized.
- D. Latches and Keepers:
  - 1. Gate latch shall be of eccentric double locking type which engage strike securely bolted to either gate frame or gate post 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.
- E. Gate manufacturer and supplier shall be responsible for all hardware associated with attaching gates and removable panels.

## 2.5 TEMPORARY FENCE

- A. Temporary chain link fence shall be installed around the temporary easements safety zone as shown on the Contract Drawings. Temporary fence materials and installation shall be in accordance with this specification sections except that fence post are not required to be installed in concrete footings and barbed wire is also not required.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Installation to conform to ASTM F-567.
- B. Post Spacing: Space line posts at intervals not exceeding ten feet.
- C. Post Setting: Set terminal, gate and line posts plumb in concrete footings of the dimensions shown on the Details. Top of footing to be 2" above grade and sloped to direct water away from posts.
- D. Bracing: Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.

- E. Top and Bottom Rail: Install through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.
- F. Top Tension Wire: If top rail is not required, stretch tension wire through loop caps and fasten to terminal posts.
- G. Fabric: Pull fabric taut with bottom selvage 2" above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15" intervals. Tie to line posts and top rails with tie wires spaced at maximum 12" on posts and 24" on rails. Attach to bottom tension wire with top rings at maximum 24" intervals.
- H. Barbed Wired: Anchor to terminal extension arms, pull taut and firmly install in slots of line post extension arms.
- I. Gates: Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete.
- J. Fasteners: Install nuts for fittings, bands, and hardware bolts on inside of fence.

### 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

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## 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:

<u>Common Name</u>	<u>Proportion By Weight</u>	<u>% of Purity</u>	<u>% of Germination</u>
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" before lifting, and shall be of uniform thickness with not over 1-1/2" or less than 1" 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 erosion control netting.
- 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 their 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 their activities or those of their 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 yard in size will be allowed up to a maximum of 10 percent of any area.

END OF SECTION 329200

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**DIVISION 33**

**UTILITIES**

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## SECTION 330933 - INSTRUMENTS

### PART 1 - GENERAL

#### 1.1 WORK INCLUDED

- A. The Contractor shall furnish and install all primary devices, transmitters, primary and secondary receivers, analyzers and accessory items as shown on the Contract Drawings and as specified herein.

### PART 2 - PRODUCTS

#### 2.1 INSTRUMENTS AND ACCESSORY EQUIPMENT

##### A. Product Descriptions

##### 1. Loop Isolator/Signal Converter:

- a. Loop isolators or signal converters shall be furnished and installed where indicated, to isolate signals or to increase the load capacity of a system required to have many devices in the loop. Isolators shall provide 3-way isolation, and shall have a power supply voltage of 115 VAC unless otherwise indicated. 2-wire style isolators are not acceptable. Isolators shall be Moore FCT-TX, AGM, RIS, or equal, enclosed as appropriate for the application, or as indicated.

##### 2. Computing Relays/Integrators:

- a. Computing relays or integrators for such purposes as amplitude discrimination, batching, summing, totalization, etc., shall be Moore, or equal.

##### 3. Transient/Lightning Suppressors:

- a. Lightning protectors shall be of 2 types - those for protecting d-c wires (current protectors) and those for protecting a-c wires.
- b. The d-c protectors shall be of the fast-acting metal oxide varistor type (MOV) designed to fit and protect all typical 4-20 mA, field mounted transmitters from damaging transients induced by lightning or heavy electrical equipment, and shall provide protection each line to ground, and line-to-line.
- c. The a-c protectors shall be the fast-acting MOV type in combination with a gas tube type secondary protector designed to provide protection against lightning and other high voltage surges for any a-c line-to-ground system.
- d. The lightning protectors shall be installed at each end of each metering loop, and on all power supplies.
- e. All PLC I/O shall be protected by TVSS devices either built-in the terminal strip or added to the panels.

##### 4. Low Range Turbidimeter

- a. The turbidimeter and transmitter for monitoring filter effluent shall be furnished by the instrument supplier and shall be HACH Model 1720E, continuous reading low range turbidimeter. The turbidity monitoring system shall include at least one turbidimeter, and one graphical interface unit with internal power supply. The system shall be capable of functioning as a single sensor system and also be easily expanded into a networked system of up to two turbidimeters, two output devices, two digital displays, two additional remote interface units, and two serial I/O modules, using a single graphical interface unit.
- b. The turbidimeter shall be a microprocessor-based, continuous-reading, on-line nephelometric instrument meeting all design and performance criteria specified by USEPA method 180.1. Light shall be directed through the surface of the sample and the detector shall be immersed in the sample, eliminating glass windows and flow cells. Optical components shall be mounted in a sealed head assembly that can be removed easily for calibration/service, without disturbing sample flow. The turbidimeter body shall be constructed of corrosion-resistant polystyrene, and shall include an internal bubble trap to vent entrained air from the sample stream. The turbidimeter shall offer the choice of formazin-based (20 or 1 NTU) or instrument comparison-based calibration methods. Accuracy shall be  $\pm 2\%$  of reading or  $\pm 0.020$  NTU (whichever is greater) from 0 to 40 NTU, and  $\pm 5\%$  of reading from 41 to 100 NTU. Resolution shall be 0.001 NTU and repeatability shall be better than  $\pm 1.0\%$  of reading or  $\pm 0.002$  NTU (whichever is greater). User selectable signal averaging, bubble rejection, alarm and recorder output hold, and self-test diagnostics shall be provided.
- c. The interface unit shall allow operators to control sensor and interface functions with user-friendly, menu-driven software, and shall provide data logging of measurement data from up to two turbidimeters for 15 minutes, 1 hour, 24 hours, 30 days, or 180 days and the capability to transfer data to a computer or printer via direct MODBUS communications or directly into a Personal Digital Assistant (PDA) via a wireless IR Port. The interface unit will also have a built-in data logger with the storage capacity to store data on 15-minute intervals for up to 6 months with two sensors per controller. Each interface will also include two 4-20 mAdc analog outputs and 3 un-powered SPDT alarm contacts. The interface unit and the DC power supply shall be housed in a NEMA-4X (indoor) industrial metal/plastic enclosure, and the power supply shall automatically accept input in the range of 100 to 230 VAC, 50/60 Hz, HACH Model SC200.
- d. All system components shall be NRTL listed to UL3101-1, certified to CSA C22.2 No. 1010.1, and CE certified by manufacturer to EN 6 1010-1. For immunity and emissions, system components shall be CE certified by manufacturer to EN50082-2 (European Generic Immunity Standard) per 89/336/EEC EMC, and En50081-2 per 89/336/EEC EMC, and shall also meet FCC Part 15, Class A and Canadian Interface-Causing Equipment Regulation ICES-003, Class A standards.
- e. All necessary materials and equipment for calibration shall be provided, including 1 liter calibration cylinder, TenSette pipet, and a pint bottle of 4000 NTU Formazin Primary Standard.
- f. Accessories included for each unit shall be relays, signal converters, interconnecting sensor cable (length as required; 6 foot sensor cable is standard; however, Contractor shall provide 25 foot sensor cable where required) for signal, and power between turbidimeter, power supply, and interface module, and instructions in 8 copies. The turbidimeter shall be mounted, piped, and wired as detailed on the Drawings.

- g. The instrument supplier shall furnish the services of a qualified technical service representative to perform supervisory services required to place the system in operation and train the plant personnel.

5. Amperometric Chlorine Analyzer with Ph Monitor

- a. The chlorine analyzer shall be an amperometric chlorine analyzer for continuous measurement of free chlorine in aqueous solutions.
- b. The method of measuring free or total chlorine will be with a three-electrode amperometric sensor immersed into an electrolytic medium with a membrane, selective to chlorine, separating it from the sample.
- c. Other methods of chlorine measurement, such as two-electrode amperometric, open cell amperometric, or measurements with external pH compensation are not acceptable.
- d. Performance Requirements
  - 1) Measurement range: 0 to 20 ppm chlorine for free chlorine
  - 2) Free Chlorine
    - a) Low Limit Of Detection (LOD): 30 ppb (0.03 ppm) or better
    - b) Limit Of Quantitation (LOQ): 90 ppb (0.09 ppm) or better
    - c) Repeatability/precision: 30 ppb or 3%, whichever is greater
    - d) Response time: ~140 s for 90% change ( $T_{90}$ ) (At a stable T and pH)
    - e) Interference: Monochloramine, Chlorine Dioxide, Ozone, and chalk deposits
  - 3) Drift: <10% within one week of calibration at a minimum (application dependent)
  - 4) Specificity/Selectivity: Non-specific to a certain chlorine form, responds to any chlorine species and other oxidizers as noted in the interference section
  - 5) Calibration method: Customer has the option to use one (zero or slope) or two point (zero and slope) calibration. Two point calibration with chemical zero is recommended for chlorine concentration <0.5 ppm
  - 6) Verification procedure: One-point process calibration (slope) against a standard reference method.
- e. Operational Criteria
  - 1) Operating temperature: 5 to 45 °C (41 to 113 °F)
  - 2) Relative humidity: 0-95%, non condensing
- f. Sample Requirements
  - 1) Maximum back pressure the chlorine sensor can manage without failure: a. 0.5 bar, no pressure impulses and/or vibrations
  - 2) Temperature: 0 to 45 °C (33 to 113 °F)
  - 3) Temperature compensation range: 5 to 45 °C (41 to 113 °F)
  - 4) Flow: 30-50 L/hr, 40 L/hr - optimal (7.9-13.2 g/hr, 10.6 g/hr - optimal)
- g. Storage Requirements

- 1) Electrolyte: 15 to 25°C (59 to 77°F)
  - 2) Chlorine sensors: 0 to 50°C (32 to 122°F) dry without electrolyte
  - 3) Panel: -20 to 60°C (-4 to 149°F)
- h. Manufacturer
- 1) Hach Company, Model CLF10sc Reagentless Free Chlorine Analyzer
- i. The CLF10 sc analyzer consists of:
- 1) Three-Electrode Amperometric Chlorine sensor
  - 2) Chlorine sensor flow cell with integrated flow sensor
  - 3) pH flow cell with grab sample port
  - 4) Digital gateway for communication between probes and controller
  - 5) Stainless steel panel
- j. The amperometric cell of the sensor consists of:
- 1) Gold cathode
  - 2) Stainless steel counter electrode
  - 3) Silver/silver chloride reference electrode
  - 4) pH buffered electrolyte
  - 5) Sensor membrane to filter chlorine species selectively and to provide interface between the electrochemical cell and the sample
- k. Wetted materials as follows:
- 1) Chlorine Measuring Cell: PVC
  - 2) Chlorine Sensor Body: PVC
  - 3) Chlorine Sensor Flow Cell: Acrylic
  - 4) Optional pH Sensor Flow Cell: PVC
- l. The sensor interface to the controller is through a digital gateway.
- m. The chlorine sensor automatically compensates for temperature utilizing an embedded temperature sensor.
- n. The electrolyte provides internal, buffered pH compensation in the range of 4-9 pH units.
- o. The sensor includes proprietary Cal Watch self-diagnostic technology.
- p. The panel assembly includes a flow cell that integrates a flow meter and control valve.
- q. Standard equipment:
- 1) Stainless Steel Mounting Panel
  - 2) Chlorine Sensor with Membrane and Electrolyte
  - 3) Chlorine Sensor flow cell
  - 4) Flow meter with control valve
  - 5) Digital gateway to sc controller with cable
  - 6) User Manual
- r. Dimensions

- 1) Sensor
  - a) Length: 7.68 in. (195 mm)
  - b) Diameter: 0.98 in. (25 mm)
- 2) Panel
  - a) Length: 19.0 in. (482.6 mm)
  - b) Width: 19.5 in. (495.3 mm)
  - c) Depth: 5.95 in. (151.2 mm)
- 3) Gateway to Controller cable: 3 ft. (1 m)

s. Weight

- 1) Panel and empty panel-mounted components: approximately 12 lbs. (5.5 kg)
- 2) Complete panel with pH sensor: approximately 20 lbs. (9.1 kg)

t. The transmitter shall be a modular single or dual channel controller that works with analog sensor modules and/or digital sensors.

u. Transmitter/Controller Manufacturer shall be Hach, Model SC200 controller.

v. The controller is available with the following requirements:

- 1) AC powered: 100 to 240 Vac  $\pm 10\%$ , 50/60 Hz; 15 W with 7 W sensor/network card load, 37 W with 25 W sensor/network card load.
- 2) The controller uses a menu-driven operation system.
- 3) The controller display is graphic dot matrix LCD with LED backlighting.
- 4) The controller is equipped with a real-time clock.
- 5) The controller is equipped with two security levels.
- 6) The controller is equipped with a data logger with RS-232 capability.
- 7) The controller shall have worded operation menus in 19 languages.
- 8) The controller is equipped with an SD card reader for data download and controller software upload.
- 9) Four electromechanical, UL rated, SPDT relays (Form C) are provided for user-configurable contacts rated 100 to 230 Vac, 5 Amp at 30 VDC resistive maximum.
- 10) The following can be programmed:
  - a) Alarm
  - b) Warning
  - c) Timer/scheduled cleaning
  - d) Feeder control
  - e) Event control
  - f) Pulse width modulation
  - g) Frequency modulation
- 11) The following can be assigned:
  - a) Primary value measurement I
  - b) Secondary value measurement I
  - c) Tertiary value measurement I

- d) Quaternary value measurement I
  - e) Primary value Measurement II
  - f) Secondary value measurement II
  - g) Tertiary value measurement II
  - h) Quaternary value measurement II
  - i) Real time clock
  - j) Calculated values
- 12) Two analog 0/4-20 mA outputs are provided with a maximum impedance of 500 ohms.
- a) The controller can be equipped with three additional 4-20 mA outputs with a maximum impedance of 500 ohms.
  - b) The following can be programmed:
    - (1) Alarms:
      - (a) Low alarm point
      - (b) Low alarm point deadband
      - (c) High alarm point
      - (d) High alarm point deadband
      - (e) Off delay
      - (f) On delay
    - (2) Controls:
      - (a) Linear
      - (b) Bi-linear
      - (c) Logarithmic
      - (d) PID
- 13) The controller can be equipped with the following forms of communication:
- a) MODBUS RS-232
  - b) MODBUS RS-485
  - c) Profibus DP
- 14) All user settings of the controller are retained for 10 years in flash memory.
- 15) The controller is equipped with a system check for:
- a) Power up test (monitoring and shutdown)
  - b) Total power draw
  - c) Memory devices
  - d) Temperature mother board
- 16) The controller has the option of graphical measurement that tracks measurement values over time.
- w. Controller housing: polycarbonate, aluminum (powder coated), and stainless steel;  
Rating: NEMA 4X enclosure, rated IP66

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 330933

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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 and Details as shown on the Contract Drawings. See Sheets C-0-501, C-0-700 and C-0-701.
- B. Valves: Section 331216

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								

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.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

- A. See NKWD Standard Drawings 100-B and 100-C on Sheet C-0-700 for product specifications.

2.2 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	4II

- E. Transition couplings for joining pipe of different outside diameters-

<u>Dresser</u>	<u>Rockwell</u>
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

- F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

<u>Dresser</u>	<u>Rockwell</u>
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

### 2.3 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" with a minimum unit weight of 2-1/2 pounds/1" x 1,000'. The tape shall be color coded and imprinted with the legend as follows:

<u>Type of Utility</u>	<u>Color Code</u>	<u>Legend</u>
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.

### 2.4 TRACER WIRE

- A. See NKWD Standard Drawing 100-C on Sheet C-0-700 for product specifications.

## 2.5 POLYEHTYLENE WRAP

- A. See NKWD Standard Drawing 100-C on Sheet C-0-700 for product specifications.

## 2.6 HYDRANTS

- A. See NKWD Standard Drawing 100-C on Sheet C-0-700 for product specifications.

## 2.7 TAPPING SLEEVE AND VALVE

- A. See NKWD Standard Drawing 100-C on Sheet C-0-700 for product specifications.

## 2.8 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 3000 psi, and reinforcing bars shall be installed as indicated on the details.

## 2.9 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 NKWD Standard Drawings 103 and 103A on Sheet C-0-501 and Standard Drawings 100-E and 100-F on Sheet C-0-701 for product installation.

### 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 3000 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 3000 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.
- E. 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.

### 3.3 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

- A. See NKWD Standard Drawing 103-A on Sheet C-0-501 for product installation.

### 3.4 TESTING

- A. See NKWD Standard Drawing 100-G on Sheet C-0-701 for product testing.
- B. Test pressure for new water lines shall be 250 psi.

### 3.5 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.

### 3.6 DISINFECTION OF POTABLE WATER LINES

- A. See NKWD Standard Drawings 100-F and 100-G on Sheet C-0-701 for disinfection requirements.

### 3.7 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

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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 and Details as shown on the Contract Drawings. See Sheets C-0-501, C-0-700 and C-0-701.
- C. Water Distribution Piping: Section 331113

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							
Solenoid Control Valve	X	X			X	X		X				
Valve Boxes		X										
Tapping Sleeve, Valve	X	X		X	X							

## PART 2 - PRODUCTS

### 2.1 GATE VALVES

- A. See NKWD Standard Drawings 100-C on Sheet C-0-700 for product specifications.

### 2.2 CHECK VALVES

- A. The valve is 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. The valves shall be Golden-Anderson Industries, Inc. Fig. No. 250-D, 125# or equal.

### 2.3 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: 8"
  - 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. 136EG-03YBCSPKC Solenoid Control Valve, as manufactured by Cla-Val Co., Newport Beach, CA 92659-0325 or Engineer approved equal.

2.4 VALVE BOXES - BURIED VALVES

- A. See NKWD Standard Drawings 100-D on Sheet C-0-700 for product specifications.

2.5 TAPPING SLEEVES AND VALVES

- A. See NKWD Standard Drawings 100-C on Sheet C-0-700 for product specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All valves shall be installed in accordance with details on the Contract 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 – RESERVOIR MIXING SYSTEM

### 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 reservoir hydrodynamic mixing system 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-Colum Elevated Water Storage Tank: Section 331619
- D. Pedosphere Elevated Water Storage Tank: Section 331620

#### 1.3 SUBMITTALS

Submit the following information to establish compliance with the specifications.

- A. Submittal detail drawing showing plan, elevation, and appropriate cross sections of the mixing equipment and anchor locations. In addition, these drawings shall show all pipe sizes and lengths, supports, and fixed joints.
- B. Independent CFD Modeling Validation
  - 1. The mixing system designer/supplier must supply data or report from at least one project where an independent company conducted CFD modeling on their mixing system design and the modeling results verified the design achieved complete mixing.
- C. Full Scale Tracer Study Validation
  - 1. The mixing system designer/supplier must supply data or report from at least one project where a full scale tracer study using calcium chloride was conducted on a circular reservoir and the tracer study results verified the mixing system design achieved complete mixing.
  - 2. The mixing system designer/supplier must supply data or report from at least one project where a full scale tracer study using calcium chloride was conducted on an elevated tank and the tracer study results verified the mixing system design achieved complete mixing.

D. Tideflex Inlet Nozzle and Waterflex Outlet Valve Testing and Validation

1. Verification of independent hydraulic testing to determine headloss and jet velocity characteristics on a minimum of eight (8) sizes of duckbill valves ranging from 2” through 48”. The testing must include multiple constructions (stiffness) within each size and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.
2. Verification of Independent Laboratory Testing for Manufacturing Consistency - the duckbill valve manufacturer shall provide summary documentation of a report conducted by an Independent Laboratory for hydraulic testing where multiple duckbill valves (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability and consistency of the manufacturing process to produce the same hydraulic characteristics.
3. Report of independent testing that studied the flow distribution characteristics of duckbill valves installed on multiport manifolds. The manufacturer must have been in the business of manufacturing duckbill valves at the time the report was published.
4. Verification of Finite Element Analysis (FEA) of duckbill valves. The duckbill valve manufacturer shall provide summary documentation of Finite Element Analysis modeling on representative duckbill nozzle sizes to determine deflection, stress and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and reverse differential pressure.
5. Verification of independent hydraulic testing to determine headloss characteristics on a minimum of three (3) sizes of perforated disc/elastomeric membrane check valves ranging from 6” through 36”. Testing must have been conducted with and without the membrane installed. At least two (2) sizes shall have tested two (2) different membrane thicknesses.
6. Verification of Finite Element Analysis (FEA) modeling on a perforated disc/elastomeric membrane check valve to determine stress and deflection characteristics under reverse differential pressure.

E. Validation of Long-term performance

1. The mixing system designer/supplier must supply at least one inspection report showing proper operation of, and no deterioration of, the duckbill valves after being in service in a water storage tank mixing application for a minimum of 10 years.

F. NSF61 Certification

1. Copy of the NSF61 Certified listing for the valves used in the Hydraulic Mixing System.
2. The valves themselves must be NSF61 certified, not just the elastomer used in construction of the valves. NSF61 approved/certified materials will not be accepted in lieu of valve certification.

3. The NSF61 Certification for the valves must be for a minimum volume of 2,000 gallons. Valves with NSF61 Certification for minimum volume of greater than 2,000 gallons are not acceptable.

G. Test Report on Elastomer Exposure to Chlorine and Chloramine

1. Copy of test report from 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."

H. System Installation Drawings

1. The duckbill valve manufacturer shall be responsible for providing engineering installation drawings of the complete manifold piping system as supplied by the manufacturer. These drawings shall include plan view piping arrangement, sections and elevations as required, support bracket installation details, duckbill nozzle orientation details, and all dimensions required for locating the system within the specified dimensions of the tank.
2. Six (6) sets of plans shall be provided to the Engineer for review and approval.
3. Two (2) sets of final fabrication and installation drawings shall be included with the shipment of the manifold piping equipment.

I. Design Calculations

1. All Design Calculations, curves, and reference information listed below must originate and be submitted by the duckbill valve manufacturer. Calculations, curves, and reference information provided by contractors relating to the mixing system are not allowed. The duckbill valve manufacturer MUST include within the submittal package the following design calculations, curves, and reference information:
  - a. Calculations showing the fill time required, under isothermal conditions, for the mixing system to achieve complete mix of the reservoir volume at minimum, average and peak fill rates. Complete mixing defined as 95% homogenous solution. The theory and equations used in calculating the mixing times must be from a published AWWA reference manual or paper. The reference document(s) must be submitted with the equations and calculations.
  - b. Calculations showing the water level drawdown required to achieve complete mixing on the fill cycles at minimum, average, and peak flow rates.
  - c. Calculations of average storage tank water age for both fill-then-draw, and simultaneous fill and draw scenarios. Theory used in calculating water age must be submitted with the calculations.
  - d. A representative Computational Fluid Dynamics (CFD) model evaluation of the proposed mixing system configuration applied within a reservoir of similar geometry. Model output documentation shall include all design variables applied for the simulation, plot of the 3-D geometry showing the mesh definition, velocity

magnitude vector and contour plots at different cross-sections throughout the water volume, simulated tracer animations showing the spatial and temporal distribution of inlet water in real time during the fill cycle.

- e. Hydraulic calculations showing the resulting jet velocities of each inlet nozzle at minimum, average, and peak fill rates.
- f. Hydraulic calculations showing the flow distribution among all inlet ports at minimum, average, and peak fill rates.
- g. Manifold hydraulic calculations showing the total headloss of the mixing system at minimum, average, and peak fill and draw rates. Headloss shall include all minor losses and headloss of nozzles and outlet check valves.
- h. Hydraulic curves showing thrust vs. flow for the inlet nozzles.
- i. Hydraulic curves for each outlet check valves showing headloss vs. flow.
- j. Calculations showing the terminal rise height of the jets that discharge at an angle above horizontal. The terminal rise height shall be calculated assuming 10°F and 20°F colder inlet water and calculated at minimum, average and peak fill rates. The theory and equations used to calculate the terminal rise height shall be included.
- k. Hydraulic curves for each inlet nozzle of Densimetric Froude number vs. flow
- l. If the calculations and supporting data provided do not show compliance with the hydrodynamic requirements of the system as interpreted by the Engineer or Owner then the submittal shall be rejected.

J. Installation, Operation and Maintenance Manuals

1. Within 30 days of final approval of the installation drawings, by the Engineer, the mixing system valve manufacturer shall provide four (4) sets of the installation portion of the Installation, Operation and Maintenance (IOM) Manuals for the applicable system. Within 30 days of final approval, by the Engineer, of the installed system the manufacturer shall provide six (6) copies of the complete Installation, Operation and Maintenance (IOM) Manual for final review and approval.
2. The manuals shall be in the following format and include the listed required information as a minimum:
  - a. Enclosed in a 3-ring binder with project title and system designation shown on the front cover and side binder.
  - b. Table of contents.
  - c. Copy of design calculations for the manifold system as defined in the previous section.
  - d. Copy of complete set of the installation plans.

- e. Copy of NSF61 Certified Listing for the valves.
- f. Parts and equipment list with specification numbers for ordering of replacement parts.
- g. Product specification sheets for nozzles, outlet valves, expansion joints, concrete anchors, and any other specialized items supplied with the system.
- h. Installation guidelines for the mixing system manifold system.
- i. Operational procedures for the mixing system manifold system.
- j. Guidelines for repair of system components.
- k. Schedule for suggested periodic maintenance of the manifold system.

#### 1.4 GUARANTY

- A. All piping, pipe support brackets, joint connections, expansion joints, and anchors shall be warranted by the mixing system manufacturer against failure under design conditions for a period on one (1) year from the date of final installation approval by the Engineer.
- B. Inlet nozzles and outlet valves shall be warranted by the manufacturer against failure under design operating conditions for a period of one (1) year from the date of final installation approval by the Engineer.

#### 1.5 REFERENCED STANDARDS

##### American National Standards Institute (ANSI)

B16.1 – Cast Iron Pipe Flanges and Flanged Fittings

B16.5 – Pipe Flanges and Flanged Fittings

B36.10 – American National Standard Weights and Dimensions of Welded and Seamless Wrought Steel Pipe

##### American Society for Testing and Materials (ASTM)

A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

A234 – Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service

A240 – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A351 – Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts

A536 – Standard Specification for Ductile Iron Castings

C110 – Ductile Iron and Gray-Iron Fittings, 3 In. through 48 In. for Water

D1330 – Standard Specification for Rubber-Sheet Gaskets

D1784 – PVC/CPVC Pipe Compounds

D1785 – PVC Pipe, Schedules 40, 80 & 120

D2466 – PVC Solvent Cement

D2855 – PVC Solvent Joints  
D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Fittings  
D3915 – PVC Pipe Fitting Compounds

American Iron and Steel Institute (AISI)

AISI 304 – 304 Stainless Steel Plate  
AISI 316 – 316 Stainless Steel Plate  
AISI 1040 – Carbon Steel Plate

American Water Works Association (AWWA)

C104 – Cement-Mortar Lining of Ductile Iron Pipe and fittings for Water  
C110 – Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In. for Water  
C115 – Flange Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges  
C200 - AWWA Standard for Steel Water Pipe 6” and Larger  
C207 – Standard for Steel Pipe Flanges for Waterworks Service – Size 4 In. to 144 In.  
C220 – AWWA Standard for Stainless Steel Pipe, 4” and Larger  
C900 – AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. for Water Distribution  
C905 – AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In Through 48 In. for Water Transmission and Distribution  
C906 – AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In. for Water Distribution

American Water Works Association Research Foundation (AWWARF)

Project No. E20-J08 – Physical Modeling of Mixing in Water Storage Tanks (Forthcoming)

National Sanitation Foundation (NSF)

NSF Standard 14 – Plastic Piping System Components and Related Materials  
NSF Standard 61 – Drinking Water System Components – Health Effects

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. The Hydrodynamic Mixing System (HMS) is defined as a supplemental system installed within a potable water storage reservoir which passively utilizes the energy provided by the inlet water supply (via pumped or gravity head) and generates a sufficient inlet momentum to achieve a complete homogeneous blending of the water volume within the reservoir with the inlet supply flow. Determination of Complete Homogeneous Blending shall be defined by the modeling requirements and supporting hydraulic analysis as conducted by each individual manufacturer for their specific system configuration as defined within these specifications. System submittals not providing this validation shall not be considered as a viable Hydrodynamic Mixing System and shall not be accepted as an equivalent to this system specification.
- B. The specifications in this section include all components of the Reservoir Hydrodynamic Mixing System consisting of a bi-directional flow manifold equipped with variable orifice duckbill inlet nozzles and outlet flow check valves that are NSF61 certified. The mixing system manufacturer shall be responsible for designing the system in accordance with the



hydrodynamic criteria defined within these specifications and submit design calculations verifying compliance in accordance with the submittal requirements. The following is a description of the Hydrodynamic Mixing System.

- C. All modeling and hydraulic and mixing calculations pertaining to the mixing system shall originate from the duckbill valve manufacturer. Modeling and calculations provided by parties other than the duckbill valve manufacturer shall not be allowed.
- D. The complete Hydrodynamic Mixing System shall be supplied by the variable orifice nozzle manufacturer to maintain single source responsibility for the system. The complete system shall be defined as all piping and appurtenances within the tank downstream of the tank penetration. Appurtenances include pipe, fittings, horizontal and vertical pipe supports, expansion joints, variable orifice duckbill check valves, and any other equipment specified within this section of the specifications. Mixing system shall be by Tideflex Technologies, Carnegie, PA 15106, or Engineer approved equal.
- E. Manufacturer's and/or contractors submitting an alternative to the named Tideflex Technologies mixing system shall be responsible for obtaining any and all proprietary rights, license fees, royalties, technology licenses, and/or permissions required to provide such a system. The Manufacturer shall indemnify and hold harmless the Owner and Engineer against all claims, damages, losses, and expenses arising out of any infringement of patent rights or copyright incident relating to this system.

## 2.2 DELIVERY, STORAGE AND HANDLING

- A. Individual nozzles and outlet valves shall be packaged separately from the piping equipment.
- B. All flanges shall be protected by using plastic inserts or plank wood, pipe sections are to be fully supported to prevent pipe deflection or damage to fittings or connections.
- C. All equipment shall be shipped on pallets capable of fully supporting the pipe sections across their entire length. Pallets should be accessible for fork lift transport or strap and hoist means without causing any load to the pipe equipment.
- D. All stainless steel components shall be stored separately away from any carbon steel components or other materials that could stain or deface the stainless steel finish from run-off of oxidized ferrous materials.
- E. All pipe equipment should be covered and stored in areas free from contact with construction site sediment erosion to prevent accumulation of materials within the pipe and fittings.
- F. Duckbill nozzles should be protected from contact with rigid objects during handling and storage. The contractor shall be responsible for replacing any duckbill nozzles or elastomeric components that are damaged after arrival on the site through installation and start-up of the system.

## 2.3 VARIABLE ORIFICE DUCKBILL INLET NOZZLES

- A. Inlet ports/nozzles shall be duckbill-style check valves that allow fluid to enter the reservoir

during fill cycles and prevent flow in the reverse direction through the nozzle during draw periods. Inlet ports/nozzles may not be fixed-diameter ports or pipes.

- B. The duckbill valves shall be NSF61 Certified. NSF61 approved/Certified materials will not be accepted in lieu of valve certification.
- C. Inlet ports/nozzles shall have a variable diameter vs. flow hydraulic profile that provides a non-linear jet velocity vs. flow characteristic and a linear headloss vs. flow characteristic. The hydraulic characteristics of the duckbill valves shall be defined by “Hydraulic Code”.
- D. The inlet ports/nozzles shall discharge an elliptically shaped jet. The nozzle must have been modeled by an independent laboratory using Laser Induced Fluorescence (LIF).
- E. Manufacturer shall have conducted independent hydraulic testing to determine headloss and jet velocity characteristics on a minimum of eight (8) sizes of duckbill valves ranging from 2” through 48”. The testing must include multiple constructions (stiffness) within each size and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.
- F. Manufacturer shall have conducted an independent hydraulic test where multiple valves (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability of the manufacturing process to produce the same hydraulic characteristics.
- G. Manufacturer shall have conducted independent hydraulic testing to study the flow distribution characteristics of duckbill valves installed on multiport manifolds.
- H. Manufacturer shall have conducted Finite Element Analysis (FEA) on various duckbill valves to determine deflection, stress, and strain characteristics under various load conditions. Modeling shall have been done for flowing conditions (positive differential pressure) and reverse differential pressure.
- I. Manufacturer shall have conducted in-house backpressure testing on duckbill valves ranging from ¾” to 48”.
- J. Manufacturer shall have at least fifteen (15) years’ experience in the manufacturing of “duckbill” style elastomeric valves.
- K. Manufacturer shall have duckbill valves installed on manifold piping systems in at least 100 distribution system reservoirs.
- L. Manufacturer shall have representative inspection videos showing the duckbill valves discharging water into the reservoir during an initial fill (unsubmerged). Manufacturer shall also have representative underwater inspection videos showing the operation of the valves when submerged.
- M. The duckbill style nozzles shall be one-piece elastomer matrix with internal fabric reinforcing designed to produce the required discharge velocity and minimum headloss requirements as stipulated in the Submittals section. The flange portion shall be an integral portion of the nozzle with fabric reinforcing spanning across the joint between the flange and nozzle body.

- N. The elastomer used in construction of the duckbill valves 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.”
- O. The manufacturer’s name, plant location, serial number and product part number which designates nozzle size, material and construction specifications shall be bonded onto the surface of the nozzle.

#### 2.4 OUTLET CHECK VALVES

- A. The outlet flow valves shall be perforated disc type with elastomeric membrane.
- 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 CARBON STEEL PIPES AND FITTINGS

- A. Carbon steel pipe and fittings shall conform to the associated standards listed in Section 1.5: Reference Standards.
- B. Dimensions for carbon steel fittings shall conform to AWWA C110, unless otherwise specified.
- C. Wall thickness for carbon steel pipe and fittings shall be specified by Schedule conforming to ANSI B36.10-1985.
- D. Wall thickness and dimensions of carbon steel tubing shall be given in exact dimensions in fractions of an inch, not by gage number.
- E. All flanges shall be carbon steel ring flanges conforming to AWWA C207 Class D. Flange drilling pattern shall be in accordance with ANSI B16.1/B16.5 standards.
- F. Ring flanges shall be continuously welded on both sides.
- G. Welding of carbon steel pipe and fittings shall be in accordance with the Reference standards.
- H. All butt welds shall be fully penetrated with gas shielding to the interior and exterior of the joint.
- I. Welded cross-sections shall have a thickness equal to or greater than the welded material.
- J. Field welding of carbon steel pipe and fittings will not be allowed unless approved by the Engineer.
- K. All welded joints shall be free of sharp edges and burrs.
- L. Coating of the inside of carbon steel pipe and fittings is not required, unless otherwise specified.
- M. Coating of the outside of carbon steel pipe and fittings shall be performed in the field, by the contractor, following installation of the manifold piping system. Surface preparation and coating procedures shall be in accordance with spec section 099720 Steel Tank Coatings.

## 2.6 FLANGE GASKETS

- A. Flange gaskets shall be full-faced and shall be in accordance with ASTM D1330.
- B. Flange gasket drilling pattern shall conform to ANSI B16.1/B16.5.
- C. Flange gaskets shall be 1/8" thick.
- D. Gasket material shall be EPDM.

## 2.7 FASTENERS

- A. Hex head bolts and nuts shall be stainless steel 316 conforming to ANSI/ASME B18.2.1 and

ANSI/ASME B18.2.2.

- B. Plastic insulating sleeve/washers shall be utilized to isolate dissimilar bolt and flange metals where and encountered and required.

## 2.8 PIPE SUPPORTS

- A. All components of the bracket assembly shall 316 stainless steel in accordance with the associated standards.
- B. The bracket assemblies shall consist of four components:
  1. A base plate (when required).
  2. A top-works weldment that consists of structural channel and angle iron. The mixing piping shall rest on the angle iron. The angle iron has predrilled holes for the U-bolt.
  3. U-bolt with four hex nuts.
  4. An 1/8" thick EPDM strip with a length equivalent to the circumference of the pipe. The strip shall be placed between the pipe and the angle iron and U-bolt.
- C. The channel of the top-works weldment shall be field fit and modified to the required length. The channel shall then be field welded to the base plate.
- D. For steel tanks, the base plate shall be field welded to the tank floor or shell. The location of the base plate shall avoid welded joints in the floor/shell plates.
- E. Plastic insulating sleeve/washers shall be utilized to isolate dissimilar metals where encountered.

## 2.9 COATINGS

- A. Following installation of the manifold system, all carbon steel and ductile iron pipe, fittings, bolted connections, pipe supports, and appurtenances shall be coated according to the interior tank paint specification as specified in section 099720 Steel Tank Coatings.
- B. Surface preparation and coating procedures shall be provided by the Engineer and the coating supplier.
- C. **Tideflex and Waterflex Valves shall not be coated.** The valves shall either be masked or be mounted after coating of the tank and piping. Contractor to ensure masking materials are removed after coating.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Installation of the manifold system shall be in accordance with the installation plans and guidelines provided by the mixing system manufacturer and as specified in the installation

section of the IOM manual.

### 3.2 INSTALLATION INSPECTION AND START UP TESTING PROCEDURES

- A. The mixing system manufacturer's authorized representative shall provide one (1) day inspection to verify that the system has been installed in accordance with the design specifications and installation drawings.
- B. Start-Up Flow Testing
  - a. Following installation of the complete manifold piping system, the Contractor shall open the upstream isolation valve to allow flow into the tank through the manifold system. The isolation valve shall be opened slowly to prevent surge or over-pressurization of the manifold system. The isolation valve shall be fully opened to inspect the flow characteristics of the manifold system.
  - b. The Contractor and factory representative shall visually inspect the entire piping system for leakage.
  - c. The Contractor and factory representative shall visually inspect all of the inlet nozzles to ensure flow is being discharged into the tank through all nozzles.

END OF SECTION 331220

SECTION 331619 – MULTI-COLUMN ELEVATED WATER STORAGE TANK (BASE 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 Tank Coatings: Section 099720
- 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.

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 a 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.

## 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 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 ( $f_c'$ ) = 4,000 psi with maximum allowable compressive stress ( $f_c$ ) = 1800 psi (working stress design). Maximum allowable reinforcing steel tensile stress ( $f_s$ ) 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
  - 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 the State in which the tank will be constructed shall be submitted with shop drawings. These shall include all design assumptions, loading conditions (including ladders), details, dimensions, plate thickness, welds, and foundation design.

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)

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Materials in every case shall conform with the requirements set out in Section 2 of the aforementioned AWWA 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 1/4 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 12" 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 ladder column. From there, it shall be routed to discharge 1 to 2 feet above the ground surface and shall have a screen and flapper on the end. The discharge shall be over a precast concrete storm inlet structure, as indicated on Sheet C-0-500. 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 connection to the bottom of the riser shall be a 12 inch standard weight carbon steel pipe with appropriate transition to a ductile iron base elbow of the same diameter. The vertical pipe shall extend up into the riser one foot above the riser base.

### 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.

- A. A fixed tower ladder equipped with both a safety cage and a fall prevention device equal to Saf-T-Climb, manufactured by Air Space Devices, Inc., Paramount, California, or 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 be 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 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 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.
- 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.
- F. A locked cabinet or utility box made of 1/4" 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. Fall prevention device on interior ladder shall be AISI Type 304 stainless steel; device on exterior ladder shall be hot-dip galvanized according to ASTM A 123; fall prevention device carrier rail shall have 0.120" wall thickness and be terminated 2 feet above bottom of 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.

## 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”).

## 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 Lightning 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

## 2.10 PERMANENT FAA OBSTRUCTION LIGHTING

- A. Tank manufacturer shall design and provide obstruction lighting per the requirements of FAA as given in Appendix C – FAA Obstruction Marking and Lighting.

## 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 shall conform to the requirements set out in Section 9 of the aforementioned AWWA Standard.

### 3.3 WELDING

- A. All welding shall conform to the requirements of AWS and those set out in Section 8 of the aforementioned AWWA 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 aforementioned AWWA Standard.

### 3.5 INSPECTION

- A. Inspection shall conform to the requirements set out in Section 11 of the aforementioned AWWA 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 inspection shall be performed prior to interior and exterior field painting.

### 3.6 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.

### 3.7 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 C652-02, 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.

3.8 CLEANUP

- A. Upon completion of the work, all construction material and debris shall be removed from the site.

END OF SECTION 331619

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SECTION 331620 – PEDESPHERE ELEVATED WATER STORAGE TANK (BASE 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 Tank Coatings: Section 099720
- 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 a 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.

## 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 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 ( $f_c'$ ) = 4,000 psi with maximum allowable compressive stress ( $f_c$ ) = 1800 psi (working stress design). Maximum allowable reinforcing steel tensile stress ( $f_s$ ) 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
  - 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 "Pedisphere" 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 the State in which the tank will be constructed shall be submitted with shop drawings. These shall include all design assumptions, loading conditions (including ladders), details, dimensions, plate thickness, welds, and foundation design.

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)

## 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 12" 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 and shall have a screen and flapper on the end. The discharge shall be over a precast concrete storm inlet structure, as indicated on Sheet C-0-500. 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 12 inch diameter standard weight steel inlet/outlet pipe that extends vertically from the base of the pedestal to the bottom of the tank. 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. Inlet/Outlet pipe shall not extend above the low water level.
- 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 shall be coated with tank interior dry system.

## 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.

- A. A fixed pedestal ladder equipped with a fall prevention device equal to Saf-T-Climb, manufactured by Air Space Devices, Inc., Paramount, California, or 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 extending from the upper platform to the tank floor access manhole.
- C. A fixed access tube ladder equipped with a fall prevention device 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 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" 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. Fall prevention device on interior ladders shall be AISI Type 304 stainless steel; fall prevention device carrier rail shall have 0.120" wall thickness and be terminated 2 feet above bottom of 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" x 36" access hatch with opening to allow ladder and safety device to continue 48" minimum above the platform floor.

## 2.7 ROOF HANDRAIL

- A. The tank shall be equipped with a roof handrail not less than 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.

## 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" x 36" access hatch with opening to allow ladder and safety device to continue 48" 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”).

2.10 ACCESS TUBE

- A. A minimum 42” diameter access tube shall be provide for tanks with capacities of 200,000 gallons and greater. The access tube shall be provide 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 36” by 80” 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 Lightning 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 PERMANENT FAA OBSTRUCTION LIGHTING

- A. Tank manufacturer shall design and provide obstruction lighting per the requirements of FAA as given in Appendix C – FAA Obstruction Marking and Lighting.

## 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 shall conform to the requirements set out in Section 9 of the aforementioned AWWA Standard.

### 3.3 WELDING

- A. All welding shall conform to the requirements of AWS and those set out in Section 8 of the aforementioned AWWA 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 aforementioned AWWA Standard.

### 3.5 INSPECTION

- A. Inspection shall conform to the requirements set out in Section 11 of the aforementioned AWWA 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 inspection shall be performed prior to interior and exterior field painting.

### 3.6 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.

### 3.7 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 C652-02, 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.

### 3.8 CLEANUP

- A. Upon completion of the work, all construction material and debris shall be removed from the site.

END OF SECTION 331619

APPENDIX A

GEOTECHNICAL EXPLORATION  
REPORT

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**GEOTECHNICAL EXPLORATION REPORT  
LUMLEY TANK REPLACEMENT  
FORT THOMAS, KENTUCKY**

Prepared for: **GRW Engineers, Inc.**

Thelen Project No.: **150258E**



**THELEN ASSOCIATES, INC.**

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June 8, 2015

GRW Engineers, Inc.  
801 Corporate Drive  
Lexington, Kentucky 40503

Attention: Mr. Brad Montgomery, P.E.

Re: Geotechnical Exploration Report  
Lumley Tank Replacement  
Fort Thomas, Kentucky

Ladies and Gentlemen:

Submitted herein are the results of the geotechnical exploration completed for the proposed Lumley Elevated Water Storage Tank Replacement in Fort Thomas, Kentucky. Our services were performed in accordance with our Subcontract Agreement dated April 29, 2015.

This report presents the results of an engineering reconnaissance, borings to explore the subsurface conditions, laboratory testing, engineering analyses, and the development of recommendations for site development and foundation design for the proposed structure. Additionally, we have included in the Appendix to this report a reprint of "Important Information about Your Geotechnical Engineering Report" published by ASFE, The Geoprofessional Business Association.

We appreciate the opportunity to provide the geotechnical consulting services for this project. If you have any questions regarding the contents of this report, or if we may be of any additional service to you, please do not hesitate to contact us.

Respectfully submitted,  
**THELEN ASSOCIATES, INC.**

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150258E

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**GEOTECHNICAL EXPLORATION REPORT  
LUMLEY TANK REPLACEMENT  
FORT THOMAS, KENTUCKY**

**1.0 INTRODUCTION**

This geotechnical exploration report was prepared for GRW Engineers, Inc. (GRW) on behalf of the Northern Kentucky Water District (NKWD) for the proposed Lumley Elevated Water Storage Tank in Fort Thomas, Kentucky. The main purposes of this exploration were to determine the general subsurface profile at the site and to relate the engineering properties of the soils and bedrock, that is, their classification, strength, and compressibility characteristics, to the site development and foundation design for the proposed elevated water storage tank. Our services included borings, laboratory testing, engineering analyses, and preparation of this report.

**2.0 PROJECT CHARACTERISTICS**

The project characteristics listed below for the Lumley Elevated Water Storage Tank Replacement were derived from the Site Survey prepared by GRW, which was received electronically by our office on May 1, 2015. Additional information was provided via Mr. Alan Bryan, P.E., and Ms. Adalyn Haney, P.E., of GRW. All elevations noted in this report are referenced to Mean Sea Level Elevation (MSL).

We currently understand that the project involves razing the existing Lumley Elevated Water Storage Tank and replacing it with a new 500,000-gallon tank to the west-southwest of, and slightly overlapped with, the current tank location. It was indicated by Mr. Dave Enzweiler with the NKWD, that the existing tank serves as a radio tower for

several communication utilities and site development may require rerouting several of the underground lines for the communication utilities. Additionally, based on the Site Survey by GRW, it is estimated that cut and fill for establishing site grades around the proposed replacement tank will be on the order of 5 feet or less.

Loading information provided by Caldwell Tanks via an email from Ms. Haney with GRW on May 21, 2015 indicates that the new tank will either be: (1) a 500,000-gallon, torus bottom tank with 6 plumb columns evenly spaced around a 50-foot diameter circle with one 60-inch diameter center riser pipe; or (2) a 500,000-gallon pedesphere with a 55.5-foot tank diameter supported by an 11.67-foot diameter column with a 30-foot base diameter. The loading information was dated May, 13, 2015.

The information indicates that the torus bottom tank would have a total load on the center riser of 1,419.14 kips and the following outside column loads:

Dead Load of Tank Structure:	42.094 kips
Anticipated Water Load:	517.537 kips
Design Snow Load:	6.320 kips
Maximum Vertical Wind Load:	159.5 kips
Horizontal Wind Load:	33.71 kips
Maximum Vertical Seismic Load:	195.9 kips
Horizontal Seismic Load:	21.30 kips

The information indicates that the pedesphere would have an anticipated water load of 4,287.70 kips. The design snow load would be 26.16 kips. The dead load of the tank structure is 371.38 kips. The vertical seismic load would be 125.54 kips. The overturning moment and shear at the top of the foundation due to wind loading would be 10,925.08 foot-kips and 74.29 kips, respectively. The overturning moment and shear at the top of the foundation due to seismic loading would be 15,795.32 foot-kips and 62.90 kips, respectively.

### **3.0 SUBSURFACE EXPLORATION**

The fieldwork phase of this exploration was carried out on May 18, 2015. A total of three (3) new borings, numbered 1 through 3, have been made for the Lumley Tank Replacement Project. The locations of the borings are shown on our Boring Plan, Drawing 150258E-1, in the Appendix to this report. The Boring Plan also includes the location of a pertinent historical boring that was completed in 2007 for NKWD under Thelen Project No. 071228E. The new boring locations were selected by GRW, and were staked in the field by a GRW survey crew relative to their control and benchmark elevation. MSL elevations are provided on the boring logs included in the Appendix to this report.

The new borings were drilled with a track-mounted drill rig advancing hollow stem augers. Sampling was accomplished ahead of the augers with a 2-inch outside diameter (O.D.) standard split spoon sampler in general accordance with the procedures outlined by ASTM D1586. Boring 1 was extended into the gray, unweathered bedrock to a depth of 30.5 feet below the existing ground surface by rock coring with a NQ-sized diamond-tipped core barrel. Observations for groundwater were made in the borings during drilling and at the completion of drilling. The borings were backfilled with soil cuttings immediately upon completion of drilling, and therefore long-term stabilized groundwater measurements could not be obtained.

As each boring was advanced, the Drilling Technician kept a field log of the subsurface profile noting the soil and bedrock types and stratifications, Standard penetration test results, groundwater levels or the lack thereof, and other pertinent data. Representative portions of the split spoon samples were placed in labeled glass jars to preserve the in situ moisture contents of the samples. Rock core samples were placed in a coring box and labeled such that all samples were marked for proper future identification.

Additionally, a surface sample was obtained for lead testing from each boring. The surface sample labeled 1A from Boring 1 was obtained by hand digging with a shovel immediately behind the guardrail adjacent to the boring location. A surface sample

labeled 1A from Boring 2 was obtained by splitting the upper portion of the first split spoon sample driven from the ground surface. The surface sample labeled 1A from Boring 3 was obtained by hand digging with a shovel immediately adjacent to the boring location. Each sample was immediately sealed in a labeled glass jar. The samples were delivered to ALS Environmental (ALS) on May 19, 2015. The report prepared by ALS documenting the results of the lead testing is included in the Appendix to this report.

#### **4.0 LABORATORY TESTING AND REVIEW**

The samples from the exploratory borings were examined and visually classified in the laboratory by the Project Geotechnical Engineer. Representative soil samples were selected for moisture content determinations and Atterberg limits tests. Representative samples of the bedrock were selected for moisture content determinations as well as uniaxial compressive strength tests. The results of these tests are included in the Tabulation of Laboratory Tests in the Appendix to this report along with the uniaxial compressive strength test forms. As stated in Section 3.0, lead testing was performed by ALS on surficial samples from the three (3) new borings; the results of which are documented in the appended ALS report.

Final boring logs were prepared by the Project Geotechnical Engineer on the basis of the visual classification in the laboratory, the laboratory test results, and the field logs kept by the Drilling Technician. Copies of the boring logs for the three (3) new borings and the pertinent historical boring from Thelen Project No. 071228E are included in the Appendix along with Soil and Rock Classification Sheets, which describe the terms and symbols used on the boring logs. The dashed lines on these boring logs indicate an approximate change in soil or bedrock strata as estimated between samples. A solid line indicates the change in strata occurred within a sample where a more precise measurement could be made. Furthermore, the transition between soil and bedrock types can be abrupt or gradual.

## **5.0 GENERAL TERRAIN, SUBSURFACE, AND GEOLOGIC CONDITIONS**

The existing site consists of modified ridge top terrain dissected by drainage swales and valleys. In previous development operations at the site, portions of the swales and valleys were filled to create the existing grades. Based on a review of historic topographic maps of the area, the immediate area of the existing tank has undergone only slight grading; however, the area to the north, west, and east of the existing tank has significantly greater amounts of fill placed. In general, the amount of fill increases in thickness with plan distance from the current tank location in these three directions.

### **5.1 Geologic Strata**

#### ***5.1.1 Pavement***

In Boring 1, 3 inches of asphalt pavement were encountered overlying 9 inches of crushed limestone base.

#### ***5.1.2 Artificial Fill***

Existing artificial fill was encountered at the ground surface or beneath the pavement in all of the borings. The fill encountered in the borings was variable across the site, but predominantly consisted of silty clay and clay with rock fragments, limestone floaters, asphalt fragments, sand, gravel, organics, and oxide stains. In Boring 1, a zone of fill consisting of clayey sand was encountered below the crushed limestone base and above the aforementioned clay fill.

The thickness of the fill encountered in the new borings ranged from 2 to 4.5 feet. The consistency of the fill in this area was predominantly very stiff; however, in Boring 1, the clay fill below the granular fill had a medium stiff consistency while the granular fill had a density described as medium dense.

The thickness of the fill encountered in the historic boring was 7.0 feet. The fill consisted of very dense crushed limestone with silty clay and soft silty clay with asphalt fragments and limestone floaters.

The Standard Penetration Test Values (N-values) for the fill ranged from 5 to 63 blows per foot (bpf), with an average N-value of 17 bpf. Natural moisture content testing of four (4) samples of fill from the new borings yielded values ranging from 8.8 to 23.1 percent. One (1) sample of the fill was classified as a CH soil (i.e., a soil with high plasticity) according to the Unified Soil Classification System (USCS) with a liquid limit of 59 percent and a plasticity index of 35 percent.

### ***5.1.3 Glacial Soils***

Native glacial soils were encountered beneath the fill in Borings 1 and 3 and the historic boring. The glacial soils consisted of silty clay and clay with variable amounts of sand and oxide stains. The consistency of the glacial soils ranged from stiff to very stiff.

The N-values for the glacial soils ranged from 7 to 26 bpf, with an average N-value of 16 bpf. Natural moisture content testing of two (2) samples of the glacial soils from the new borings yielded values ranging from 29.8 percent to 38.4 percent. One (1) sample of the glacial soils was classified as a CH soil according to the USCS with a liquid limit of 65 percent and a plasticity index of 38 percent.

### ***5.1.4 Residual Soils***

Residual soils or residuum were encountered beneath the existing fill or glacial soils in Boring 2 and the historic boring. These soils are typically termed residual because they have weathered in place over time from the underlying parent bedrock. These residual soils were described as consisting of very stiff silty clay with trace bedding planes, remnant shale beds, limestone layers/floaters, and oxide stains.

The N-values for the residual soil were 12 and 26 bpf. The natural moisture content of one (1) tested residual soil sample was 21.6 percent. One (1) sample of the residual soil was classified as a CL soil (i.e., a soil with low plasticity) according to the USCS with a liquid limit of 44 percent and a plasticity index of 22 percent.

### **5.1.5 Shale and Limestone Bedrock**

The overburden soils at the site are underlain by bedrock consisting of interbedded shale and limestone layers. The depth to the upper boundary of bedrock from the existing ground surface varied from 4.5 feet to 12 feet.

Available geologic mapping (Geologic Map of the Newport and Withamsville Quadrangles, KY, USGS, 1973) indicates the bedrock immediately underlying the overburden soils belongs to either the Bellevue Tongue of the Grant Lake Limestone or the Fairview Formation.<sup>1</sup>

The aforementioned mapping indicates that the Bellevue Tongue of the Grant Lake Limestone is comprised of shelly, rubbly limestone with fossils in an argillaceous matrix. The limestone beds are described as thin, highly irregular, and lenticular. Very thin and discontinuous shale partings are also noted to be present in this bedrock formation.

The mapping indicates the Fairview Formation is comprised of 40 to 65 percent limestone, with the remaining percentage consisting of shale. The limestone is described as predominantly coarsely crystalline and encountered in beds that are irregularly to evenly layered. The limestone beds are noted as typically less than 8 inches thick, but locally as much as 3 feet thick. The shale interbeds of this formation are described as laminated to thinly bedded, calcareous, and in beds generally less than 10 inches thick.

Based on the boundaries of the members shown on the aforementioned Geologic Map, the majority of bedrock encountered on this site should be the Fairview Formation. The characteristics of the bedrock core recovered from Boring 1 are also consistent with the description of the Fairview Formation bedrock.

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<sup>1</sup> The Bellevue Tongue of the Grant Lake Limestone is underlain by the Fairview Formation.

Bedrock in the Northern Kentucky Area is typically classified into three (3) zones, characterized by the degree of weathering of the shale fraction. The uppermost zone is termed highly weathered, wherein the shale is typically brown in color and has almost weathered to a clay-like soil, yet characteristic bedding planes are still prevalent. In the intermediate weathered zone, the shale is typically olive brown with occasional gray and somewhat stronger than the shale in the highly weathered zone. The lowest zone is the parent unweathered gray shale. All three zones are interbedded with essentially unweathered limestone. It is not uncommon for one or both of the two upper weathered zones to be absent at any location due to differential weathering, erosion, prior excavation, or other factors. The Rock Classification Sheet, which is included in the Appendix of this report, describes the varying degrees of weathering along with the rock strength descriptions that are used on the appended boring logs.<sup>2</sup>

Regarding the limestone, these layers are predominantly unweathered, and their strengths are estimated to range from medium strong to very strong (i.e., unconfined compressive strengths ranging from 4,000 psi to upwards of 30,000 psi). Occasionally, thin 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 all of the new borings made for this project at depths varying from 4.5 to 9.5 feet below the ground surface, and in thicknesses ranging from 2.5 to 7.3 feet. Interbedded highly weathered shale and limestone bedrock was also encountered in the historic boring at a depth of 12.0 feet below the ground surface, and in a thickness of 5.0 feet. The strength of the highly weathered shale was described as extremely weak. Natural moisture content testing of three (3) samples of the highly weathered shale from the new borings

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<sup>2</sup> The descriptions of the strengths of bedrock vary between the historical borings and the new borings explicitly completed for this project. For reference, “very soft” on the historical borings is approximately synonymous with “extremely weak” while “soft” and “very weak” are approximate equals. “Moderately tough” may be correlated with “weak”, and “hard” may be correlated with “medium strong” to “very strong”.



yielded values of 15.7, 20.3, and 21.9 percent. It should be noted that clay seams were encountered in Borings 1 and 2 within the highly weathered bedrock.

Interbedded weathered shale and limestone bedrock was encountered in all of the new borings made for this project at depths ranging from 7.0 to 14.5 feet below the ground surface and in thicknesses ranging from 3.7 feet to 11.8 feet. Interbedded weathered shale and limestone bedrock was encountered in the historic boring at a depth of 17.0 feet below the ground surface and terminated within the weathered bedrock at a depth of 25.1 feet below the ground surface. The strength of the weathered shale was described as extremely weak. Natural moisture content testing of four (4) samples of the weathered shale from the new borings yielded results varying from 14.3 to 20.8 percent.

Interbedded unweathered shale and limestone bedrock was encountered in all of the new borings made for this project at depths ranging from 18.0 to 20.3 feet below the ground surface. The strength of the unweathered shale was described as ranging from extremely weak to very weak. Natural moisture content testing of five (5) samples of the unweathered shale from the new borings yielded results varying from 5.2 to 14.9 percent. Two (2) uniaxial compression tests were performed on unweathered shale portions of the bedrock. Table 1 documents the results from these compression tests.

**Table 1. Summary of unconfined compression test data on unweathered shale samples.**

Boring Number	Sample Number	Depth (ft)		Moisture Content (%)	Dry Unit Weight (pcf)	Unconfined Compressive Strength (psi)
		From	To			
1	RC-1	22.5	22.9	8.5	133.7	97
1	RC-2	27.8	28.2	5.2	146.1	607

## **5.2 Groundwater Conditions**

Observations for groundwater were made in the borings during drilling and at the completion of drilling. The borings were backfilled with soil cuttings immediately upon completion of drilling; therefore, long-term stabilized groundwater measurements could not be obtained.

Groundwater measurement notes are included at the bottoms of the boring logs in the Appendix. In all of the new borings, groundwater was not encountered and the boreholes were “Dry” at the completion of drilling or were affected by the introduction of core water for the bedrock coring (e.g., Boring 1); that is, no accumulated groundwater was measured.

Additionally, based on our local experience, periodic groundwater seepage can occur as perched water within the existing fill, at the fill/native soil interface, at the soil/bedrock interface, and along limestone layers within the bedrock. Locally concentrated flow may occur along fractures within the bedrock or within saturated zones of overburden soils that were not encountered by the borings. Groundwater levels and seepage/flow rates are expected to vary with time, location, and amounts of precipitation.

## **6.0 CONCLUSIONS AND RECOMMENDATIONS**

### **6.1 General**

Based upon our engineering reconnaissance of the site, the borings, a visual examination of the samples, the laboratory tests, our understanding of the proposed construction, and our experience as Consulting Soil and Foundation Engineers in Northern Kentucky, we have reached the conclusions and make the recommendations in this report.

The conclusions and recommendations of this report have been derived by relating the general principles of the discipline of Geotechnical Engineering to the proposed construction outlined in Section 2.0 of this report. Because changes in surface, subsurface, climatic, and economic conditions can occur with time and location, we recommend for our mutual interest that the use of this report be restricted to this specific project.

Our understanding of the proposed design and construction is based on the documents provided to us at the time that this report was prepared and which are referenced in Section 2.0 of this report. We recommend that our office be retained to review the final

design documents, plans, and specifications, to assess any impact changes, additions, or revisions in these documents may have on the conclusions and recommendations of this Geotechnical Report. Any changes or modifications which are made in the field during the construction phase that alter site grading, structure locations, infrastructure, or other related site work should also be reviewed by our office prior to their implementation.

If conditions are encountered in the field during construction that vary from the facts of this report, we recommend that our office be contacted immediately to review the changed conditions in the field and make appropriate recommendations. It is our understanding that the timeframe for beginning and completing the site work for this project will be continuous without interruption or delay. Should interruptions or delays occur, our office should be kept apprised to modify recommendations accordingly.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, 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 that were observed are strictly for the information of our Client.

We have performed the borings and laboratory tests for our evaluation of the site conditions and for the formulation of the conclusions and recommendations of this report. We assume no responsibility for the interpretation or extrapolation of the data by others.

The earthwork recommendations of this report presume that the earthwork will be monitored continuously by an Engineering Technician under the direction of a Registered Professional Geotechnical Engineer. We recommend that the Owner contract these services directly with Thelen Associates, Inc.

We recommend that a preconstruction meeting be held at the site with the Owner's representative, the Design Civil Engineer, the Architect, the Structural Engineer, the General Contractor, the Excavating Contractor, the Geotechnical Engineer, and any other interested parties to review the scope and schedule of the proposed earthwork and foundation installation.

In general, it is our opinion that the site is suitable for the proposed earthwork and new structures provided that the recommendations contained herein are implemented relative to site preparation, earthwork operations, and foundation design.

### **6.2 Seismicity**

Based on the borings and our interpretation of the 2013 Edition of the Kentucky Building Code (2013 KBC), it is our opinion that the project site should be classified as Site Class C.

### **6.3 Excavation Support**

Excavation support should be the responsibility of the Contractor. All excavation support should be designed and implemented such that the excavations are adequately braced, shored, sloped, and ventilated in order to protect and ensure the safety of workers within and near the excavations and to protect all adjacent ground, slopes, structures, and infrastructure. All federal, state, and local safety regulations should be satisfied along with OSHA regulations. The analyses, discussions, conclusions, and recommendations throughout this report are not to be interpreted as pre-engineering compliance with OSHA regulations or any other safety regulations.

### **6.4 Site Preparation and Earthwork Operations**

As stated in Section 2.0, it is our understanding that earthwork for this proposed site development will only include minor cuts and fills on the order of 5 feet or less.

The initial preparation of the site for grading should include the removal of all trees, brush, vegetation, heavy root systems, and topsoil from the proposed cut, fill, pavement,

and structure areas. The vegetation should be properly disposed of in accordance with local regulations, and the topsoil should be stockpiled away from the proposed structure area for use on the completed cut and fill surfaces or for future landscaping purposes, if permitted by the project specifications.

All concrete, rubble, and debris associated with the existing tank that is razed should be wasted off site.

After performing the above operations, the exposed subgrade should be thoroughly proofrolled using a heavy piece of on-site equipment under the review of the Project Geotechnical Engineer, or a representative thereof. If any soft or yielding soils are observed during the proofrolling operations, they should be undercut to firm material at the direction of the Project Geotechnical Engineer, or representative thereof.

Fill placed to establish grades should be placed in thin (less than 8-inch thick) loose lifts, each compacted to achieve a dry density of not less than 98 percent of the standard Proctor maximum dry density, ASTM D698. The moisture content of the soils at the time of compaction should be within 2 percent below to 3 percent above the optimum moisture content. The top 12 inches of subgrade soils below exterior pavements should be moisture conditioned to within 2 percent of optimum and be compacted to at least 100 percent, ASTM D698, immediately prior to paving. The on-site silty clays and existing fill should be suitable for reuse as compacted fill.

Groundwater is not expected to have a significant adverse effect on the majority of the proposed earthwork construction; however, the Contractor must be prepared to remove seepage that accumulates during excavation on fill surfaces or at subgrade levels.

It is recommended that any unpaved areas adjacent to the tank foundations or pavements have a minimum ten percent decline slope for at least ten feet away from those structures and pavements. More than ten feet away from the structures and pavements, unpaved surfaces should slope at least two percent away from the structure or pavements. Paved areas should slope at least two percent away from the structures.

## **6.5 Deep Foundation Design Recommendations**

The “Foundations” plan for the existing 300,000-gallon elevated tank at this site, which was dated July 13, 1934 and prepared by Columbia Engineering Corporation, was provided by Ms. Haney of GRW. A review of this plan indicated that the existing tank is supported on isolated spread footings connected by reinforced concrete members. The spread footings are shown to be 14 feet square and bearing at elevations ranging from 821.9 to 818.5 ft. Upon comparison with the borings for this project, these existing footings appear to be bearing in very stiff residual soils or the weathered interbedded shale and limestone bedrock.

Based on our experience with similar projects, it is anticipated that footings bearing in natural soils beneath any fill soils at minimum depths required by design or frost protection is common for the types of tanks being considered. However, for this project at this site where foundations for the new tank will have to fit between some of the larger existing tank footings, we recommend that the new tank be supported on drilled shafts extending through the overburden soils and the weathered zones of the bedrock to derive end bearing support in the gray, unweathered bedrock in order to take advantage of higher bearing capacity of the unweathered bedrock and allow for smaller shaft diameters. We recommend that the axial resistance of the drilled shafts be derived only from tip resistance, and that skin friction be ignored. Table 2 provides the unit tip resistances for the drilled shafts in kips per square foot (ksf) for design methods based on allowable stress design (ASD) and load and resistance factor design (LRFD).

Where the drilled shafts will be supporting lateral loads, the drilled shafts should also be designed using a p-y approach with the parameters discussed in Section 6.5.1.

The drilled shaft excavations should be made straight and plumb with level bottoms. All 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 4 inches of water in the bottom of any shaft.

**Table 2. Unit tip resistance for drilled shafts.**

<b>Ratio of Unweathered Bedrock Embedment to Bedrock Socket Diameter*</b>	<b>Unit Tip Resistance (ksf)</b>	
	<b>ASD**</b>	<b>LRFD***</b>
< 1.5 (12-inch min.)	30	90
≥ 1.5	70	210

\*The minimum embedments should be provided into bedrock that is suitable for the indicated unit tip resistances.

\*\* Unit tip resistances for ASD are allowable and have a factor of safety incorporated into the values.

\*\*\* Unit tip resistances for LRFD approach are unfactored; therefore, a resistance factor of 0.55 should be applied to these values.

The bottoms of any grade beams atop the drilled shafts should be at least 30 inches below final exterior grades for frost protection. The grade beams should be excavated with uniform bottoms of trenches and vertical uniform sidewalls so that the concrete is cast neat against the bottoms and sides of the excavations and that proper concrete cover is provided for the reinforcing steel.

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 the design recommendations within this report and the soil and bedrock conditions encountered in the borings.

Although the use of temporary casing is not anticipated, we recommend that the Contract Documents include a bid item for casing shafts from the ground surface to the top of the bedrock as recommended by the Project Geotechnical Engineer, or the representative thereof, on a per cased shaft basis.

### ***6.5.1 Laterally Loaded Deep Foundation Elements***

This section provides the parameters for evaluating the lateral resistance of laterally loaded deep foundation elements (e.g., drilled shafts). Table 3 provides parameters for the overburden soils while Table 4 provides parameters for bedrock. The parameters in

both of these tables are suited for a p-y analysis of laterally loaded deep foundation elements.

**Table 3. Overburden soil parameters for p-y analyses of laterally loaded deep foundation elements.**

Soil Description from Boring Log	p-y Curve Model/ Material Type	Unit Weight, $\gamma$ (pcf)	Saturated Unit Weight, $\gamma_{sat}$ (pcf)	Cohesion, c (psf)	Friction Angle, $\phi$ (°)	Strain, $\epsilon_{50}$	Initial Horizontal Subgrade Reaction, k (pci)	
							Static	Cyclic
Stiff Glacial and Residual Soils	Stiff Clay	120	125	1,500	-	0.007	500	200

**Table 4. Bedrock parameters for p-y analyses of laterally loaded deep foundation elements.**

Bedrock Description from Boring Log	p-y Curve Model/ Material Type	Unit Weight, $\gamma$ (pcf)	Uniaxial Compressive Strength, $q_u$ (psf)	Initial Modulus of Rock Mass, $E_m$ (psi)	Strain, $\epsilon_{50}$ or Strain Factor, $k_{rm}$	Initial Horizontal Subgrade Reaction (pci)
Highly Weathered Shale Bedrock	Stiff Clay	140	9,000	3,125	0.002	2,000
Weathered Shale Bedrock	Weak Rock	140	12,000	4,165	0.0005	2,000
Unweathered Shale Bedrock	Weak Rock	140	40,000	14,000	0.0005	3,470

Lateral resistance for deep foundations should be ignored within the existing and new fill and also within the upper 5 feet of overburden soils below proposed finished grade.

Where the spacing of laterally loaded deep foundations are close enough that their areas of resistance overlap, we recommend that an appropriate p-multiplier be applied in the analyses to account for this overlapping and reduction in resistance. Refer to Table 5 for recommended p-multiplier values.



**Table 5. Recommended p-multiplier,  $p_m$ , values for drilled shafts (from FHWA NHI-10-016, Drilled Shafts: Construction Procedures and LRFD Design Methods, 2010).**

Pile Spacing (c-c)	Design p-multiplier, $p_m$			
	3D*	4D*	5D*	$\geq 6D^*$
Lead Row	0.7	0.85	1.0	1.0
2 <sup>nd</sup> Row	0.5	0.65	0.85	1.0
3 <sup>rd</sup> and Higher Rows	0.35	0.5	0.7	1.0

\*D is the shaft diameter

## **6.6 Utility and Foundation Backfilling Recommendations**

The Contractor should be required to prevent groundwater seepage or rainwater from ponding around completed foundations, including grade beams, or within utility trenches.

### ***6.6.1 Foundation Backfilling***

Any below-grade foundation walls should be backfilled as soon as possible with the on-site clayey soils or approved borrow placed in thin (less than 8-inch thick) loose lifts, with each lift compacted to a dry density of at least 98 percent of the standard Proctor maximum dry density, ASTM D698. The moisture content of the soils at the time of compaction should be within a range of 2 percent below to 3 percent above the optimum moisture. The backfill level should be maintained the same on both sides of the foundation wall to prevent unbalanced earth pressures on the wall. We recommend that granular backfill not be used for foundations unless drainage outlets are provided to prevent a buildup of water in the granular backfill. Undrained granular backfill may act as a reservoir for water that may later seep into the clays and shales and cause swelling. Swelling soils can cause excessive pressures on foundations and pavements.

### ***6.6.2 Utility Trench Backfilling***

We anticipate 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 should be compacted to at least 75 percent relative density per ASTM D4253 and D4254 for soils that do not exhibit a well-defined moisture-density relationship, or at least 98 percent of the standard Proctor maximum dry density (ASTM D698) for soils that exhibit a well-defined moisture-density relationship. Clayey backfill should be moisture-conditioned to within 2 percent below to 3 percent above the optimum moisture content for compaction and compacted to densities not less than 98 percent of the standard Proctor maximum dry density (ASTM D698).

All backfill should be placed in 6- to 8-inch thick lifts with each lift thoroughly compacted to the specified degree of compaction. Under no circumstances should the backfill be flushed in an attempt to obtain compaction.

If flowable fill is used, the flowable fill should have a maximum permeability of  $10^{-5}$  centimeters/second and should have a design strength of at least 30 psi for stability and not greater than 100 psi for future excavatability.

For utilities within the perimeters of the proposed structure, one of the following two options should be implemented to further reduce the potential for water collecting in the utility trenches:

- 1) The granular bedding and pipe zone backfill should be eliminated around the proposed utility pipes 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.
- 2) Concrete dam or anti-seepage collars should be provided where the utility crosses beneath the exterior footings of the proposed building. These dams or collars should extend at least 6 inches beyond the sides and bottoms of the utility

trenches into the in situ soils to cutoff water that may want to migrate from the exterior of the structure into the utility trenches underneath the interior of the building.

Prior to placing the bedding and utilities within the utility trench, all soft, saturated, and compressible material should be removed from the bottom of the trench exposing moist stiff soils or undisturbed bedrock.

**APPENDIX**

ASFЕ Report Information

Boring Plan, Drawing 150258E-1

Boring Logs

Soil Classification Sheet

Rock Classification Sheet

Tabulation of Laboratory Tests

Rock Uniaxial Compressive Strength Test Forms

ALS Environmental Report Dated June 2, 2015

# Important Information about Your 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 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 your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the 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.

## **A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors**

Geotechnical engineers consider a number of 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,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- 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 study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the 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 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 construction recommendations included in your report. *Those 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 recommendations if that engineer does not perform construction observation.*

### **A Geotechnical Engineering Report Is Subject to Misinterpretation**

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower 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. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing 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 Contractors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors 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 contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

### **Read Responsibility Provisions Closely**

Some clients, design professionals, and contractors do not 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.

### **Geoenvironmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental 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 geoenvironmental 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, a number of 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 ASFE-Member Geotechnical Engineer for Additional Assistance**

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

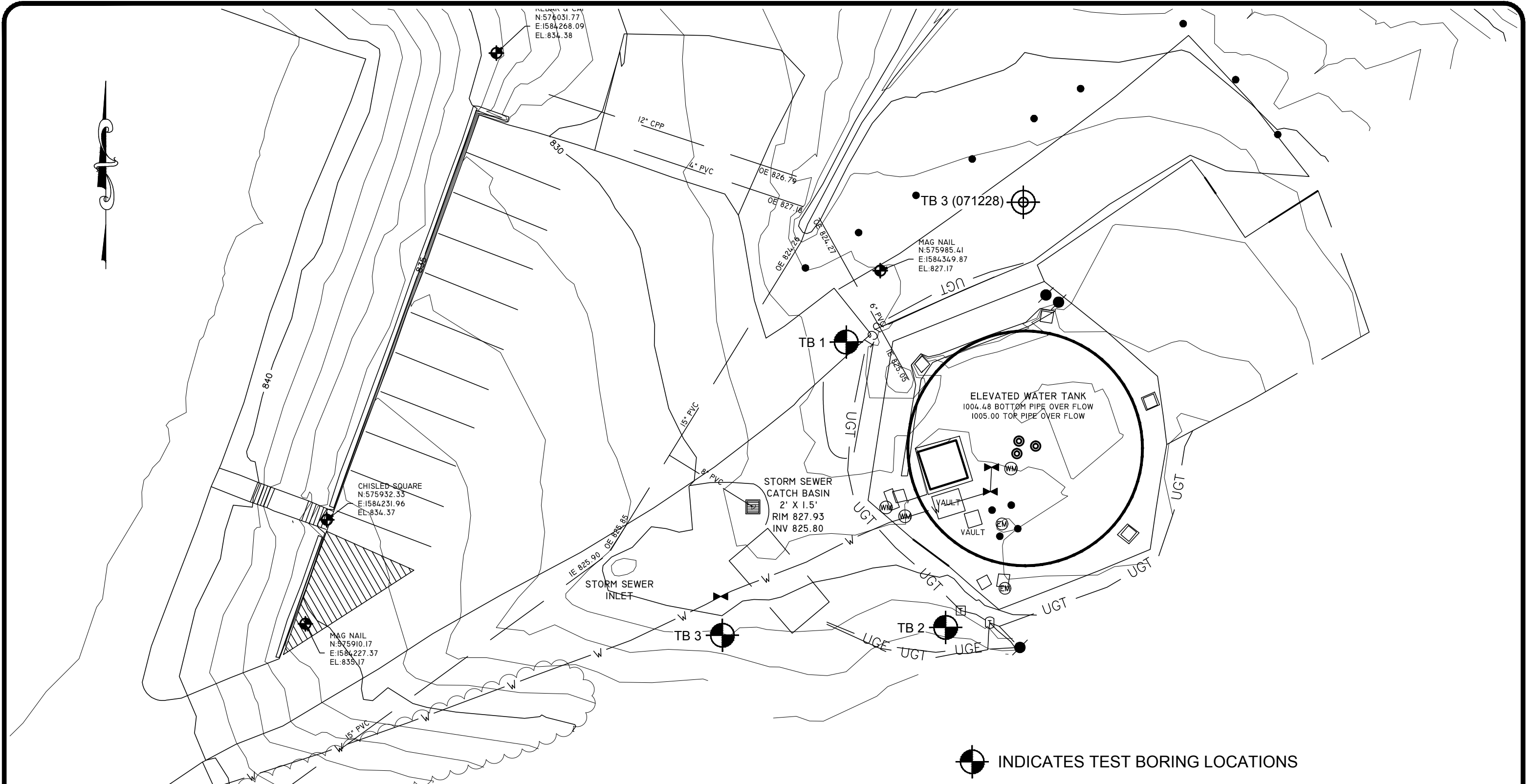
## **ASFE THE GEOPROFESSIONAL BUSINESS ASSOCIATION**

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IIGER03135.0MRP


Bid Set



NOTE: BASE MAP RECEIVED ELECTRONICALLY FROM GRW ENGINEERS, INC. ON MAY 1, 2015.

-  INDICATES TEST BORING LOCATIONS
-  INDICATES PREVIOUSLY DRILLED TEST BORING LOCATIONS

Drawing Revisions	



**THELEN ASSOCIATES, INC.**  
 Geotechnical • Testing Engineers  
 1398 Cox Avenue, Erlanger, Kentucky 41018 / 859-746-9400  
 Lexington, Kentucky • Cincinnati, Ohio • Dayton, Ohio

Title: **BORING PLAN**  
 Client: **GRW Engineers, Inc.**

Project: **Geotechnical Exploration  
Lumley Tank Replacement**  
 Location: **Ft. Thomas, Kentucky**

Scale: **1" = 20'**  
 Date: **6/5/2015**  
 Drawing No.: **150258E-1**



**LOG OF TEST BORING**

CLIENT: GRW Engineers, Inc. BORING #: 1  
PROJECT: Geotechnical Exploration, Lumley Tank Replacement PROJECT #: 150258E  
Ft. Thomas, Kentucky PAGE #: 1 of 2

LOCATION OF BORING: As shown on Boring Plan, Drawing No. 150258E-1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6"		Recovery	
							Rock Core RQD (%)	(in.)	(%)	
827.6	Ground Surface	0.0	0							
827.3	ASPHALT (3 inches)	0.3								
826.6	GRAVEL (9 inches)	1.0								
825.1	Mixed dark brown moist medium dense FILL, clayey sand with little asphalt fragments and traces of gravel and limestone fragments.	2.5		D	1	DS	8-7-6	10	56	
823.1	Mixed dark gray moist medium stiff FILL, sandy clay with traces of rock fragments, asphalt fragments and gravel.	4.5		D	2	DS	6-3-2	6	33	
818.1	Brown, trace reddish brown and gray moist very stiff CLAY with trace sand (glacial).	9.5	5	I	3	DS	3-4-3	8	44	
813.1	Interbedded brown, trace gray moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE with clay seams (bedrock).	14.5	10	L	4	DS	7-8-8	0	0	
				I	5	DS	4-35-10	18	100	
				I	6	DS	9-8-12	15	83	
			15	I	7	DS	14-12-50	16	89	
				I	8	DS	12-50/6"	6	50	

Datum: Mean Sea Level Hammer Weight: 140 lb. Hole Diameter: 7.25 in. Drill Rig: CME-55 TD-3  
Surface Elevation: 827.6 ft. Hammer Drop: 30 in. Rock Core Diameter: 1.875 in. Foreman: J. Franz  
Date Started: 5/18/2015 Pipe Size: 2 in. O.D. Boring Method: HSA-3.25 Engineer: R. Bach/J. Hauber  
Date Completed: 5/18/2015

<b>BORING METHOD</b>	<b>SAMPLE TYPE</b>	<b>SAMPLE CONDITIONS</b>	<b>GROUNDWATER DEPTH</b>
HSA = Hollow Stem Augers	PC = Pavement Core	D = Disintegrated	First Noted <u>Core Water</u>
CFA = Continuous Flight Augers	CA = Continuous Flight Auger	I = Intact	At Completion <u>Core Water</u>
DC = Driving Casing	DS = Driven Split Spoon	U = Undisturbed	After <u>--</u>
MD = Mud Drilling	PT = Pressed Shelby Tube	L = Lost	Backfilled <u>Immediately</u>
	RC = Rock Core		

\* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals





*Offices*  
Erlanger, Kentucky  
Lexington, Kentucky  
Cincinnati, Ohio  
Dayton, Ohio

**LOG OF TEST BORING**

CLIENT: GRW Engineers, Inc. BORING #: 1  
PROJECT: Geotechnical Exploration, Lumley Tank Replacement PROJECT #: 150258E  
Ft. Thomas, Kentucky PAGE #: 2 of 2  
LOCATION OF BORING: As shown on Boring Plan, Drawing No. 150258E-1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6"	Recovery	
							Rock Core RQD (%)	(in.)	(%)
807.3 807.1	Interbedded gray moist extremely weak partly fissile unweathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	20.3 20.5	20	I	9	DS	70/6"	6	100
802.1	Interbedded gray moist extremely weak to very weak unweathered SHALE and gray medium strong to very strong LIMESTONE. The shale is partly calcareous and weathered along limestone contacts with thin to medium beds up to 7 inches thick while the limestone is in thin to medium beds up to 5 inches thick. This interval is comprised of 32% limestone. (Fairview Formation)	25.5	25	I	10	RC	RQD = 34%	56	93
797.1	Interbedded gray moist very weak unweathered SHALE and gray medium strong to very strong LIMESTONE. The shale is partly calcareous and partly fissile with thin to medium beds up to 18 inches thick while the limestone is in thin to medium beds up to 6 inches thick. This interval is comprised of 28% limestone. (Fairview Formation)	30.5	30	I	11	RC	RQD = 30%	58	97
	Bottom of test boring at 30.5 feet.  Sample for lead testing was obtained by hand digging with a shovel in the grass immediately behind the guardrail adjacent to the test boring location.		35						

Datum: Mean Sea Level Hammer Weight: 140 lb. Hole Diameter: 7.25 in. Drill Rig: CME-55 TD-3  
Surface Elevation: 827.6 ft. Hammer Drop: 30 in. Rock Core Diameter: 1.875 in. Foreman: J. Franz  
Date Started: 5/18/2015 Pipe Size: 2 in. O.D. Boring Method: HSA-3.25 Engineer: R. Bach/J. Hauber  
Date Completed: 5/18/2015

<b>BORING METHOD</b>	<b>SAMPLE TYPE</b>	<b>SAMPLE CONDITIONS</b>	<b>GROUNDWATER DEPTH</b>
HSA = Hollow Stem Augers	PC = Pavement Core	D = Disintegrated	First Noted <u>Core Water</u>
CFA = Continuous Flight Augers	CA = Continuous Flight Auger	I = Intact	At Completion <u>Core Water</u>
DC = Driving Casing	DS = Driven Split Spoon	U = Undisturbed	After <u>--</u>
MD = Mud Drilling	PT = Pressed Shelby Tube	L = Lost	Backfilled <u>Immediately</u>
	RC = Rock Core		

\* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals



**LOG OF TEST BORING**

CLIENT: GRW Engineers, Inc. BORING #: 2  
 PROJECT: Geotechnical Exploration, Lumley Tank Replacement PROJECT #: 150258E  
Ft. Thomas, Kentucky PAGE #: 1 of 1  
 LOCATION OF BORING: As shown on Boring Plan, Drawing No. 150258E-1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6"	Recovery	
							Rock Core RQD (%)	(in.)	(%)
832.2	Ground Surface	0.0	0						
830.2	Mixed brown moist very stiff FILL, silty clay with traces of sand, oxide stains, and roots.	2.0		I	1A 1B	DS	6-5-4	10	56
827.7	Brown and dark brown moist very stiff SILTY CLAY with trace bedding planes, remnant shale beds, limestone layers/floaters, and trace oxide stains (residuum) (CL).	4.5		I	2	DS	3-5-7	11	61
825.2	Interbedded brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE with clay seams (bedrock).	7.0	5	I	3	DS	6-8-5	18	100
813.4	Interbedded brown and olive brown moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	18.8	10	I	4	DS	12-50/6"	12	100
				I	5	DS	12-7-27	4	22
				I	6	DS	27-30-50	4	22
			15	I	7	DS	50/6"	3	50
811.7	Interbedded gray moist extremely weak to very weak unweathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	20.5	20	I	8 9	DS DS	21-31-50/3" 50/6"	7 4	47 67
	Split spoon refusal and bottom of test boring at 20.5 feet.  Sample 1A was obtained for lead testing from the upper portion of the split spoon driven from the ground surface.		25 30						

Datum: Mean Sea Level Hammer Weight: 140 lb. Hole Diameter: 7.25 in. Drill Rig: CME-55 TD-3  
 Surface Elevation: 832.2 ft. Hammer Drop: 30 in. Rock Core Diameter: -- Foreman: J. Franz  
 Date Started: 5/18/2015 Pipe Size: 2 in. O.D. Boring Method: HSA-3.25 Engineer: R. Bach/J. Hauber  
 Date Completed: 5/18/2015

<b>BORING METHOD</b>	<b>SAMPLE TYPE</b>	<b>SAMPLE CONDITIONS</b>	<b>GROUNDWATER DEPTH</b>
HSA = Hollow Stem Augers	PC = Pavement Core	D = Disintegrated	First Noted <u>None</u>
CFA = Continuous Flight Augers	CA = Continuous Flight Auger	I = Intact	At Completion <u>Dry</u>
DC = Driving Casing	DS = Driven Split Spoon	U = Undisturbed	After <u>--</u>
MD = Mud Drilling	PT = Pressed Shelby Tube	L = Lost	Backfilled <u>Immediately</u>
	RC = Rock Core		

\* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals



**LOG OF TEST BORING**

CLIENT: GRW Engineers, Inc. BORING #: 3  
 PROJECT: Geotechnical Exploration, Lumley Tank Replacement PROJECT #: 150258E  
Ft. Thomas, Kentucky PAGE #: 1 of 1  
 LOCATION OF BORING: As shown on Boring Plan, Drawing No. 150258E-1

ELEV.	COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS DESCRIPTION	Strata Depth (feet)	Depth Scale (feet)	Sample Condition	Sample Number	Sample Type	SPT* Blows/6"	Recovery	
							Rock Core RQD (%)	(in.)	(%)
831.3	Ground Surface	0.0	0						
829.3	Mixed brown and dark brown moist very stiff FILL, silty clay with traces of sand, limestone floaters/fragments, asphalt fragments, organics, and oxide stains.	2.0		I	1A 1B	DS	6-12-7	10	56
826.8	Mixed reddish brown moist very stiff FILL, clay with traces of sand, gravel, roots, and oxide stains (CH).	4.5		I	2	DS	2-2-3	9	50
824.3	Brown and reddish brown moist stiff CLAY with traces of sand and oxide stains (CH).	7.0	5	I	3	DS	2-4-7	18	100
817.0	Interbedded brown and olive brown moist extremely weak highly weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	14.3	10	I	4	DS	21-50/6"	12	100
				I	5	DS	8-30-17	18	100
				I	6	DS	27-50/6"	12	100
813.3	Interbedded brown and olive brown moist extremely weak weathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	18.0	15	I	7	DS	23-11-10	18	100
812.3	Interbedded gray moist very weak unweathered SHALE and gray medium strong to very strong LIMESTONE (bedrock).	19.0		I	8A 8B	DS	22-27-50	18	100
	Bottom of test boring at 19.0 feet.  Sample 1A was obtained for lead testing by hand digging with a shovel immediately adjacent to the boring location.		20						
			25						
			30						

Datum: Mean Sea Level Hammer Weight: 140 lb. Hole Diameter: 7.25 in. Drill Rig: CME-55 TD-3  
 Surface Elevation: 831.3 ft. Hammer Drop: 30 in. Rock Core Diameter: -- Foreman: J. Franz  
 Date Started: 5/18/2015 Pipe Size: 2 in. O.D. Boring Method: HSA-3.25 Engineer: R. Bach/J. Hauber  
 Date Completed: 5/18/2015

<b>BORING METHOD</b>	<b>SAMPLE TYPE</b>	<b>SAMPLE CONDITIONS</b>	<b>GROUNDWATER DEPTH</b>
HSA = Hollow Stem Augers	PC = Pavement Core	D = Disintegrated	First Noted <u>None</u>
CFA = Continuous Flight Augers	CA = Continuous Flight Auger	I = Intact	At Completion <u>Dry</u>
DC = Driving Casing	DS = Driven Split Spoon	U = Undisturbed	After <u>--</u>
MD = Mud Drilling	PT = Pressed Shelby Tube	L = Lost	Backfilled <u>Immediately</u>
	RC = Rock Core		

\* SPT = Standard Penetration Test - Driving 2" O.D. Sampler 18" with 140-Pound Hammer Falling 30"; Count Made at 6" Intervals



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Geotechnical • Testing Engineers

1398 Cox Avenue / Erlanger, Kentucky 41018-1002 / 859-746-9400 / Fax 859-746-9408  
 2140 Waycross Road / Cincinnati, Ohio 45240-2719 / 513-825-4350 / Fax 513-825-4756  
 www.thelenassoc.com

## LOG OF TEST BORING

CLIENT: Northern Kentucky Water District BORING #: 3  
 PROJECT: Consulting Services, Tank Site #3 - N. Ft. Thomas Avenue, Ft. Thomas, Kentucky JOB #: 071228E  
 LOCATION OF BORING: As shown on Boring Plan, Drawing 071228E-3

ELEV.	SOIL DESCRIPTION COLOR, MOISTURE, DENSITY, PLASTICITY, SIZE, PROPORTIONS	STRATA DEPTH (feet)	DEPTH SCALE (feet)	SAMPLE				
				Cond	Blows/6"	No.	Type	Rec. (Inches)
97.0	SURFACE	0.0						
95.0	Mixed gray, trace brown moist very dense FILL, crushed limestone, trace silty clay.	2.0		D	28/31/32	1	DS	10
	Mixed green and gray moist soft FILL, silty clay, trace asphalt fragments and limestone floaters.		5	I	4/5/6	2	DS	8
90.0		7.0		I	3/4/6	3	DS	6
87.5	Mottled brown moist stiff CLAY with iron oxide stains.	9.5		I	5/6/12	4	DS	10
			10					
85.0	Brown moist very stiff SILTY CLAY with iron oxide stains and limestone fragments, trace bedding planes.	12.0		I	4/12/14	5	DS	10
80.0	Interbedded brown moist very soft highly weathered SHALE and gray hard LIMESTONE (bedrock).	17.0	15	I	50/2"	6	DS	1
				L	50/0"	7	DS	0
	Interbedded olive brown and gray moist soft weathered SHALE and gray hard LIMESTONE (bedrock).		20	I	28/50/3"	8	DS	9
				I	40/48/50	9	DS	18
72.5		24.5		I	50/6"	10	DS	6
71.9	Interbedded gray moist soft weathered SHALE and gray hard LIMESTONE (bedrock).	25.1	25	I	50/1"	11	DS	1
	Split spoon refusal and bottom of test boring at 25.1 feet.							

Datum Relative Hammer Wt. 140 lbs. Hole Diameter 5"/8" in. Foreman GB/ML  
 Surf. Elev. 97.0 ft. Hammer Drop 30 in. Rock Core Dia. - in. Engineer MES  
 Date Started 12/24/07 Pipe Size O.D. 2 in. Boring Method CFA/3-1/4 HSA Date Completed 12/24/07

### SAMPLE CONDITIONS

D - DISINTEGRATED  
 I - INTACT  
 U - UNDISTURBED  
 L - LOST

### SAMPLE TYPE

DS - DRIVEN SPLIT SPOON  
 PT - PRESSED SHELBY TUBE  
 CA - CONTINUOUS FLIGHT AUGER  
 RC - ROCK CORE

### GROUNDWATER DEPTH

FIRST NOTED 22.5 ft.  
 AT COMPLETION 11.9 ft.  
 AFTER - hrs. - ft.  
 BACKFILLED Immed. hrs.

### BORING METHOD

HSA - HOLLOW STEM AUGERS  
 CFA - CONTINUOUS FLIGHT AUGERS  
 DC - DRIVING CASING  
 MD - MUD DRILLING

STANDARD PENETRATION TEST - DRIVING 2" O.D. SAMPLER 1' WITH 140# HAMMER FALLING 30"; COUNT MADE AT 6" INTERVALS

Bid Set



## SOIL CLASSIFICATION SHEET

### NON COHESIVE SOILS (Silt, Sand, Gravel and Combinations)

#### Density

Very Loose	- 5 blows/ft. or less
Loose	- 6 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

	<u>Field Identification</u>
Very Soft	Easily penetrated several inches by fist
Soft	Easily penetrated several inches by thumb
Medium Stiff	Can be penetrated several inches by thumb with moderate effort
Stiff	Readily indented by thumb but penetrated only with great effort
Very Stiff	Readily indented by thumbnail
Hard	Indented with difficulty by thumbnail

#### Unconfined Compressive Strength (tons/sq. ft.)

Less than 0.25
0.25 – 0.5
0.5 – 1.0
1.0 – 2.0
2.0 – 4.0
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.



## 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)  
40-150

Extremely Weak

Indented by thumbnail

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.

THELEN ASSOCIATES, INC.  
 1398 COX AVENUE  
 ERLANGER, KENTUCKY 41018-1002

GRW ENGINEERS, INC.  
 GEOTECHNICAL EXPLORATION  
 LUMLEY TANK REPLACEMENT  
 FT. THOMAS, KENTUCKY  
 150258E

**TABULATION OF LABORATORY TESTS**

Boring No.	Sample No.	Depth (ft.)		Moisture Content (%)	Natural Dry Density (pcf)	Atterberg Limits (%)			USCS Classification	Unconfined Compressive Strength (psf)
		From	To			LL	PL	PI		
1	1B	1.0	2.5	8.8						
1	2	2.5	4.0	13.1						
1	3	5.0	6.5	38.4						
1	5	10.0	11.5	20.3						
1	7	15.0	16.5	14.3						
1	9A	20.0	20.5	7.5						
1	RC-1	22.5	22.9	8.5	133.7					14,000
1	RC-2	27.8	28.2	5.2	146.1					87,400
2	1B	0.5	1.5	21.8						
2	2	2.5	4.0	21.6		44	22	22	CL	
2	4	7.5	8.5	18.6						
2	8	17.5	18.8	20.8						
2	9	20.0	20.5	5.5						
3	2	2.5	4.0	23.1		59	24	35	CH	
3	3	5.0	6.5	29.8		65	27	38	CH	
3	4	7.5	8.5	21.9						
3	5	10.0	11.5	15.7						
3	7	15.0	16.5	16.9						
3	8B	18.5	19.0	14.9						



**UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE  
ASTM D7012 - METHOD C**

CLIENT : GRW Engineers, Inc.

PROJECT NO.: 150258E

PROJECT: Geotechnical Exploration, Lumley Tank Replacement

LOCATION: Ft. Thomas, Kentucky

DATE: 5/26/2015

BORING NO.: 1

SAMPLE NO.: RC-1

DEPTH (ft.): 22.5-22.9

SAMPLE DESCRIPTION: Gray moist extremely weak, partly calcareous, unweathered SHALE

BEDROCK FORMATION: Fairview Formation

LOAD DIRECTION: 90° to Lithology

TEST TEMPERATURE (°F): 70

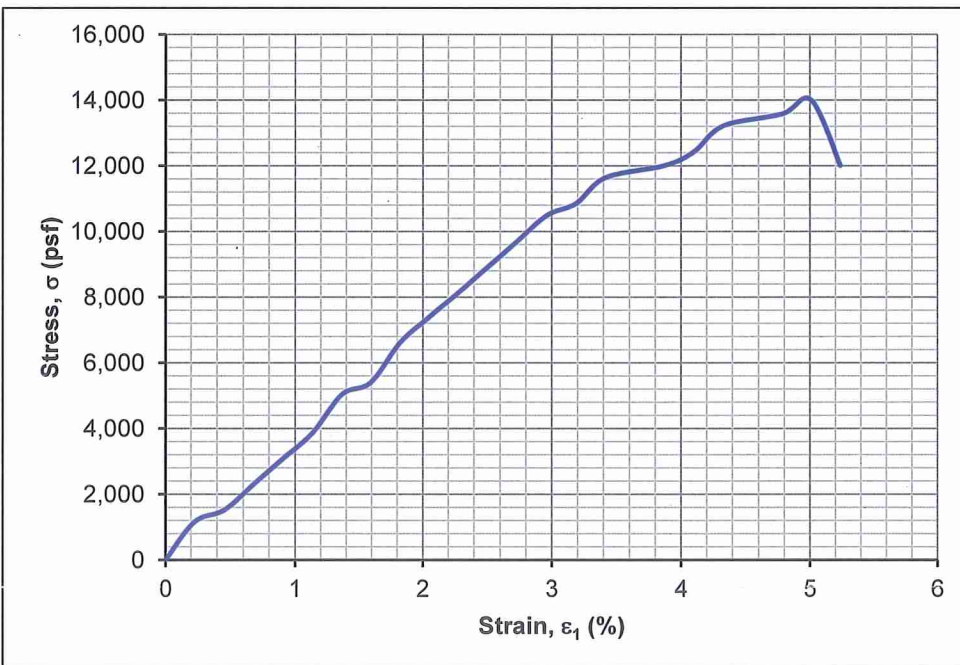
COMPRESSION APPARATUS.: Other

**SAMPLE DATA**

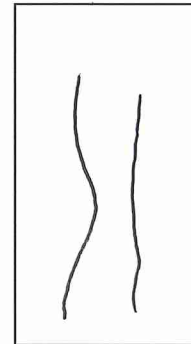
DIAMETER (in.):	1.87
HEIGHT (in.):	4.39
HEIGHT TO DIAMETER RATIO:	2.3
WET UNIT WEIGHT (pcf):	145.1
DRY UNIT WEIGHT (pcf):	133.7
MOISTURE CONTENT (%):	8.5

**FAILURE DATA**

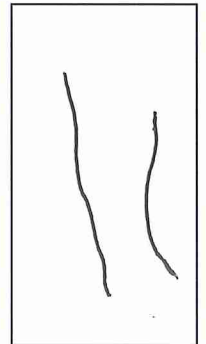
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	1.2
TIME TO FAILURE (min.):	4.3
AXIAL STRAIN AT FAILURE (%):	5.0
UNIAXIAL COMPRESSIVE STRENGTH, $q_u$ (ksf):	14.0
UNIAXIAL COMPRESSIVE STRENGTH, $q_u$ (psi):	97.2



**FAILURE SHAPES**



**FRONT VIEW**



**SIDE VIEW**

REMARKS :





**UNIAXIAL COMPRESSIVE STRENGTH OF INTACT ROCK CORE  
ASTM D7012 - METHOD C**

CLIENT : GRW Engineers, Inc.

PROJECT NO.: 150258E

PROJECT: Geotechnical Exploration, Lumley Tank Replacement

LOCATION: Ft. Thomas, Kentucky

DATE: 5/26/2015

BORING NO.: 1

SAMPLE NO.: RC-2

DEPTH (ft.): 27.8-28.2

SAMPLE DESCRIPTION: Gray moist very weak, partly calcareous, partly fissile, unweathered SHALE

BEDROCK FORMATION: Fairview Formation

LOAD DIRECTION: 90° to Lithology

TEST TEMPERATURE (°F): 70

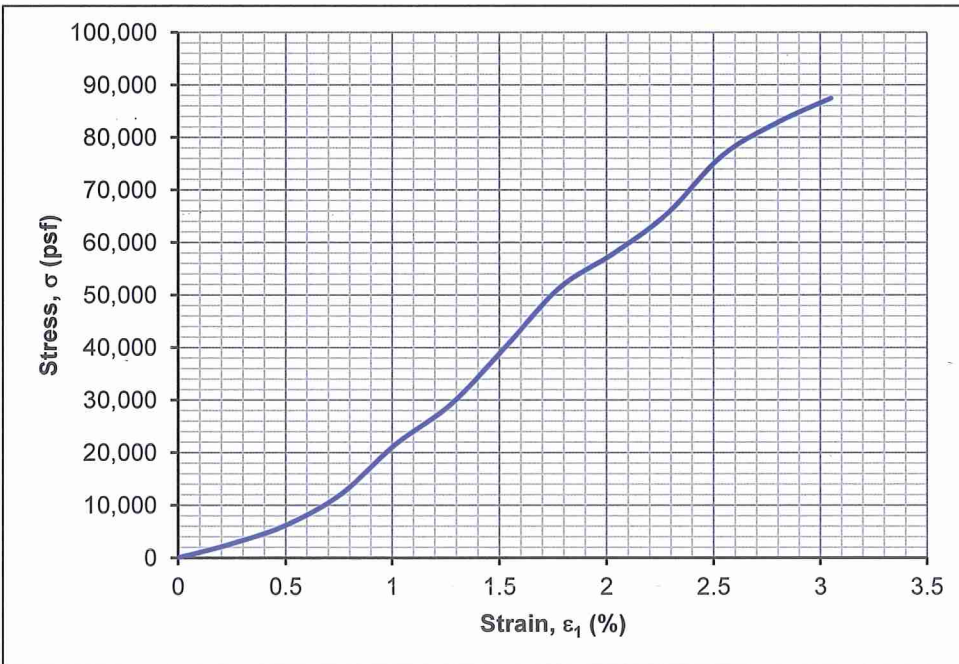
COMPRESSION APPARATUS.: Other

**SAMPLE DATA**

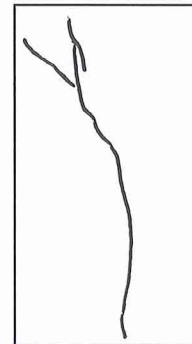
DIAMETER (in.):	1.86
HEIGHT (in.):	3.93
HEIGHT TO DIAMETER RATIO:	2.1
WET UNIT WEIGHT (pcf):	153.7
DRY UNIT WEIGHT (pcf):	146.1
MOISTURE CONTENT (%):	5.2

**FAILURE DATA**

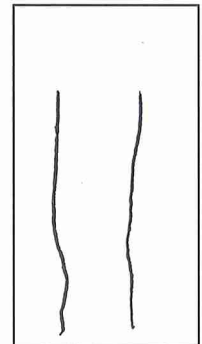
AVERAGE RATE OF AXIAL STRAIN TO FAILURE (%/min.):	<b>0.8</b>
TIME TO FAILURE (min.):	<b>3.8</b>
AXIAL STRAIN AT FAILURE (%):	<b>3.1</b>
UNIAXIAL COMPRESSIVE STRENGTH, $q_u$ (ksf):	<b>87.4</b>
UNIAXIAL COMPRESSIVE STRENGTH, $q_u$ (psi):	<b>607.0</b>



**FAILURE SHAPES**



**FRONT VIEW**



**SIDE VIEW**

REMARKS :



02-Jun-2015

Joe Hauber  
Thelen Associates, Inc.  
1398 Cox Avenue  
Erlanger, KY 41018

Tel: 859-746-9400  
Fax: 859-746-9408

Re: Lumley Tank Replacement; 150258E

Work Order: **1505527**

Dear Joe,

ALS Environmental received 3 samples on 19-May-2015 03:13 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 9.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

**Chris Gibson**

Electronically approved by: Chris Gibson

Chris Gibson  
Project Manager

ADDRESS 4388 Glendale Milford Rd Cincinnati, Ohio 45242- | PHONE (513) 733-5336 | FAX (513) 733-5347

ALS GROUP USA, CORP. Part of the ALS Group An ALS Limited Company

Environmental 

[www.alsglobal.com](http://www.alsglobal.com)

RIGHT SOLUTIONS. RIGHT PARTNER.

Bid Set

---

**Client:** Thelen Associates, Inc.  
**Project:** Lumley Tank Replacement; 150258E  
**Work Order:** 1505527

**Work Order Sample Summary**

---

<u>Lab Samp ID</u>	<u>Client Sample ID</u>	<u>Matrix</u>	<u>Tag Number</u>	<u>Collection Date</u>	<u>Date Received</u>	<u>Hold</u>
1505527-01	Boring 1, Sample 1A, Depth 0.0-0.3	Soil		5/19/2015 10:00	5/19/2015 15:13	<input type="checkbox"/>
1505527-02	Boring 2, Sample 1A, Depth 0.0-1.0	Soil		5/18/2015 13:00	5/19/2015 15:13	<input type="checkbox"/>
1505527-03	Boring 3, Sample 1A, Depth 0.0-0.2	Soil		5/18/2015 10:00	5/19/2015 15:13	<input type="checkbox"/>

## ALS Environmental

Date: 02-Jun-15

---

**Client:** Thelen Associates, Inc.  
**Project:** Lumley Tank Replacement; 150258E  
**Work Order:** 1505527

---

### Case Narrative

The analytical data provided relates directly to the samples received by ALS Laboratory Group and for only the analyses requested.

Results relate only to the items tested and are not blank corrected unless indicated.

QC sample results for this data met laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Laboratory Group. Samples will be disposed in 30 days unless storage arrangements are made.

**ALS Environmental**

Date: 02-Jun-15

**Client:** Thelen Associates, Inc.  
**Project:** Lumley Tank Replacement; 150258E  
**Sample ID:** Boring 1, Sample 1A, Depth 0.0-0.3  
**Collection Date:** 5/19/2015 10:00 AM

**Work Order:** 1505527  
**Lab ID:** 1505527-01  
**Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
<b>MOISTURE</b>			<b>SM2540B</b>		Prep Date: <b>5/22/2015</b>	Analyst: <b>VAW</b>
Moisture	9.3		0.010	% of sample	1	5/22/2015
<b>LEAD BY ICP</b>			<b>SW6010B</b>		Prep Date: <b>5/21/2015</b>	Analyst: <b>SRL</b>
Lead	58		5.5	mg/Kg-dry	1	5/29/2015 12:36 PM

Note:

# ALS Environmental

Date: 02-Jun-15

**Client:** Thelen Associates, Inc.  
**Project:** Lumley Tank Replacement; 150258E  
**Sample ID:** Boring 2, Sample 1A, Depth 0.0-1.0  
**Collection Date:** 5/18/2015 01:00 PM

**Work Order:** 1505527  
**Lab ID:** 1505527-02  
**Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
<b>MOISTURE</b>			<b>SM2540B</b>		Prep Date: <b>5/22/2015</b>	Analyst: <b>VAW</b>
Moisture	16		0.010	% of sample	1	5/22/2015
<b>LEAD BY ICP</b>			<b>SW6010B</b>		Prep Date: <b>5/21/2015</b>	Analyst: <b>SRL</b>
Lead	140		6.0	mg/Kg-dry	1	5/29/2015 12:39 PM

Note:

**ALS Environmental**

Date: 02-Jun-15

**Client:** Thelen Associates, Inc.  
**Project:** Lumley Tank Replacement; 150258E  
**Sample ID:** Boring 3, Sample 1A, Depth 0.0-0.2  
**Collection Date:** 5/18/2015 10:00 AM

**Work Order:** 1505527  
**Lab ID:** 1505527-03  
**Matrix:** SOIL

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
<b>MOISTURE</b>			<b>SM2540B</b>		Prep Date: <b>5/22/2015</b>	Analyst: <b>VAW</b>
Moisture	18		0.010	% of sample	1	5/22/2015
<b>LEAD BY ICP</b>			<b>SW6010B</b>		Prep Date: <b>5/21/2015</b>	Analyst: <b>SRL</b>
Lead	13		6.0	mg/Kg-dry	1	5/29/2015 12:48 PM

Note:

**Client:** Thelen Associates, Inc.  
**Work Order:** 1505527  
**Project:** Lumley Tank Replacement; 150258E

**QC BATCH REPORT**

Batch ID: **28534** Instrument ID **ICP3** Method: **SW6010B**

<b>MBLK</b>	Sample ID: <b>mblk-28534-28534</b>			Units: <b>mg/Kg</b>		Analysis Date: <b>5/29/2015 12:27 PM</b>				
Client ID:	Run ID: <b>ICP3_150529A</b>			SeqNo: <b>1063116</b>		Prep Date: <b>5/21/2015</b>		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Lead ND 5.0

<b>LCS</b>	Sample ID: <b>lcs-28534-28534</b>			Units: <b>mg/Kg</b>		Analysis Date: <b>5/29/2015 12:33 PM</b>				
Client ID:	Run ID: <b>ICP3_150529A</b>			SeqNo: <b>1063118</b>		Prep Date: <b>5/21/2015</b>		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Lead 3196 5.0 3248 0 98.4 70-130 0

<b>MS</b>	Sample ID: <b>1505527-02a ms</b>			Units: <b>mg/Kg</b>		Analysis Date: <b>5/29/2015 12:42 PM</b>				
Client ID: <b>Boring 2, Sample 1A, Depth 0.0-1.0</b>	Run ID: <b>ICP3_150529A</b>			SeqNo: <b>1063121</b>		Prep Date: <b>5/21/2015</b>		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Lead 1067 5.0 999.2 116 95.2 70-130 0

<b>MSD</b>	Sample ID: <b>1505527-02a msd</b>			Units: <b>mg/Kg</b>		Analysis Date: <b>5/29/2015 12:45 PM</b>				
Client ID: <b>Boring 2, Sample 1A, Depth 0.0-1.0</b>	Run ID: <b>ICP3_150529A</b>			SeqNo: <b>1063122</b>		Prep Date: <b>5/21/2015</b>		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

Lead 1086 4.9 985.2 116 98.4 62.3-133 1067 1.72 20

The following samples were analyzed in this batch: 1505527-01a 1505527-02a 1505527-03a

**Note:** See Qualifiers Page for a list of Qualifiers and their explanation.



**Client:** Thelen Associates, Inc.  
**Project:** Lumley Tank Replacement; 150258E  
**WorkOrder:** 1505527

**QUALIFIERS,  
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

<u>Acronym</u>	<u>Description</u>
DUP	Method Duplicate
E	EPA Method
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SDL	Sample Detection Limit
SW	SW-846 Method

<u>Units Reported</u>	<u>Description</u>
% of sample	
mg/Kg-dry	

Sample Receipt Checklist

Client Name: THELEN-ERLANGER

Date/Time Received: 19-May-15 15:13

Work Order: 1505527

Received by: PCD

Checklist completed by Rob Nieman 20-May-15  
eSignature Date

Reviewed by: Chris Gibson 21-May-15  
eSignature Date

Matrices:

Carrier name: Client

Shipping container/cooler in good condition? Yes  No  Not Present

Custody seals intact on shipping container/cooler? Yes  No  Not Present

Custody seals intact on sample bottles? Yes  No  Not Present

Chain of custody present? Yes  No

Chain of custody signed when relinquished and received? Yes  No

Chain of custody agrees with sample labels? Yes  No

Samples in proper container/bottle? Yes  No

Sample containers intact? Yes  No

Sufficient sample volume for indicated test? Yes  No

All samples received within holding time? Yes  No

Container/Temp Blank temperature in compliance? Yes  No

Temperature(s)/Thermometer(s): ambient

Cooler(s)/Kit(s):

Water - VOA vials have zero headspace? Yes  No  No VOA vials submitted

Water - pH acceptable upon receipt? Yes  No  N/A

pH adjusted? Yes  No  N/A

pH adjusted by:

Login Notes:

-----

Client Contacted:

Date Contacted:

Person Contacted:

Contacted By:

Regarding:

Comments:

[Empty text box for comments]

CorrectiveAction:

[Empty text box for corrective action]

**APPENDIX B**

**EXISTING LUMLEY TANK  
INSPECTION REPORT**

This page was left blank intentionally.

September 11, 2012

Attn: Dave Enzweiler  
Northern Kentucky Water District  
700 Alexandria Pike  
Fort Thomas, KY 41075-2153

RE: 275,000 Gallon Double Ellipse (Lumley)  
Preliminary Maintenance Inspection

Mr. Enzweiler:

Please find enclosed the above referenced report for the 275,000-gallon double ellipse water storage tank. The inspection was completed on July 17. The report consists of: 1) cover page; 2) conclusions and recommendations; 3) detailed report; 4) Field Inspection Report (FIR); 5) photographs and descriptions, and 6) flash drive.

Brief explanation: 1) The cover page is self-explanatory. 2) Conclusions and recommendations explain in short form what was found on the tank and what DIXON recommends for repair and maintenance of the tank. 3) This section is the long report that goes into details to explain what exactly was found and why DIXON makes the recommendations. 4) Field Inspection Report (FIR) is the form that was completed when the inspection team was on-site and includes the dimensions and conditions of the tank. 5) Photographs and descriptions give the Owner a visual record of the condition of the tank and appurtenances. 6) flash drive is an Adobe PDF format of the complete report and photos for your convenience.

If you have any questions or concerns, please call me at (859) 380-7533.

Thank you for choosing DIXON for your inspection needs.

FOR DIXON ENGINEERING, INC.,

Earl Strater  
Project Manager

# Dixon Engineering, Inc.

Preliminary Maintenance Inspection

275,000 Gallon Double Ellipse  
(Lumley)

Northern Kentucky Water District

Inspection Performed: July 17, 2012  
Report Prepared: August 28, 2012  
Reviewed by Ira M. Gabin, P.E.: September 7, 2012

Phone (616) 374-3221  
Fax (616) 374-7116  
<http://www.dixonengineering.net>  
[dixon@dixonengineering.net](mailto:dixon@dixonengineering.net)

Dixon Engineering Inc.  
1104 Third Ave. Lake Odessa, MI 48849

## **CONCLUSIONS:**

1. The exterior coating is an epoxy urethane coating system that is in poor condition. The coating has faded extensively. Primary modes of failure are delamination, rust bleedthrough, spot coating breaks to the substrate, rust undercutting and erosion. The coating has poor adhesion. There are numerous areas of spot coating failure on the legs, riser, sidewalls and roof. Coating deterioration is significant and the condition is much below average for a 13-year-old coating system.
2. The wet interior coating is a three-coat epoxy system that is in fair condition overall. The coating has good adhesion. Below the high water line the coating has moderate spot failures on the floor and sidewalls. Above the high water line, the coating is in good condition. The roof coating is deteriorating at the riveted seams and previous spot repairs.
3. One exterior coating sample was taken and analyzed for metal content. Test results indicated the exterior is a lead bearing coating.

## **RECOMMENDATIONS:**

1. Schedule regular cleanings and inspections of the tank by an independent third party as recommended by AWWA, or once every five years.
2. Complete the recommended work immediately. The coating work is the greatest cost and largest part of the recommendations. The repairs and upgrades should be completed during the next major tank rehabilitation process when coating repairs are made.
3. Consider long term to replace with a new tank. The cost to abrasive blast clean the exterior to a commercial grade (SSPC-SP6) condition inside a dust tight rigid frame containment system, and recoat with a polyurethane coating system is estimated at \$300,000, plus \$400,000 for containment. This is likely the same or more than the cost of a new \$300,000 gallon tank.
4. Install a floating-type cathodic protection system on the interior. The estimated cost is \$18,000.
5. Abrasive blast clean the pit piping to a commercial grade (SSPC-SP6) and apply a two coat epoxy system. The estimated cost is \$4,000.
6. Water clean and coat the foundations to prevent further deterioration. Cost would be incidental to exterior painting.

7. Repair areas of missing grout between the base-plate and the foundation. The estimated cost is \$1,000.
8. Drill drainage holes in the balcony to prevent ponding water. The estimated cost is \$500.
9. Install safety grabs and rigging couplings on the exterior roof for temporary fall prevention of workers in the wet interior. Cost would be incidental to coating costs.
10. Remove the riser tie band from the riser rods, weld attachment lugs to the riser, and reconnect the riser rods. The estimated cost is \$5,000. (Only to be done if the exterior is repainted.)
11. Install rigging couplings under the bowl, halfway between each leg and the riser. The clips would be used by contractors for rigging safety lines during exterior work. Cost would be incidental to repainting costs.
12. Install a 36-inch manway in the bottom of the riser. The estimated cost is \$8,000.
13. Replace the wet interior roof hatch with a 30-inch hatch. The estimated cost is \$3,000.
14. Replace the sidewall/roof ladder with a vertical ladder and a step-off platform. The estimated cost is \$10,000.
15. Replace the wet interior ladder. The estimated cost is \$10,000.
16. Unbolt the grate over the top of the riser. Cost would be incidental to cathodic protection installation.



## **A DISCUSSION ON RESCUE AND RETRIEVAL OPERATIONS FROM ELEVATED LEG STORAGE TANKS**

A series of accidents involving falls from or in water tanks has highlighted inadequacies in tank design and a potentially greater problem. The rescue may be more dangerous, with potential for more loss of life or injury, than the original accident. Contractors and engineers are responsible for their own employees. Even with safety training and proper equipment, accidents will occur. Most rescue squads are local or neighboring fire departments, some with more practice than other departments. Elevated tanks were designed to store water, not for rescue or retrieval convenience. The following items would make working on and retrieval from water tanks safer. This discussion is offered as a starting point. We recommend that you meet with your rescue personnel and draft a rescue plan. A copy of the plan should be kept at the tank and with the rescue crew.

OSHA now requires 30-inch manways and hatches, and roof ladders are to be replaced with platforms, steps, and railings. We have always objected to replacement of ladders as new regulations are passed relatively frequently, especially on retrofit of existing tanks. We recommend the changes for the convenience and safety of your employees rescue personnel, and others working on the tank. As far as we know, none of these conversion items to be discussed are required or mandated by any government agency for retrofits.

DIXON recommends these changes be made during the next major tank painting.

### RETRIEVAL FROM INTERIOR:

#### Current Access:

Access to the roof is from the leg ladder, the sidewall ladder, and the roof ladder. These ladders do meet OSHA size standards. All ladders contain a fall prevention device. There is a ladder in the wet interior from the roof hatch to the bowl area. The wet interior ladder is in poor condition and has a fall prevention device that has broken. There is a 24-inch manway in the bottom of the riser. The roof has a 24-inch hatch for the wet interior. There is a grate over the top of the riser in the bowl. There is an 8.5 x 12 foot by 43-inch high railing on the roof with a 4-inch high kick plate. The area within the railing is large enough for temporary basket storage. There is not a painter's rigging rail around the roof railing.

#### Modified Access:

Providing safe access to rescue personnel is essential. Replace the sidewall ladder so it extends straight up to a work platform with railings that surrounds the roof edge hatch. Replace the existing roof hatch with a 30-inch hatch with lockable, rainproof lid. The

existing hatch is too small for a rescue basket and rescue personnel with equipment. Replace the roof ladder with a series of steps and railings to permit access to the center of the roof standing upright. This ladder can be used by your personnel for checking lights, vents, and security annually, or by antenna personnel. Repair the existing wet interior ladder from the roof hatch to the wet interior floor. Replace the grate over or a railing around the top of the riser.

Retrieval down the riser:

1. Retrieval down through the riser is usually the safest method. Remove the *new* vent from the top center of the tank, and attach a winch or pulley system to a tripod set-up over the vent.
2. Raise and lower the basket through the riser and out the new 36-inch diameter manway at the bottom of the riser. Rescue personnel would also raise and lower all their equipment through the riser, and then leave the wet interior using the wet interior ladder with fall prevention. On the roof, personnel would be working from inside the security of a roof railing around the center attachment area and the roof hatch.

Modifications Necessary (As stated in the recommendations):

1. Install a 36-inch manway in the bottom of the riser. (\$8,000)
2. Install a new sidewall ladder with a step-off platform and roof handrails. (\$10,000)
3. Install a new 30-inch roof hatch. (\$3,000)
4. Repair the wet interior ladder. (\$10,000)
5. Unbolt the grate over the riser.

Equipment:

Winch or pulley system and a tripod.

Basket.

Fall prevention sliders.

**COST SUMMARY:**

Abrasive Blast Clean & Recoat Exterior	
Inside Rigid Containment	\$700,000
Install Cathodic Protection	18,000
Abrasive Blast Clean & Recoat Pit Piping	4,000
Repair Areas of Missing Grout	1,000
Drill Drainage Holes in Balcony	500
Remove Riser Tie Bands & Weld Lugs to Riser	5,000
Install 36-inch Manway Riser	8,000
Replace Roof Hatch	3,000
Replace Damaged Wet Ladder	8,000
Install Vertical Sidewall Ladder & Step-off Platform`	<u>10,000</u>
Subtotal	\$757,500
Engineering & Contingencies	<u>100,000</u>
TOTAL	\$857,500

Note: Exterior painting is for aesthetics and can be delayed temporarily or permanently. We recommend building a new tank instead of repainting the exterior. The tank can remain in service indefinitely as long as the interior coatings are maintained.

## **INSPECTION:**

On July 17, 2012, Dixon Engineering, Inc. (DIXON) performed a preliminary maintenance inspection on the 275,000-gallon Lumley double ellipse water storage tank owned by the Northern Kentucky Water District in the City of Fort Thomas, Kentucky. Purposes of the inspection were to evaluate the interior and exterior coating's performance and life expectancy; assess the condition of metal surfaces and appurtenances; review safety and health aspects; and make budgetary recommendations for continued maintenance of the tank. All recommendations, with budgeting estimates for repairs are incorporated in this report. The inspection was performed by Andy Schrauben, Assistant Project Manager. The inspector was assisted by Larry Houck, Brad Lavery and Earl Strater, staff technicians. Scheduling and arrangements for the inspection were completed through Dave Enzweiler. A source of water for cleaning was provided by the Northern Kentucky Water District. Following the inspection, chlorine was added to disinfect the tank per AWWA Standard C652-07 Method No. 3.

## **TANK INFORMATION:**

The tank was built in 1936 by Des-Moines Steel Co. The tank is riveted construction. The exterior and wet interior were last painted in 1999.

## **CONDITIONS AND RECOMMENDATIONS:**

### **EXTERIOR COATING CONDITIONS:**

The exterior coating system is a multiple coat epoxy urethane coating system.

Information provided to DIXON showed the exterior was power tool cleaned. Bare metal surfaces were then primed, followed by application of a full intermediate coat and a full finish coat to the entire tank over the existing coating.

The exterior coating is in poor condition overall and is not adequately protecting the metal; the aesthetics are poor. The system is performing worse than would be expected for a 13 year old system.

The leg and riser coating is in poor condition. There are extensive coating breaks with large amounts of surface rust and rust staining. Primary methods of deterioration are spot coating breaks, brittleness, delamination, rust bleedthrough and erosion. There are extensive areas of rust bleedthrough.

The coating on the bowl is in poor condition. There are extensive coating breaks with large amounts of surface rust and rust staining. Primary modes of failure are spot coating breaks, rust bleedthrough, erosion, brittleness and delamination.

Coating on the balcony is in poor condition. There is rust bleed-through on the top of the balcony where water has ponded. There are not enough drain holes in these areas.

The sidewall coating is in poor condition. Primary modes of failure are spot coating breaks to substrate, rust bleedthrough, rust undercutting and erosion. There are extensive areas of rust bleedthrough on the sidewalls.

The roof coating is in poor condition. Primary methods of roof coating deterioration are rust bleedthrough, spot coating breaks to substrate, rust undercutting and erosion. There are extensive areas of rust bleed-through on the roof.

Poor adhesion was noted on the ASTM x-cut test areas, with 75 percent loss of topcoat to the substrate in areas tested. The tank is not a candidate for over-coating.

This exterior system was tested at .041 percent lead by weight.

Lettering on the tank consists of 'Northern Kentucky Water Service District' in two locations and is block style.

#### **EXTERIOR COATING RECOMMENDATIONS:**

We believe it would be cost prohibitive to repaint the tank. The tank is very tall, and its riveted and lattice leg construction make it very hard to repaint. We estimate \$700,000 for this cost, but it is possible the cost may be higher or no contractors will bid at all due to the difficulty of the work and tight site conditions. A new 300,000 gallon tank would likely cost about the same as exterior painting and be a far better long term investment.

#### **WET INTERIOR COATING CONDITIONS:**

The wet interior coating is an epoxy system applied in 1999.

The roof coating is in good condition. The coating is 98 percent intact, with the primary areas of deterioration along the riveted seams and previous spot repairs.

The sidewall coating is in fair condition. The coating on the sidewalls is 95 percent intact. There is no significant damage at the high water line, which would be the area most affected by ice pressures and ice movement. Causes of deterioration are spot coating breaks from age.

The coating on the tank bottom is in good condition, 98 percent intact. Causes of deterioration are spot coating breaks from age.

The tank bottom was covered with approximately ¼-inch of mud sediment that was flushed from the interior.

The coating in the riser is in fair condition, 95 percent intact. Causes of deterioration are spot coating breaks from age. The coating is still protecting the metal, with the exception of several spot coating breaks.

The sidewalls, bowl, and riser are covered with moderate mineral staining, which does not affect the integrity of the coating system.

Moderate active pitting of the metal was found on the sidewalls, floor and riser.

Extensive previous pitting of the metal was found on the sidewalls and riser.

Overall adhesion of the coating is good. Adhesion was tested by use of low-pressure washing. With poor adhesion, it would be possible to notice the coating fluctuate and layers of coating would be removed. With very poor adhesion, the existing coating may be removed.

This is a crude form of testing, yet the least destructive. A destructive test cuts the coating to the substrate. The test area is then susceptible to corrosion because it has been scratched to bare metal.

#### **WET INTERIOR COATING RECOMMENDATIONS:**

The existing coating system has not deteriorated to the point where replacement is warranted assuming cathodic protection is installed. Re-inspect in five years to update the recoat time and costs.

#### **CATHODIC PROTECTION CONDITIONS:**

The tank does not contain a cathodic protection system.

The tank does not have clips and a pressure fitting already installed for a future cathodic protection installation.

### **CATHODIC PROTECTION RECOMMENDATIONS:**

Install an impressed current cathodic protection system. The system is designed with a horizontal ring configuration. The anode is suspended into the lower one-third of the tank by floats. As water fills the tank, the anode takes the desired ring configuration. This design is considered ice-free. Formation of ice normally occurs at the high water level and some along the sidewalls. As long as the tank is operated in the upper one-half of its capacity, the probability of ice damage is very low. The anode used is a platinized niobium or titanium wire with a design life of ten years. The system also incorporates copper/copper sulfate reference anodes.

The system is automatically controlled by monitoring the water-to-tank potential. It provides protection to steel surfaces where holidays (coating pinholes) or coating breaks exist. Cathodic protection operates by inhibiting galvanic cell corrosion where steel is exposed. The system creates an equipotential across the tank and drives the tank potential down to a point (-850 millivolts) where corrosion is essentially non-existent. Only surfaces that are in contact with water are protected because water acts as the electrolyte for the circuit. Therefore, areas of the roof and upper sidewalls are not protected by the system. The estimated cost is \$18,000.

### **PIT AND PIT PIPING CONDITIONS:**

The tank is operated by valve located in the pit below the tank.

The piping is in fair condition. Coating on the pipes is in poor condition. The pipes and valves have extensive coating failure.

The pit was dry during the inspection.

### **PIT AND PIPING RECOMMENDATIONS:**

Abrasive blast clean the piping to a commercial blast condition (SSPC-SP 6), and apply an epoxy system. The estimated cost is \$4,000. This can be delayed until the wet interior is repainted.

### **SITE CONDITIONS:**

The size of the tank site is small and is fenced with a locking gate.

There is a small sized staging area for the contractor's equipment.

The site is well maintained.

There is residential development to the east and west. It is adjacent to city buildings to the south and rural areas to the north.

The neighbors are close to the tank and extra precautions will need to be taken to keep from getting paint or debris on the neighbors' properties.

The site is accessible from a paved drive. The tank is located approximately 1,000-feet from the main access road.

There is vegetation encroaching on the foundation.

There are two antenna control panels with exposed equipment and two buildings adjacent to the tank.

**SITE RECOMMENDATIONS:**

Remove growth next to the footings to prevent encroachment on the foundations.

**FOUNDATION CONDITIONS:**

The exposed leg foundations are in good condition and showed minor amounts of deterioration. Deterioration includes cracking, chipping, and spalling with no rebar exposed.

The top 0 – 24-inches of the leg foundations are exposed. The riser foundation is flush with grade.

Water is collecting next to the foundation.

Corrosion is occurring on the anchor bolts. The anchor bolts are corroded.

**FOUNDATION RECOMMENDATIONS:**

Pressure wash the leg concrete and patch the small areas of deterioration. Coat the exposed concrete to prevent further deterioration with an epoxy coating system. The cost would be incidental to exterior painting.

**GROUT CONDITIONS:**

The grout is in fair condition. 3-feet of the grout is missing between the bottom plate and the leg foundation.



### **GROUT RECOMMENDATIONS:**

Repair the grout at the leg foundation. The purpose of the grout is to evenly distribute the dead and live loads onto the foundations. Grout also keeps water from getting between the foundation and tank.

Remove all loose or deteriorated leg grout then repair with an epoxy grout. The estimated cost is \$1,000.

### **LEG CONDITIONS:**

The tank is supported by six single lattice leg columns that attach to the sidewall and bowl at the balcony level. The leg columns have moderate corrosion in the boxes at the base of the columns.

The legs are in good condition and appeared in alignment.

### **BALCONY CONDITIONS:**

#### *Disclaimer:*

*Unless we feel balconies are unsafe, it is our opinion that if the balconies were built to code at the time of construction, they do not require replacement. The code for ladder sizes changed three times in the late 80's and early 90's and it seems excessive to replace ladders each time. However, it is our responsibility to inform you of this possible deficiency.*

The exterior balcony is in good condition, the coating is in poor condition. The balcony on the exterior sidewall is 30-inches wide with a 42-inch high handrail. The handrail has 36-inch riveted knee wall and a 9-inch high railing.

The vertical balcony posts are angle iron and the top rail is angle iron. There is a flat stock knee wall.

The exterior balcony does not contain sufficient drainage holes and water is pooling on the walkway.

Three openings in the balcony have been cut for cable access and the overflow pipe. The openings are not reinforced.

**BALCONY RECOMMENDATIONS:**

Drill holes in the balcony to drain water and prevent water ponding on the top of the balcony. The estimated cost is \$500.

**ROOF HANDRAIL AND PAINTER'S RAILS:**

A handrail is located on the roof surrounding the roof hatches and the vent. The handrail is in good condition. The handrail is being used for antenna mounts.

The tank has no painter's rail.

**AVIATION LIGHTS AND ELECTRICAL CONDITIONS:**

The tank has four single aviation lights around the balcony and a single strobe on the roof that is in good condition. The lights appear to be operating properly.

The antennas are higher than the aviation lights.

**ANTENNAS:**

The roof area contains one antenna. The antenna is attached to the roof handrail.

The balcony has nineteen antennas attached to mounting brackets and poles and antennas are attached to the legs in the 4<sup>th</sup> bay above the ground.

Note: The antennas would need to be temporarily relocated to allow for exterior painting to be completed.

**ROD CONDITIONS:**

The tank's sway rods are in good condition.

The coating on the sway rods is in poor condition with significant coating failures and surface rust on the rods and turnbuckles, and on the struts between the leg columns.

Because of the inaccessibility of the sway rods, the exact tension could not be determined. However, based on the amount of coating loss on the sway rods where they cross, it was evident the rods are tight.

The tank has thirty riser tie rods extend from the leg columns to the riser with bolted ring connections. The riser tie rods are in good condition. Crevice corrosion is active behind the ring.

There are not rigging couplings under the bowl.

#### **ROD RECOMMENDATIONS:**

Remove the riser tie band from the riser rods, weld attachment lugs to the riser, and reconnect the riser rods. The estimated cost is \$5,000.

Install rigging couplings on the bowl halfway between each leg and the riser. The couplings would be used by contractors for rigging safety lines. Currently the contractor has no separate, independent tie off location for safety lines. The rigging and safety lines are tied to the same location. Cost would be incidental to repainting costs.

#### **OVERFLOW PIPE CONDITIONS:**

The tank has a 6-inch diameter overflow pipe that exits the roof knuckle, extends down along the sidewall through the balcony and down along a leg column to ground level.

The discharge end of the overflow pipe is not screened.

The end of the pipe has a solid flap gate that is in good condition.

The pipe discharges to a storm drain with the required air gap. The discharge area is in good condition.

#### **HATCH AND MANWAY CONDITIONS:**

The tank has a 24 x 24-inch flip-top, square and a 24-inch diameter flip-top, roof access hatches to the wet interior. The hatches are in good condition.

The roof wet interior hatches are secured with padlocks matching the owner's master key system.

The tank has a 24-inch diameter access manway in the riser that is in good condition.

The manway is hinged, the gasket showed no signs of leaking.

### **HATCH AND MANWAY RECOMMENDATIONS:**

Install a 36-inch manway in the riser, average rescue baskets will not pass through the existing manway. The estimated cost is \$8,000.

Replace the square wet interior roof access hatch with a new 30-inch curbed hatch. Average rescue baskets and rescue personnel wearing equipment will not pass through the existing 24-inch hatches. The estimated cost is \$3,000.

### **VENT CONDITIONS:**

The roof vent is a 24-inch flow-through design. The vent is in good condition.

The vent is properly screened.

### **VENT RECOMMENDATIONS:**

Annually inspect the vent to make sure the screen is open and not damaged.

### **LADDER CONDITIONS:**

#### **Exterior:**

The tank has an exterior leg ladder that starts approximately 2-feet above ground level, and extends up to a small platform at the top of the balcony railing, with a ladder from the platform to the balcony. The ladder is caged and is in good condition. The ladder contains a cable-type fall prevention device.

The tank has a fixed sidewall shell and a fixed roof ladder that follows the slope of the roof to the center near the vent. The ladder has a cable-type fall prevention device.

#### **Wet:**

The wet interior contains a ladder that is in poor condition. It has been damaged by ice.

The wet interior ladder contains a cable-type fall prevention device. The fall prevention device is in poor condition. The cable has corroded through and is hanging loose from the top anchor.

### **LADDER RECOMMENDATIONS:**

#### **Disclaimer:**

*Unless DIXON feels ladders are unsafe, it is our opinion that if they were built to code at the time of construction, they do not require replacement. The code changed three times in the late*

*80's and early 90's and it seems excessive to replace ladders each time. It is, however, our responsibility to inform you of this possible deficiency.*

Exterior:

The roof and sidewall shell ladder should be replaced with a vertical sidewall ladder that runs up to a step-off platform surrounded with handrails at the roof hatch. The step-off platform will provide a safe working area around the roof hatch. Estimated cost is \$6,000.

Wet:

Replace the wet interior ladder and replace the fall prevention device. The estimated cost is \$10,000.

**FILL PIPE CONDITIONS:**

The fill pipe extends 30-inches into the bottom of the riser. There is not a deflector plate over top of the line.

**MUD VALVE CONDITIONS:**

A single mud valve is located in the bottom of the riser.

The mud valve operated properly during the inspection.

**WET INTERIOR METAL CONDITIONS:**

The steel structure is in good condition above the high water line and in fair condition below it.

Extensive pitting had occurred prior to current coating.

Active pitting was observed on the sidewall, floor and riser.

Riser:

There is a grate over the riser opening.

The grate was bolted in place so the inspector could not repel down the riser.

**WET INTERIOR METAL RECOMMENDATIONS:**

**Riser:**

Unbolt the grate to allow access. Cost would be incidental to cathodic protection installation.

## ANALYTICAL LABORATORY REPORT

Tuesday, July 24, 2012

Page 1 of 1

**CUSTOMER:** Dixon Engineering  
1104 3rd Ave.  
Lake Odessa, MI 48849

**DATE RECEIVED:** Monday, July 23, 2012  
**PO/PROJECT #:**  
**SUBMITTAL #:** 2012-07-23-005

**LAB NUMBER: AB30531****Sampled By:** Andy Schrauben**Job Location:** N. KY Water District**Sample Identification:** 1 - Lumley Tank - Exterior**Date Sampled:** Tuesday, July 17, 2012**Sample Description:** Paint Chips**Preparation Method:** EPA 3050B-P-M (Acid Digestion for Paints)**Analysis Method:** EPA 6010C (ICP-AES Method for Determination of Metals)**Date Analyzed:** Tuesday, July 24, 2012

<u>ELEMENT</u>	<u>RESULT (by weight)</u>	<u>REPORTING LIMIT (RL)</u>
Chromium	< RL	0.0013 %
Lead	0.041 %	0.0025 %

Unless otherwise noted, the condition of each sample was acceptable upon receipt, all laboratory quality control requirements were met, and sample results have not been adjusted based on field blank or other analytical blank results.

**Tests Reviewed By:** Jason Kraai, Senior Analyst

*Jason Kraai*  
Jason Kraai  
2012.07.24  
17:29:53 -04'00'

Corrosion Control Consultants & Labs, Inc. is AIHA accredited in the Environmental Lead Program for paint, soil, dust wipes, and air; and in the Industrial Hygiene Program for metals in air.

This report shall not be reproduced except in full, without written approval of CCC&L.

Individual sample results relate only to the sample as received by the laboratory.

**STEEL TANK FIELD INSPECTION REPORT**  
**LEGGED TANK**

DATE: July 17, 2012

**I. TANK DATA**

OWNER: Northern Kentucky Water District

CLIENT CODE: 17-59-01-05

TANK NAME: Lumley

LOCATION: Street: 130 N. Fort Thomas Ave.

City: Fort Thomas

State: Kentucky

TANK SIZE: Capacity: 275,000 gallons

Diameter: 40 feet

Height to overflow (HWL): 212 feet

CONSTRUCTION: Riveted

Type of structure: Double Ellipse

Type of Roof: Hemisphere

Type of Bowl: Hemisphere

DATE CONSTRUCTED: 1936

MANUFACTURER: Des-Moines Steel Company

CONSTRUCTED BY: Union Light, Heat & Power Co.

COATING HISTORY	<u>EXTERIOR</u>	<u>WET INTERIOR</u>
DATE LAST COATED	<u>1999</u>	<u>1999</u>
CONTRACTOR	<u>Unknown</u>	<u>Unknown</u>
COATING SYSTEM	<u>3-coat zinc, epoxy, urethane</u>	<u>3-coat epoxy</u>
SURFACE PREPARATION	<u>SSPC SP-3</u>	<u>SSPC SP-10</u>
COATING SAMPLES	<u>Yes</u>	
HEAVY METAL	<u>Yes .041%</u>	

INSPECTED BY: Dixon Engineering, Inc.

PERSONNEL: Inspector Andrew Schrauben; top person Brad Laverty; ground person Larry Houck and Earl Strater

TYPE OF INSPECTION: Preliminary Maintenance (dry)

DATE LAST INSPECTED: Unknown



## **II. INSPECTION DATA** **SITE CONDITIONS**

Fenced: **Yes**

Control building: **Yes**

Location: **Under tank**

Antenna control site: **Yes**

Number: **3**

Location: **Adjacent to tank**

SCADA controls: **Yes**

Location: **Outside**

Site conditions: **Well maintained**

Neighborhood: **Residential**

To the North: **Trees - rural**

To the East: **Residential**

To the South: **City buildings**

To the West: **City garage, residential**

Power lines within 50 feet: **Yes**

Location: **On east side of tank attached to leg**

Site drainage: **Away from tank**

Indications of underground leakage: **No**

Shrub, tree, etc. encroachment: **No**

### **PIPING:**

Structure Type: **Pit**

Location: **Under tank**

Condition of structure: **Good**

Structure is: **Dry**

Sump Pump Present: **No**

Condition of coating: **Poor**

Describe coating: **No coating remaining**

Condition of metal: **Fair**

### **FOUNDATION**

#### **Riser:**

Foundation exposed: **No**

Height exposed: **None – flush with grade**

Undermining of foundation: **No**

Indications of riser settlement: **No**

## **FOUNDATION**

### **Legs:**

Foundation exposed: **Yes & no**  
Height exposed: **0 – 24 inches**  
Undermining of foundation: **No**  
Exposed foundation condition: **Good**  
Chipped or cracked: **Yes**  
    Severity: **Minor**  
    Location: **Varies**  
    Exposed rebar: **No**  
Type of grout: **Cement**  
    Condition: **Fair**  
    Grout missing: **Yes**  
        Amount missing: **3 feet**  
Indications of leg settlement: **No**

## **EXTERIOR COATING**

### **Legs:**

Number: **6**  
Type: **Lattice**  
Exterior connection to tank: **Good**  
Topcoat condition: **Poor**  
Previous coating condition: **Poor**  
    Describe coating: **Chalking, fading, delaminating, spot coating  
breaks to substrate, rust bleedthrough, erosion, rust  
undercutting**  
Dry film thickness: **5 – 20 mils**  
Coating adhesion: **1A**  
Metal condition: **Good**

### **Riser:**

Type: **Wet**  
Diameter: **48 inches**  
Topcoat condition: **Poor**  
Previous coating condition: **Poor**  
    Describe coating: **Chalking, fading, delaminating, spot coating  
breaks to substrate, rust bleedthrough, erosion, rust  
undercutting**  
Mildew growth: **No**  
Dry film thickness: **8 – 20 mils**

## **EXTERIOR COATING**

Coating adhesion: **1A**

Metal condition: **Good**

### **Bowl:**

Topcoat condition: **Poor**

Previous coating condition: **Poor**

Describe coating: **Chalking, fading, delaminating, spot coating breaks to substrate, rust bleedthrough, erosion, rust undercutting**

Mildew growth: **No**

Metal condition: **Good**

### **Sidewall:**

Lettering: **Yes** Number: **2**

Describe lettering: **Northern Kentucky Water Service District**

Logo: **No**

Topcoat condition: **Poor**

Previous coating condition: **Poor**

Describe coating: **Chalking, fading, delaminating, spot coating breaks to substrate, rust bleedthrough, erosion, rust undercutting**

Dry film thickness: **9 – 12 mils**

Metal condition: **Good**

### **Roof:**

Topcoat condition: **Poor**

Previous coating condition: **Poor**

Describe coating: **Chalking, fading, delaminating, spot coating breaks to substrate, rust bleedthrough, erosion, rust undercutting**

Dry film thickness: **14 - 16 mils**

Coating adhesion: **1A**

Metal condition: **Good**

## **EXTERIOR APPURTENANCES**

### **Anchor bolts:**

Number of bolts per leg: 2

Diameter: 2¼ inches

Number of riser bolts: 0

Coating condition: **Poor**

Metal condition: **Fair**

Bolt comments: **Corrosion on bolts at the coating breaks**

### **Exterior overflow pipe:**

Coating condition: **Poor**

Metal condition: **Fair**

Inside diameter: **6 inches**

Condition of screen: **No screen**

Flap gate: **Yes**

Design: **Solid**

Flap gate operable: **Yes**

Air gap: **Yes**

Pipe to storm drain distance: **6 inches**

Splash pad: **Yes**

Type: **Storm drain**

Condition: **Good**

### **Riser access:**

Type: **Bottom manway**

Dimensions: **24 inches in diameter**

Coating condition: **Good**

Metal condition: **Good**

Gasket: **Yes**

Leaking: **No**

Hinged: **Yes**

### **Struts and Rods:**

Number of bays: 5

Sway rods: Coating condition: **Fair**

Metal condition: **Good-to-fair**

Loose Rods: **No**

Struts: Coating condition: **Fair**

Metal condition: **Good**

## **EXTERIOR APPURTENANCES**

Riser rods: Coating condition: **Poor**

Metal condition: **Good**

Rigging points: **None**

### **Leg ladder:**

Coating condition: **Fair**

Metal condition: **Good**

Height to start of ladder: **2 feet**

Toe clearance: **5 inches**

Width of rungs: **16 inches**

Thickness of rungs: **3/4 inch**

Shape of rungs: **Round**

Fall prevention device: **Yes**

Type: **Cable**

Condition: **Good**

Cage: **Yes**

Diameter: **24 inches**

Condition: **Fair**

Step off platform: **Yes**

Dimensions: **26 x 13 inches**

### **Balcony:**

Balcony width: **30 inches**

Railing height: **43 inches**

Toe plate height: **36 inches**

Top Rail: **Angle**

Size: **2<sup>3</sup>/<sub>4</sub> x 2<sup>3</sup>/<sub>4</sub> inches**

Balcony coating condition: **Poor**

Describe coating: **Chalking, fading, delaminating, spot coating  
breaks to substrate, rust bleedthrough, erosion, rust  
undercutting**

Exterior connection to tank: **Good**

Missing any bolts or rivets: **No**

Number of penetrations: **2 – overflow/cables**

Penetrations reinforced: **No**

Penetration uses: **Overflow pipe, cables**

Accumulation of bird droppings: **Yes**

Water pooling: **Yes**

Metal condition: **Good**

## **EXTERIOR APPURTENANCES**

### **Sidewall ladder:**

Type: **Vertical without a platform**

Design: **Fixed**

Coating condition: **Fair**

Metal condition: **Good**

Toe clearance: **7 inches**

Width of rungs: **15 inches**

Thickness of rungs: **¾ inch**

Shape of rungs: **Round**

Fall prevention device: **Yes**

Type: **Cable**

Condition: **Good**

Cage: **No**

### **Roof ladder:**

Design: **Fixed**

Style: **Ladder**

Coating condition: **Fair**

Metal condition: **Good**

Toe clearance: **7¾ inches**

Width of rungs: **15 inches**

Thickness of rungs: **¾ inch**

Shape of rungs: **Round**

Fall prevention device: **Yes**

Type: **Cable**

Condition: **Good**

Cage: **No**

### **Roof handrail:**

Shape: **Rectangle**

Coating condition: **Poor**

Metal condition: **Good**

Size: **12-ft. x 8-ft. 6-in. rectangle**

Height: **43 inches**

Mid-rail height: **14 inches & 28 inches**

Toe plate height: **4 inches**

Painter's rail: **No**

## **EXTERIOR APPURTENANCES**

### **Roof hatches:**

Wet interior: Coating condition: **Poor**

Metal condition: **Good**

Neck diameter: **(1) 24 inch diameter round; (1) 24 inch square**

Hatch security: **Lock**

### **Roof vent:**

Number: **1**

Type: **Standard**

Neck diameter: **24 inches**

Vent Material: **Steel**

Coating condition: **Poor**

Metal condition: **Good**

Screen condition: **Good**

Percent of screen open: **100**

### **Aviation lights:**

Condition: **Good**

Functioning: **Unknown**

Design: **Beacon**

Photoelectric Cell: **No**

Items higher than lights: **Yes**

Aviation light comments: **One beam on roof; four reds on balcony**

### **Roof Rigging points:**

Rigging clips: **Yes**

Number: **24**

Coating condition: **Fair**

Metal condition: **Good**

Rigging comments: **Clips on outer knuckle**

### **Antennas:**

Location: Number: **One whip antenna**

Attached to: **Handrail**

Balcony Number: **19**

Leg Number: **4**

Antennas or cables interfere with climbing: **Yes**

Location: **Around balcony**

## **WET INTERIOR COATING**

### **Roof:**

Topcoat condition: **Good**

Primer coating condition: **Good**

Describe coating: **Spot coating breaks to substrate, rust bleedthrough**

Metal condition: **Good**

Condition of laps: Condition: **Good**

Lap seams: **Caulked**

Roof comments: **Deterioration limited to rivets and old weld burns that have been spot coated**

### **Sidewall:**

Topcoat condition: **Fair**

Primer coating condition: **Fair**

Describe coating: **Spot coating breaks to substrate**

Mineral deposits: **Moderate**

Metal condition: **Good**

Active pitting: **Yes**

Deepest pit depth: **Not measured**

Number of pits: **More than 75**

Previous pitting: **Yes**

Deepest pit depth: **Not measured**

Number of pits: **More than 75**

Previous pit filling: **No**

Sidewall comments: **150 – 200 small coating breaks on panels and rivets**

### **Tank bottom:**

Topcoat condition: **Good**

Primer coating condition: **Good**

Describe coating: **Spot coating breaks to substrate**

Mineral deposits: **Light**

Metal condition: **Good**

Active pitting: **Yes**

Deepest pit depth: **Not measured**

Number of pits: **11 – 25**

Previous pitting: **No**

Previous pit filling: **No**

Depth of sediment: **¼ inch**



## **EXTERIOR APPURTENANCES**

Bottom comments: **There is an area of rust staining and coating breaks in the bowl around the wet ladder caused by corrosion to the ladder**

### **Riser:**

Topcoat condition: **Fair**

Primer coating condition: **Fair**

Describe coating: **Spot coating breaks to substrate**

Mineral deposits: **Yes**

Severity: **Moderate**

Metal condition: **Good**

Active pitting: **Yes**

Deepest pit depth: **Not measured**

Number of pits: **11 – 25**

Previous pitting: **Yes**

Deepest pit depth: **Not measured**

Number of pits: **More than 75**

Previous pit filling: **No**

Riser comments: **It appears that tar was used to coat the riveted seams in the lower riser**

## **WET INTERIOR APPURTENANCES**

### **Tank ladder:**

Coating condition: **Poor**

Metal condition: **Poor**

Toe clearance: **Open**

Width of rungs: **16 inches**

Thickness of rungs: **¾ inch**

Shape of rungs: **Rebar**

Shape of side rails: **Channel**

Fall prevention device: **Yes**

Type: **Cable**

Condition: **Poor – cable corroded**

Ladder comments: **Ladder side rails are corroded and brittle above the high water line**

### **Fill pipe:**

Diameter: **12 inches**

Height above floor: **30 inches**

## **EXTERIOR APPURTENANCES**

Deflector plate: **No**  
Removable silt ring: **No**  
Recirculation line in pipe: **No**  
Coating condition: **Fair**  
Metal condition: **Good**

### **Overflow pipe:**

Type: **Weir box**  
Coating condition: **Fair**  
Metal condition: **Good**

### **Riser safety:**

Riser grate: **Yes**  
Coating condition: **Fair**  
Metal condition: **Good**  
Opening size: **48 inches**  
Opening hinged: **No**  
Riser railing: **No**  
Riser safety comments: **The grate is bolted to the floor**

## **RECOMMENDATIONS:**

### **Foundation: Clean, repair and recoat**

Complete work: **With exterior paint project**

### **Coating:**

**Exterior: Abrasive blast clean and recoat in rigid containment; abrasive blast clean and recoat pit piping**

Complete work: **When aesthetics dictate**

**Wet Interior: No work**

**Safety: Install a 36 inch manway in riser, replace roof hatch, repair wet interior ladder, replace grate over wet riser**

Complete work: **With next paint project**

**Repairs: Install cathodic protection, repair missing grout, drill drainage holes in balcony, remove riser tie bands and weld lugs to riser, install sidewall ladder and step-off platform, weld and fill pit in the wet**

Complete work: **With next paint project**

Field Inspection Report is prepared from the contractor's viewpoint. It contains information the contractor needs to prepare his bid for any repair or recoating. The engineer uses it to prepare the engineering report. Cost estimates are more accurate if the contractor's problems can be anticipated. While prepared from the contractor's viewpoint, the only intended beneficiary is the owner. These reports are completed with diligence, but the accuracy is not guaranteed. The contractor is still advised to visit the site.

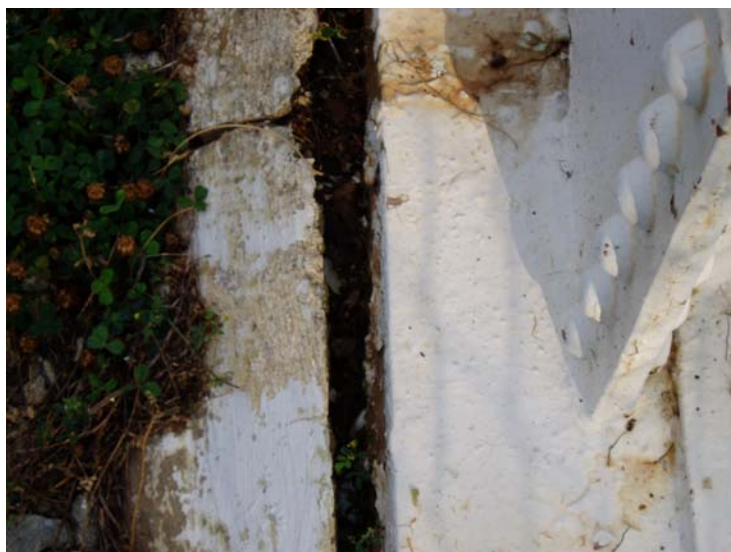


Northwest elevation view of the 275,000 gallon Lumley double ellipse water storage tank owned by the Northern Kentucky Water District in Fort Thomas, Kentucky.



2) Minor foundation deterioration and view of the overflow pipe discharge area.

3) Minor foundation deterioration.



4) Grout has pulled away from a leg foundation and base plate.



5) Coating deterioration at a leg base and sway rod.

6) Steel corrosion at a leg base.



7) Corrosion at the base of a leg column.



8) Spot coating breaks to substrate and rust staining on the riser.

9) Extensive rust bleedthrough on the riser.



10) Same.



11) Extensive delamination and coating breaks to substrate on a leg. (typical)

12) Rust bleed through and coating erosion inside of a leg column.



13) Coating deterioration on the overflow pipe and sway rod connection to the leg.





14) Coating breaks to substrate  
On asway rod.

15) Typical coating breaks to  
substrate and corrosion on a  
strut.



16) Corrosion and rust staining  
behind a riser tie band, and  
coating erosion on the riser.



17) Coating breaks to substrate on the leg, leg ladder, and ladder cage.

18) Coating breaks and rust undercutting on the bowl.



19) Rust bleedthrough on the bowl.



20) Coating erosion on the leg ladder, bowl, overflow pipe, and below the balcony floor.

21) Coating breaks to substrate on the step-off platform, the balcony knee wall, and overflow pipe.

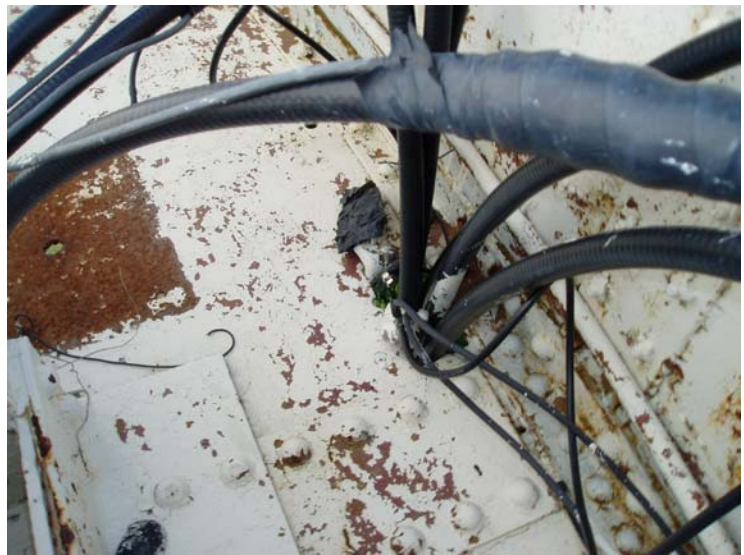


22) Rust bleed through and delaminations on the balcony floor. No drainage holes in this section.



23) Extensive balcony coating deterioration.

24) Penetration for cable access in the balcony floor is not reinforced.



25) Rust bleedthrough and erosion of the sidewall coating.



26) Spot coating breaks to substrate on the sidewall.

27) Coating breaks and coating erosion on the sidewall and overflow pipe.



28) Coating erosion on the north sidewall.



29) Coating breaks to substrate on the wet interior roof hatch.

30) Coating erosion on the roof.



31) Same.



32) Coating breaks to substrate on the roof handrail.

33) Delamination of coating on the ventilation hatch.

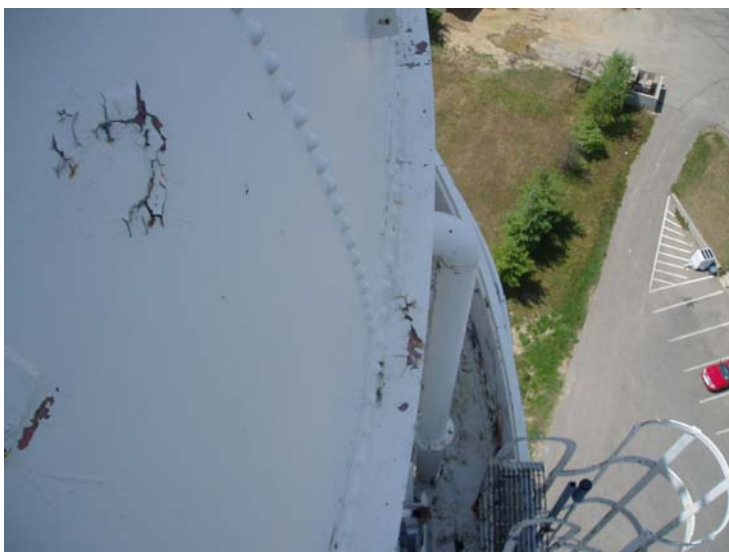


34) View of the roof vent and strobe light/beacon.



35) Coating breaks to substrate on top of the roof vent.

36) Corrosion and rust staining around the hatch to the wet interior.



37) Delamination and rust undercutting on the roof knuckle.





38) Rust bleedthrough at the riveted seams and previous spot repairs on the wet interior roof.

39) Rust bleedthrough on the overflow weir box and riveted seams.



40) Heavy corrosion on the wet interior ladder. The siderails are very brittle. The fall prevention device is corroded and broken.



41) Numerous spot coating breaks and rust staining on the sidewall. Extensive pitting prior to the current coating.

42) Same.

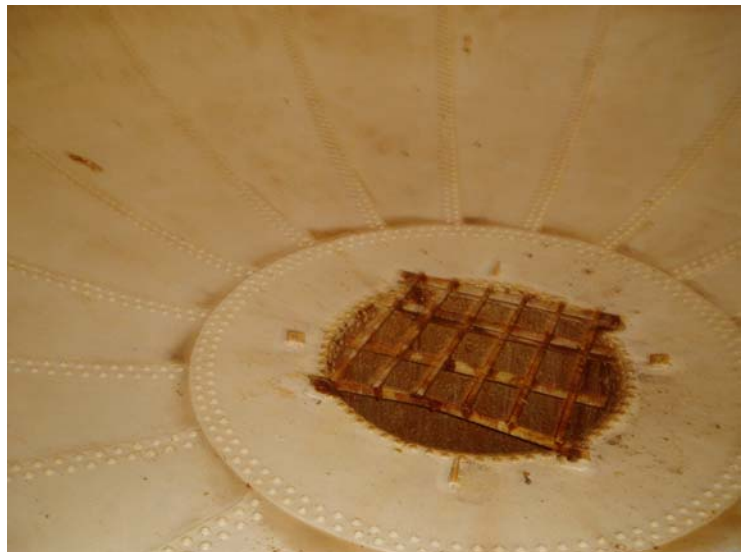


43) Active pitting on the tank sidewall.



44) View of the wet interior floor before cleaning.

45) View of the floor after cleaning.

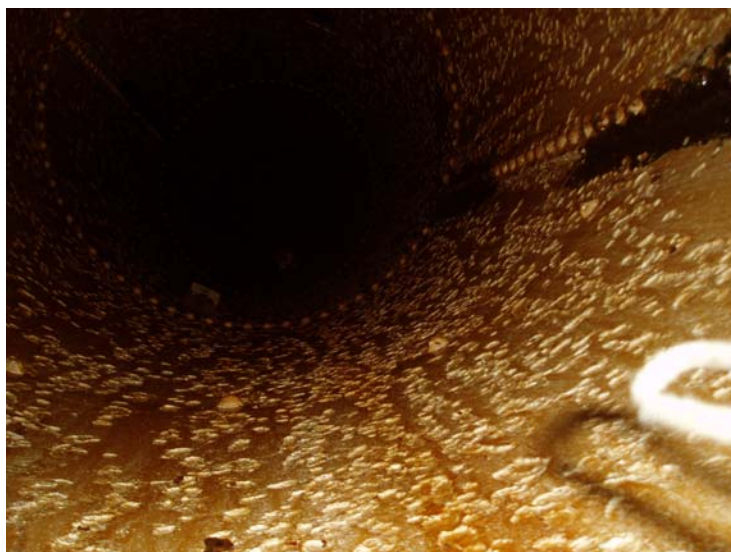


46) Active pitting on the floor.



47) Coating breaks and coating damage around the wet interior ladder caused by deterioration of the ladder siderails.

48) Spot coating break at a riveted seam on the floor.



49) Spot coating breaks to substrate and previous pitting in the wet riser.



50) A tar like substance has been applied to part of the riser seams—other areas of the seams have exposed substrate.

51) View of the fill pipe in the bottom of the riser.



52) The pit piping has no coating remaining.

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## APPENDIX C

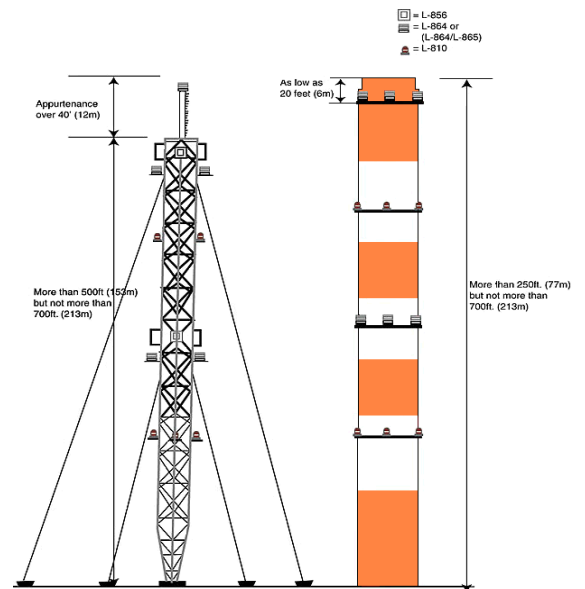
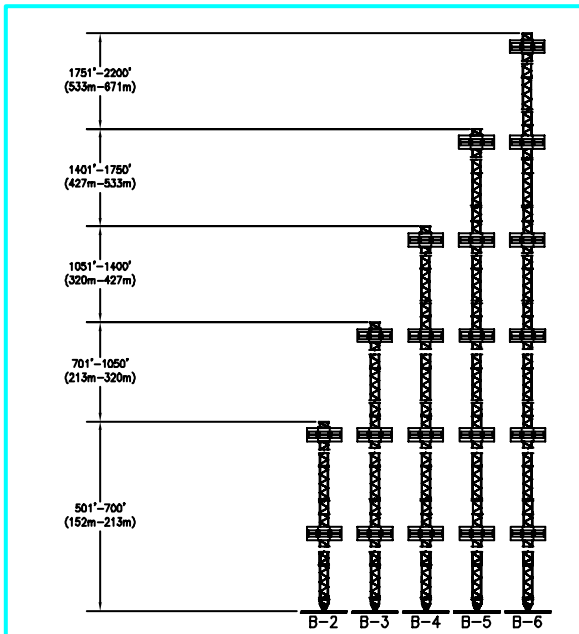
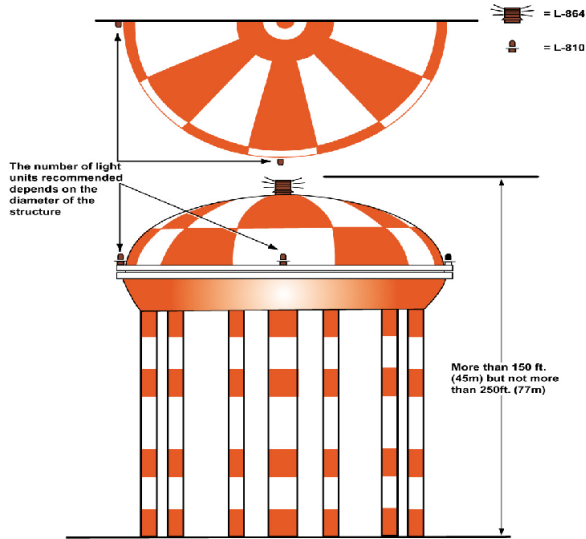
# FAA Obstruction Marking and Lighting

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## Obstruction Marking and Lighting



**Subject:** CHANGE 2 TO OBSTRUCTION  
MARKING AND LIGHTING

**Date:** 2/1/07  
**Initiated by:** AJR-33

**AC No.:** 70/7460-1K  
**Change:** 2

1. PURPOSE. This change amends the Federal Aviation Administration's standards for marking and lighting structures to promote aviation safety. The change number and date of the change material are located at the top of the page.
2. EFFECTIVE DATE. This change is effective February 1, 2007.
3. EXPLANATION OF CHANGES.
  - a. Table of Contents. Change pages i through iii.
  - b. Page 1. Paragraph 1. **Reporting Requirements**. Incorporated the word "Title" in reference to the 14 Code of Federal Regulations (14 CFR part 77). FAA Regional Air Traffic Division office to read Obstruction Evaluation service (OES). FAA website to read <http://oeaaa.faa.gov>.
  - c. Page 1. Paragraph 4. **Supplemental Notice Requirement** (subpart b). FAA Regional Air Traffic Division office to read OES.
  - d. Page 1. Paragraph 5. **Modifications and Deviations** (subpart a). FAA Regional Air Traffic Division office to read OES.
  - e. Page 1. Paragraph 5. **Modifications and Deviations** (subpart c). FAA Regional office to read OES.
  - f. Page 2. Paragraph 5. **Modifications and Deviations** (subpart d). Removed period to create one sentence.
  - g. Page 2. Paragraph 7. **Metric Units**. And to read however.
  - h. Page 3. Paragraph 23. **Light Failure Notification** (subpart b). Nearest to read appropriate. FAA's website to read web. Website [www.faa.gov/ats/ata/ata400](http://www.faa.gov/ats/ata/ata400) to read <http://www.afss.com>.
  - i. Page 4. Paragraph 24. **Notification of Restoration**. Removed AFSS.
  - j. Page 5. Paragraph 32. **Paint Standards**. Removed a comma after "Since".
  - k. Page 5. Paragraph 33. **Paint Patterns** (subpart d. **Alternate Bands**). Removed number 6. Number 7 to read number 6.
  - l. Page 9. Paragraph 41. **Standards**. TASC to read OTS. SVC-121.23 to read M-30.

- m. Page 14. Paragraph 55. **Wind Turbine Structures.** Removed. The paragraph numbers that follow have been changed accordingly.
- n. Page 18. Paragraph 65. **Wind Turbine Structures.** Removed. The paragraph numbers that follow have been changed accordingly.
- o. Page 20. Paragraph 77. **Radio and Television Towers and Similar Skeletal Structures.** Excluding to read including.
- p. Page 23. Paragraph 85. **Wind Turbine Structures.** Removed. The paragraph number that follows has been changed accordingly.
- q. Page 33-34. Chapter 13. **Marking and Lighting Wind Turbine Farms.** Added.
- r. Page A1-3. Appendix 1. Verbiage removed under first structure.



Nancy B. Kalinowski

Director, System Operations Airspace and Aeronautical Information Management

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PAGE CONTROL CHART

AC 70/7460-1K CHG 2

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i through iii	8/1/00	i through iii	1/1/07
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9	3/1/00	9	1/1/07
14	3/1/00	14	1/1/07
18-34	3/1/00	18-34	1/1/07
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## CHAPTER 1. ADMINISTRATIVE AND GENERAL PROCEDURES

### 1. REPORTING REQUIREMENTS

A sponsor proposing any type of construction or alteration of a structure that may affect the National Airspace System (NAS) is required under the provisions of Title 14 Code of Federal Regulations (14 CFR part 77) to notify the FAA by completing the Notice of Proposed Construction or Alteration form (FAA Form 7460-1). The form should be sent to the Obstruction Evaluation service (OES). Copies of FAA Form 7460-1 may be obtained from OES, Airports District Office or FAA Website at <http://oeaaa.faa.gov>.

### 2. PRECONSTRUCTION NOTICE

The notice must be submitted:

a. At least 30 days prior to the date of proposed construction or alteration is to begin.

b. On or before the date an application for a construction permit is filed with the Federal Communications Commission (FCC). (The FCC advises its applicants to file with the FAA well in advance of the 30-day period in order to expedite FCC processing.)

### 3. FAA ACKNOWLEDGEMENT

The FAA will acknowledge, in writing, receipt of each FAA Form 7460-1 notice received.

### 4. SUPPLEMENTAL NOTICE REQUIREMENT

a. If required, the FAA will include a FAA Form 7460-2, Notice of Actual Construction or Alteration, with a determination.

b. FAA Form 7460-2 Part 1 is to be completed and sent to the FAA at least 48 hours prior to starting the actual construction or alteration of a structure. Additionally, Part 2 shall be submitted no later than 5 days after the structure has reached its greatest height. The form should be sent to the OES.

c. In addition, supplemental notice shall be submitted upon abandonment of construction.

d. Letters are acceptable in cases where the construction/alteration is temporary or a proposal is abandoned. This notification process is designed to permit the FAA the necessary time to change affected procedures and/or minimum flight altitudes, and to otherwise alert airmen of the structure's presence.

*Note-*  
NOTIFICATION AS REQUIRED IN THE DETERMINATION IS CRITICAL TO AVIATION SAFETY.

### 5. MODIFICATIONS AND DEVIATIONS

a. Requests for modification or deviation from the standards outlined in this AC must be submitted to the OES. The sponsor is responsible for adhering to approved marking and/or lighting limitations, and/or recommendations given, and should notify the FAA and FCC (for those structures regulated by the FCC) prior to removal of marking and/or lighting. A request received after a determination is issued may require a new study and could result in a new determination.

b. *Modifications.* Modifications will be based on whether or not they impact aviation safety. Examples of modifications that may be considered:

1. *Marking and/or Lighting Only a Portion of an Object.* The object may be so located with respect to other objects or terrain that only a portion of it needs to be marked or lighted.

2. *No Marking and/or Lighting.* The object may be so located with respect to other objects or terrain, removed from the general flow of air traffic, or may be so conspicuous by its shape, size, or color that marking or lighting would serve no useful purpose.

3. *Voluntary Marking and/or Lighting.* The object may be so located with respect to other objects or terrain that the sponsor feels increased conspicuity would better serve aviation safety. Sponsors who desire to voluntarily mark and/or light their structure should request the proper marking and/or lighting from the FAA to ensure no aviation safety issues are impacted.

4. *Marking or Lighting an Object in Accordance with the Standards for an Object of Greater Height or Size.* The object may present such an extraordinary hazard potential that higher standards may be recommended for increased conspicuity to ensure the safety to air navigation.

c. *Deviations.* The OES conducts an aeronautical study of the proposed deviation(s) and forwards its recommendation to FAA headquarters in Washington, DC, for final approval. Examples of deviations that may be considered:

1. Colors of objects.
2. Dimensions of color bands or rectangles.
3. Colors/types of lights.
4. Basic signals and intensity of lighting.

5. Night/day lighting combinations.

6. Flash rate.

d. The FAA strongly recommends that owners become familiar with the different types of lighting systems and to specifically request the type of lighting system desired when submitting FAA Form 7460-1. (This request should be noted in "item 2.D" of the FAA form.) Information on these systems can be found in Chapter 12, Table 4 of this AC. While the FAA will make every effort to accommodate the structure sponsor's request, sponsors should also request information from system manufacturers in order to determine which system best meets their needs based on purpose, installation, and maintenance costs.

**6. ADDITIONAL NOTIFICATION**

Sponsors are reminded that any change to the submitted information on which the FAA has based its determination, including modification, deviation or optional upgrade to white lighting on structures which are regulated by the FCC, must also be filed with the FCC prior to making the change for proper

authorization and annotations of obstruction marking and lighting. These structures will be subject to inspection and enforcement of marking and lighting requirements by the FCC. FCC Forms and Bulletins can be obtained from the FCC's National Call Center at 1-888-CALL-FCC (1-888-225-5322). Upon completion of the actual change, notify the Aeronautical Charting office at:

NOAA/NOS  
Aeronautical Charting Division  
Station 5601, N/ACC113  
1305 East-West Highway  
Silver Spring, MD 20910-3233

**7. METRIC UNITS**

To promote an orderly transition to metric units, sponsors should include both English and metric (SI units) dimensions. The metric conversions may not be exact equivalents, however, until there is an official changeover to the metric system, the English dimensions will govern.

## CHAPTER 2. GENERAL

### 20. STRUCTURES TO BE MARKED AND LIGHTED

Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet (61m) above ground level (AGL) or exceeds any obstruction standard contained in 14 CFR part 77, should normally be marked and/or lighted. However, an FAA aeronautical study may reveal that the absence of marking and/or lighting will not impair aviation safety. Conversely, the object may present such an extraordinary hazard potential that higher standards may be recommended for increased conspicuity to ensure safety to air navigation. Normally outside commercial lighting is not considered sufficient reason to omit recommended marking and/or lighting. Recommendations on marking and/or lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design. The FAA may also recommend marking and/or lighting a structure that does not exceed 200 (61m) feet AGL or 14 CFR part 77 standards because of its particular location.

### 21. GUYED STRUCTURES

The guys of a 2,000-foot (610m) skeletal tower are anchored from 1,600 feet (488m) to 2,000 feet (610m) from the base of the structure. This places a portion of the guys 1,500 feet (458m) from the tower at a height of between 125 feet (38m) to 500 feet (153m) AGL. 14 CFR part 91, section 119, requires pilots, when operating over other than congested areas, to remain at least 500 feet (153m) from man-made structures. Therefore, the tower must be cleared by 2,000 feet (610m) horizontally to avoid all guy wires. Properly maintained marking and lighting are important for increased conspicuity since the guys of a structure are difficult to see until aircraft are dangerously close.

### 22. MARKING AND LIGHTING EQUIPMENT

Considerable effort and research have been expended in determining the minimum marking and lighting systems or quality of materials that will produce an acceptable level of safety to air navigation. The FAA will recommend the use of only those marking and lighting systems that meet established technical standards. While additional lights may be desirable

to identify an obstruction to air navigation and may, on occasion be recommended, the FAA will recommend minimum standards in the interest of safety, economy, and related concerns. Therefore, to provide an adequate level of safety, obstruction lighting systems should be installed, operated, and maintained in accordance with the recommended standards herein.

### 23. LIGHT FAILURE NOTIFICATION

a. Sponsors should keep in mind that conspicuity is achieved only when all recommended lights are working. Partial equipment outages decrease the margin of safety. Any outage should be corrected as soon as possible. Failure of a steady burning side or intermediate light should be corrected as soon as possible, but notification is not required.

b. Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to the appropriate flight service station (FSS) so a Notice to Airmen (NOTAM) can be issued. Toll-free numbers for FSS are listed in most telephone books or on the web at <http://www.afss.com>. This report should contain the following information:

1. Name of persons or organizations reporting light failures including any title, address, and telephone number.
2. The type of structure.
3. Location of structure (including latitude and longitude, if known, prominent structures, landmarks, etc.).
4. Height of structure above ground level (AGL)/above mean sea level (AMSL), if known.
5. A return to service date.
6. FCC Antenna Registration Number (for structures that are regulated by the FCC).

*Note-*

1. When the primary lamp in a double obstruction light fails, and the secondary lamp comes on, no report is required. However, when one of the lamps in an incandescent L-864 flashing red beacon fails, it should be reported.

2. After 15 days, the NOTAM is automatically deleted from the system. The sponsor is responsible for calling the nearest FSS to extend the outage date or to report a return to service date.

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**24. NOTIFICATION OF RESTORATION**

As soon as normal operation is restored, notify the same FSS that received the notification of failure. The FCC advises that noncompliance with notification procedures could subject its sponsor to penalties or monetary forfeitures.

**25. FCC REQUIREMENT**

FCC licensees are required to file an environmental assessment with the Commission when seeking authorization for the use of the high intensity flashing white lighting system on structures located in residential neighborhoods, as defined by the applicable zoning law.

## CHAPTER 3. MARKING GUIDELINES

### 30. PURPOSE

This chapter provides recommended guidelines to make certain structures conspicuous to pilots during daylight hours. One way of achieving this conspicuity is by painting and/or marking these structures. Recommendations on marking structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

### 31. PAINT COLORS

Alternate sections of aviation orange and white paint should be used as they provide maximum visibility of an obstruction by contrast in colors.

### 32. PAINT STANDARDS

The following standards should be followed. To be effective, the paint used should meet specific color requirements when freshly applied to a structure. Since all outdoor paints deteriorate with time and it is not practical to give a maintenance schedule for all climates, surfaces should be repainted when the color changes noticeably or its effectiveness is reduced by scaling, oxidation, chipping, or layers of contamination.

**a. *Materials and Application.*** Quality paint and materials should be selected to provide extra years of service. The paint should be compatible with the surfaces to be painted, including any previous coatings, and suitable for the environmental conditions. Surface preparation and paint application should be in accordance with manufacturer's recommendations.

**Note-**

*In-Service Aviation Orange Color Tolerance Charts are available from private suppliers for determining when repainting is required. The color should be sampled on the upper half of the structure, since weathering is greater there.*

**b. *Surfaces Not Requiring Paint.*** Ladders, decks, and walkways of steel towers and similar structures need not be painted if a smooth surface presents a potential hazard to maintenance personnel. Paint may also be omitted from precision or critical surfaces if it would have an adverse effect on the transmission or radiation characteristics of a signal. However, the overall marking effect of the structure should not be reduced.

**c. *Skeletal Structures.*** Complete all marking/painting prior to or immediately upon

completion of construction. This applies to catenary support structures, radio and television towers, and similar skeletal structures. To be effective, paint should be applied to all inner and outer surfaces of the framework.

### 33. PAINT PATTERNS

Paint patterns of various types are used to mark structures. The pattern to be used is determined by the size and shape of the structure. The following patterns are recommended.

**a. *Solid Pattern.*** Obstacles should be colored aviation orange if the structure has both horizontal and vertical dimensions not exceeding 10.5 feet (3.2m).

**b. *Checkerboard Pattern.*** Alternating rectangles of aviation orange and white are normally displayed on the following structures:

1. Water, gas, and grain storage tanks.
2. Buildings, as required.

3. Large structures exceeding 10.5 feet (3.2m) across having a horizontal dimension that is equal to or greater than the vertical dimension.

**c. *Size of Patterns.*** Sides of the checkerboard pattern should measure not less than 5 feet (1.5m) or more than 20 feet (6m) and should be as nearly square as possible. However, if it is impractical because of the size or shape of a structure, the patterns may have sides less than 5 feet (1.5m). When possible, corner surfaces should be colored orange.

**d. *Alternate Bands.*** Alternate bands of aviation orange and white are normally displayed on the following structures:

1. Communication towers and catenary support structures.

2. Poles.

3. Smokestacks.

4. Skeletal framework of storage tanks and similar structures.

5. Structures which appear narrow from a side view, that are 10.5 feet (3.2m) or more across and the horizontal dimension is less than the vertical dimension.

6. Coaxial cable, conduits, and other cables attached to the face of a tower.

**e. Color Band Characteristics.** Bands for structures of any height should be:

1. Equal in width, provided each band is not less than 1½ feet (0.5m) or more than 100 feet (31m) wide.
2. Perpendicular to the vertical axis with the bands at the top and bottom ends colored orange.
3. An odd number of bands on the structure.
4. Approximately one-seventh the height if the structure is 700 feet (214m) AGL or less. For each additional 200 feet (61m) or fraction thereof, add one (1) additional orange and one (1) additional white band.
5. Equal and in proportion to the structure's height AGL.

**Structure Height to Bandwidth Ratio**

Example: If a Structure is:		
Greater Than	But Not More Than	Band Width
10.5 feet (3.2m)	700 feet (214m)	1/7 of height
701 feet (214m)	900 feet (275m)	1/9 of height
901 feet (275m)	1,100 feet (336m)	1/11 of height
1,100 feet (336m)	1,300 feet (397m)	1/13 of height

TBL 1

**f. Structures With a Cover or Roof.** If the structure has a cover or roof, the highest orange band should be continued to cover the entire top of the structure.

**g. Skeletal Structures Atop Buildings.** If a flagpole, skeletal structure, or similar object is erected on top of a building, the combined height of the object and building will determine whether marking is recommended; however, only the height of the object under study determines the width of the color bands.

**h. Partial Marking.** If marking is recommended for only a portion of a structure because of shielding by other objects or terrain, the width of the bands should be determined by the overall height of the structure. A minimum of three bands should be displayed on the upper portion of the structure.

**i. Teardrop Pattern.** Spherical water storage tanks with a single circular standpipe support may be marked in a teardrop-striped pattern. The tank should show alternate stripes of aviation orange and white. The stripes should extend from the top center of the tank to its supporting standpipe. The width of the stripes should be equal, and the width of each stripe at the greatest girth of the tank should not be less than 5 feet (1.5m) nor more than 15 feet (4.6m).

**j. Community Names.** If it is desirable to paint the name of the community on the side of a tank, the stripe pattern may be broken to serve this purpose. This open area should have a maximum height of 3 feet (0.9m).

**k. Exceptions.** Structural designs not conducive to standard markings may be marked as follows:

1. If it is not practical to color the roof of a structure in a checkerboard pattern, it may be colored solid orange.
2. If a spherical structure is not suitable for an exact checkerboard pattern, the shape of the rectangles may be modified to fit the shape of the surface.
3. Storage tanks not suitable for a checkerboard pattern may be colored by alternating bands of aviation orange and white or a limited checkerboard pattern applied to the upper one-third of the structure.
4. The skeletal framework of certain water, gas, and grain storage tanks may be excluded from the checkerboard pattern.

**34. MARKERS**

Markers are used to highlight structures when it is impractical to make them conspicuous by painting. Markers may also be used in addition to aviation orange and white paint when additional conspicuity is necessary for aviation safety. They should be displayed in conspicuous positions on or adjacent to the structures so as to retain the general definition of the structure. They should be recognizable in clear air from a distance of at least 4,000 feet (1219m) and in all directions from which aircraft are likely to approach. Markers should be distinctively shaped, i.e., spherical or cylindrical, so they are not mistaken for items that are used to convey other information. They should be replaced when faded or otherwise deteriorated.

**a. Spherical Markers.** Spherical markers are used to identify overhead wires. Markers may be of another shape, i.e., cylindrical, provided the projected area of such markers will not be less than that presented by a spherical marker.

**1. Size and Color.**

The diameter of the markers used on extensive catenary wires across canyons, lakes, rivers, etc., should be not less than 36 inches (91cm). Smaller 20-inch (51cm) spheres are permitted on less extensive power lines or on power lines below 50 feet (15m) above the ground and within 1,500 feet (458m) of an airport runway end. Each marker should be a solid color such as aviation orange, white, or yellow.

**2. Installations.**

**(a) Spacing.** Markers should be spaced equally along the wire at intervals of approximately 200 feet (61m) or a fraction thereof. Intervals between markers should be less in critical areas near runway ends (i.e., 30 to 50 feet (10m to 15m)). They should be displayed on the highest wire or by another means at the same height as the highest wire. Where there is more than one wire at the highest point, the markers may be installed alternately along each wire if the distance between adjacent markers meets the spacing standard. This method allows the weight and wind loading factors to be distributed.

**(b) Pattern.** An alternating color scheme provides the most conspicuity against all backgrounds. Mark overhead wires by alternating solid colored markers of aviation orange, white, and yellow. Normally, an orange sphere is placed at each end of a line and the spacing is adjusted (not to exceed 200 feet (61m)) to accommodate the rest of the markers. When less than four markers are used, they should all be aviation orange.

**b. Flag Markers.** Flags are used to mark certain structures or objects when it is technically impractical to use spherical markers or painting. Some examples are temporary construction equipment, cranes, derricks, oil and other drilling rigs. Catenaries should use spherical markers.

**1. Minimum Size.** Each side of the flag marker should be at least 2 feet (0.6m) in length.

**2. Color Patterns.** Flags should be colored as follows:

**(a) Solid.** Aviation orange.

**(b) Orange and White.** Arrange two triangular sections, one aviation orange and the other white to form a rectangle.

**(c) Checkerboard.** Flags 3 feet (0.9m) or larger should be a checkerboard pattern of aviation orange and white squares, each 1 foot (0.3m) plus or minus 10 percent.

**3. Shape.** Flags should be rectangular in shape and have stiffeners to keep them from drooping in calm wind.

**4. Display.** Flag markers should be displayed around, on top, or along the highest edge of the obstruction. When flags are used to mark extensive or closely grouped obstructions, they should be displayed approximately 50 feet (15m) apart. The flag stakes should be of such strength and height that they will support the flags above all surrounding ground, structures, and/or objects of natural growth.

**35. UNUSUAL COMPLEXITIES**

The FAA may also recommend appropriate marking in an area where obstructions are so grouped as to present a common obstruction to air navigation.

**36. OMISSION OR ALTERNATIVES TO MARKING**

There are two alternatives to marking. Either alternative requires FAA review and concurrence.

**a. High Intensity Flashing White Lighting Systems.** The high intensity lighting systems are more effective than aviation orange and white paint and therefore can be recommended instead of marking. This is particularly true under certain ambient light conditions involving the position of the sun relative to the direction of flight. When high intensity lighting systems are operated during daytime and twilight, other methods of marking may be omitted. When operated 24 hours a day, other methods of marking and lighting may be omitted.

**b. Medium Intensity Flashing White Lighting Systems.** When medium intensity lighting systems are operated during daytime and twilight on structures 500 feet (153m) AGL or less, other methods of marking may be omitted. When operated 24 hours a day on structures 500 feet (153m) AGL or less, other methods of marking and lighting may be omitted.

*Note-*

SPONSORS MUST ENSURE THAT ALTERNATIVES TO MARKING ARE COORDINATED WITH THE FCC FOR STRUCTURES UNDER ITS JURISDICTION PRIOR TO MAKING THE CHANGE.





## CHAPTER 4. LIGHTING GUIDELINE

### 40. PURPOSE

This chapter describes the various obstruction lighting systems used to identify structures that an aeronautical study has determined will require added conspicuity. The lighting standards in this circular are the minimum necessary for aviation safety. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

### 41. STANDARDS

The standards outlined in this AC are based on the use of light units that meet specified intensities, beam patterns, color, and flash rates as specified in AC 150/5345-43.

These standards may be obtained from:

Department of Transportation  
OTS  
Subsequent Distribution Office, M-30  
Ardmore East Business Center  
3341 Q 75th Avenue  
Landover, MD 20785

### 42. LIGHTING SYSTEMS

Obstruction lighting may be displayed on structures as follows:

**a. Aviation Red Obstruction Lights.** Use flashing beacons and/or steady burning lights during nighttime.

**b. Medium Intensity Flashing White Obstruction Lights.** Medium intensity flashing white obstruction lights may be used during daytime and twilight with automatically selected reduced intensity for nighttime operation. When this system is used on structures 500 feet (153m) AGL or less in height, other methods of marking and lighting the structure may be omitted. Aviation orange and white paint is always required for daytime marking on structures exceeding 500 feet (153m) AGL. This system is not normally recommended on structures 200 feet (61m) AGL or less.

**c. High Intensity Flashing White Obstruction Lights.** Use high intensity flashing white obstruction lights during daytime with automatically selected reduced intensities for twilight and nighttime operations. When this system is used, other methods of marking and lighting the structure may be omitted.

This system should not be recommended on structures 500 feet (153m) AGL or less, unless an FAA aeronautical study shows otherwise.

*Note-*

*All flashing lights on a structure should flash simultaneously except for catenary support structures, which have a distinct sequence flashing between levels.*

**d. Dual Lighting.** This system consists of red lights for nighttime and high or medium intensity flashing white lights for daytime and twilight. When a dual lighting system incorporates medium flashing intensity lights on structures 500 feet (153m) or less, or high intensity flashing white lights on structures of any height, other methods of marking the structure may be omitted.

**e. Obstruction Lights During Construction.** As the height of the structure exceeds each level at which permanent obstruction lights would be recommended, two or more lights of the type specified in the determination should be installed at that level. Temporary high or medium intensity flashing white lights, as recommended in the determination, should be operated 24 hours a day until all permanent lights are in operation. In either case, two or more lights should be installed on the uppermost part of the structure any time it exceeds the height of the temporary construction equipment. They may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level.

**f. Obstruction Lights in Urban Areas.** When a structure is located in an urban area where there are numerous other white lights (e.g., streetlights, etc.) red obstruction lights with painting or a medium intensity dual system is recommended. Medium intensity lighting is not normally recommended on structures less than 200 feet (61m).

**g. Temporary Construction Equipment Lighting.** Since there is such a variance in construction cranes, derricks, oil and other drilling rigs, each case should be considered individually. Lights should be installed according to the standards given in Chapters 5, 6, 7, or 8, as they would apply to permanent structures.

### 43. CATENARY LIGHTING

Lighted markers are available for increased night conspicuity of high-voltage (69KV or greater) transmission line catenary wires. These markers should be used on transmission line catenary wires near airports, heliports, across rivers, canyons, lakes, etc. The lighted markers should be manufacturer certified as recognizable from a minimum distance of 4,000 feet (1219m) under nighttime conditions, minimum visual flight rules (VFR) conditions or having a minimum intensity of at least 32.5 candela. The lighting unit should emit a steady burning red light. They should be used on the highest energized line. If the lighted markers are installed on a line other than the highest catenary, then markers specified in paragraph 34 should be used in addition to the lighted markers. (The maximum distance between the line energizing the lighted markers and the highest catenary above the lighted marker should be no more than 20 feet (6m).) Markers should be distinctively shaped, i.e., spherical, cylindrical, so they are not mistaken for items that are used to convey other information. They should be visible in all directions from which aircraft are likely to approach. The area in the immediate vicinity of the supporting structure's base should be clear of all items and/or objects of natural growth that could interfere with the line-of-sight between a pilot and the structure's lights. Where a catenary wire crossing requires three or more supporting structures, the inner structures should be equipped with enough light units per level to provide a full coverage.

### 44. INSPECTION, REPAIR AND MAINTENANCE

To ensure the proper candela output for fixtures with incandescent lamps, the voltage provided to the lamp filament should not vary more than plus or minus 3 percent of the rated voltage of the lamp. The input voltage should be measured at the lamp socket with the lamp operating during the hours of normal operation. (For strobes, the input voltage of the power supplies should be within 10 percent of rated voltage.) Lamps should be replaced after being operated for not more than 75 percent of their rated life or immediately upon failure. Flashtubes in a light unit should be replaced immediately upon failure, when the peak effective intensity falls below specification limits or when the fixture begins skipping flashes, or at the manufacturer's recommended intervals. Due to the effects of harsh environments, beacon lenses should be visually inspected for ultraviolet damage, cracks, crazing, dirt

build up, etc., to insure that the certified light output has not deteriorated. (See paragraph 23, for reporting requirements in case of failure.)

### 45. NONSTANDARD LIGHTS

Moored balloons, chimneys, church steeples, and similar obstructions may be floodlighted by fixed search light projectors installed at three or more equidistant points around the base of each obstruction. The searchlight projectors should provide an average illumination of at least 15 foot-candles over the top one-third of the obstruction.

### 46. PLACEMENT FACTORS

The height of the structure AGL determines the number of light levels. The light levels may be adjusted slightly, but not to exceed 10 feet (3m), when necessary to accommodate guy wires and personnel who replace or repair light fixtures. Except for catenary support structures, the following factors should be considered when determining the placement of obstruction lights on a structure.

**a. Red Obstruction Lighting Systems.** The overall height of the structure including all appurtenances such as rods, antennas, obstruction lights, etc., determines the number of light levels.

**b. Medium Intensity Flashing White Obstruction Lighting Systems.** The overall height of the structure including all appurtenances such as rods, antennas, obstruction lights, etc., determines the number of light levels.

**c. High Intensity Flashing White Obstruction Lighting Systems.** The overall height of the main structure including all appurtenances such as rods, antennas, obstruction lights, etc., determines the number of light levels.

**d. Dual Obstruction Lighting Systems.** The overall height of the structure including all appurtenances such as rods, antennas, obstruction lights, etc., is used to determine the number of light levels for a medium intensity white obstruction light/red obstruction dual lighting system. The overall height of the structure including all appurtenances is used to determine the number of light levels for a high intensity white obstruction light/red obstruction dual lighting system.

**e. Adjacent Structures.** The elevation of the tops of adjacent buildings in congested areas may be used as the equivalent of ground level to determine the proper number of light levels required.

f. **Shielded Lights.** If an adjacent object shields any light, horizontal placement of the lights should be adjusted or additional lights should be mounted on that object to retain or contribute to the definition of the obstruction.

#### 47. MONITORING OBSTRUCTION LIGHTS

Obstruction lighting systems should be closely monitored by visual or automatic means. It is extremely important to visually inspect obstruction lighting in all operating intensities at least once every 24 hours on systems without automatic monitoring. In the event a structure is not readily accessible for visual observation, a properly maintained automatic monitor should be used. This monitor should be designed to register the malfunction of any light on the obstruction regardless of its position or color. When using remote monitoring devices, the communication status and operational status of the system should be confirmed at least once every 24 hours. The monitor (aural or visual) should be located in an area generally occupied by responsible personnel. In some cases, this may require a remote monitor in an attended location. For each structure, a log should be maintained in which daily operations status of the lighting system is recorded. Beacon

lenses should be replaced if serious cracks, crazing, dirt build up, etc., has occurred.

#### 48. ICE SHIELDS

Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulations from damaging the light units.

#### 49. DISTRACTION

a. Where obstruction lights may distract operators of vessels in the proximity of a navigable waterway, the sponsor must coordinate with the Commandant, U.S. Coast Guard, to avoid interference with marine navigation.

b. The address for marine information and coordination is:

Chief, Aids to Navigation Division (OPN) U.S. Coast Guard Headquarters 2100 2nd Street, SW., Rm. 3610 Washington, DC 20593-0001 <i>Telephone: (202) 267-0980</i>
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## CHAPTER 5. RED OBSTRUCTION LIGHT SYSTEM

### 50. PURPOSE

Red Obstruction lights are used to increase conspicuity during nighttime. Daytime and twilight marking is required. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

### 51. STANDARDS

The red obstruction lighting system is composed of flashing omnidirectional beacons (L-864) and/or steady burning (L-810) lights. When one or more levels is comprised of flashing beacon lighting, the lights should flash simultaneously.

**a. Single Obstruction Light.** A single (L-810) light may be used when more than one obstruction light is required either vertically or horizontally or where maintenance can be accomplished within a reasonable time.

**1. Top Level.** A single light may be used to identify low structures such as airport ILS buildings and long horizontal structures such as perimeter fences and building roof outlines.

**2. Intermediate Level.** Single lights may be used on skeletal and solid structures when more than one level of lights is installed and there are two or more single lights per level.

**b. Double Obstruction Light.** A double (L-810) light should be installed when used as a top light, at each end of a row of single obstruction lights, and in areas or locations where the failure of a single unit could cause an obstruction to be totally unlighted.

**1. Top Level. Structures 150 feet (46m) AGL or less** should have one or more double lights installed at the highest point and operating simultaneously.

**2. Intermediate Level.** Double lights should be installed at intermediate levels when a malfunction of a single light could create an unsafe condition and in remote areas where maintenance cannot be performed within a reasonable time. Both units may operate simultaneously, or a transfer relay may be used to switch to a spare unit should the active system fail.

**3. Lowest Level.** The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by an FAA aeronautical study, the lowest level of lights may be eliminated.

### 52. CONTROL DEVICE

Red obstruction lights should be operated by a satisfactory control device (e.g., photo cell, timer, etc.) adjusted so the lights will be turned on when the northern sky illuminance reaching a vertical surface falls below a level of 60 foot-candles (645.8 lux) but before reaching a level of 35 foot-candles (367.7 lux). The control device should turn the lights off when the northern sky illuminance rises to a level of not more than 60 foot-candles (645.8 lux). The lights may also remain on continuously. The sensing device should, if practical, face the northern sky in the Northern Hemisphere. (See AC 150/5345-43.)

### 53. POLES, TOWERS, AND SIMILAR SKELETAL STRUCTURES

The following standards apply to radio and television towers, supporting structures for overhead transmission lines, and similar structures.

#### a. Top Mounted Obstruction Light.

**1. Structures 150 Feet (46m) AGL or Less.** Two or more steady burning (L-810) lights should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

**2. Structures Exceeding 150 Feet (46m) AGL.** At least one red flashing (L-864) beacon should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

**3. Appurtenances 40 Feet (12m) or Less.** If a rod, antenna, or other appurtenance 40 feet (12m) or less in height is incapable of supporting a red flashing beacon, then it may be placed at the base of the appurtenance. If the mounting location does not allow unobstructed viewing of the beacon by a pilot, then additional beacons should be added.

**4. Appurtenances Exceeding 40 Feet (12m).** If a rod, antenna, or other appurtenance exceeding 40 feet (12m) in height is incapable of supporting a red flashing beacon, a supporting mast with one or more beacons should be installed adjacent to the appurtenance. Adjacent installations should not exceed the height of the appurtenance and be within 40 feet (12m) of the tip to allow the pilot an unobstructed view of at least one beacon.

**b. Mounting Intermediate Levels.** The number of light levels is determined by the height of the structure, including all appurtenances, and is detailed in Appendix 1. The number of lights on each level is

determined by the shape and height of the structure. These lights should be mounted so as to ensure an unobstructed view of at least one light by a pilot.

### 1. *Steady Burning Lights (L-810).*

#### (a) *Structures 350 Feet (107m) AGL or Less.*

Two or more steady burning (L-810) lights should be installed on diagonally or diametrically opposite positions.

#### (b) *Structures Exceeding 350 Feet (107m)*

*AGL.* Install steady burning (L-810) lights on each outside corner of each level.

### 2. *Flashing Beacons (L-864).*

#### (a) *Structures 350 Feet (107m) AGL or Less.*

These structures do not require flashing (L-864) beacons at intermediate levels.

#### (b) *Structure Exceeding 350 Feet (107m)*

*AGL.* At intermediate levels, two beacons (L-864) should be mounted outside at diagonally opposite positions of intermediate levels.

## 54. CHIMNEYS, FLARE STACKS, AND SIMILAR SOLID STRUCTURES

### a. *Number of Light Units.*

1. The number of units recommended depends on the diameter of the structure at the top. The number of lights recommended below are the minimum.

2. When the structure diameter is:

(a) *20 Feet (6m) or Less.* Three light units per level.

(b) *Exceeding 20 Feet (6m) But Not More Than 100 Feet (31m).* Four light units per level.

(c) *Exceeding 100 Feet (31m) But Not More Than 200 Feet (61m).* Six light units per level.

(d) *Exceeding 200 Feet (61m).* Eight light units per level.

### b. *Top Mounted Obstruction Lights.*

1. *Structures 150 Feet (46m) AGL or Less.* L-810 lights should be installed horizontally at regular intervals at or near the top.

2. *Structures Exceeding 150 Feet (46m) AGL.* At least three L-864 beacons should be installed.

3. *Chimneys, Cooling Towers, and Flare Stacks.* Lights may be displayed as low as 20 feet (6m) below the top to avoid the obscuring effect of deposits and heat generally emitted by this type of structure. It is important that these lights be readily accessible for

cleaning and lamp replacement. It is understood that with flare stacks, as well as any other structures associated with the petrol-chemical industry, normal lighting requirements may not be necessary. This could be due to the location of the flare stack/structure within a large well-lighted petrol-chemical plant or the fact that the flare, or working lights surrounding the flare stack/structure, is as conspicuous as obstruction lights.

c. *Mounting Intermediate Levels.* The number of light levels is determined by the height of the structure including all appurtenances. For cooling towers 600 feet (183m) or less, intermediate light levels are not necessary. Structures exceeding 600 feet (183m) AGL should have a second level of light units installed approximately at the midpoint of the structure and in a vertical line with the top level of lights.

1. *Steady Burning (L-810) Lights.* The recommended number of light levels may be obtained from Appendix 1. At least three lights should be installed on each level.

2. *Flashing (L-864) Beacons.* The recommended number of beacon levels may be obtained from Appendix 1. At least three lights should be installed on each level.

(a) *Structures 350 Feet (107m) AGL or Less.* These structures do not need intermediate levels of flashing beacons.

(b) *Structures Exceeding 350 Feet (107m) AGL.* At least three flashing (L-864) beacons should be installed on each level in a manner to allow an unobstructed view of at least one beacon.

## 55. GROUP OF OBSTRUCTIONS

When individual objects, except wind turbines, within a group of obstructions are not the same height and are spaced a maximum of 150 feet (46m) apart, the prominent objects within the group should be lighted in accordance with the standards for individual obstructions of a corresponding height. If the outer structure is shorter than the prominent, the outer structure should be lighted in accordance with the standards for individual obstructions of a corresponding height. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. In addition, at least one flashing beacon should be installed at the top of a prominent center obstruction or on a special tower located near the center of the group.

## 56. ALTERNATE METHOD OF DISPLAYING OBSTRUCTION LIGHTS

When recommended in an FAA aeronautical study, lights may be placed on poles equal to the height of the obstruction and installed on or adjacent to the structure instead of installing lights on the obstruction.

## 57. PROMINENT BUILDINGS, BRIDGES, AND SIMILAR EXTENSIVE OBSTRUCTIONS

When objects within a group of obstructions are approximately the same overall height above the surface and are located a maximum of 150 feet (46m) apart, the group of obstructions may be considered an extensive obstruction. Install light units on the same horizontal plane at the highest portion or edge of prominent obstructions. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. If the structure is a bridge and is over navigable water, the sponsor must obtain prior approval of the lighting installation from the Commander of the District Office of the United States Coast Guard to avoid interference with marine navigation. Steady burning lights should be displayed to indicate the extent of the obstruction as follows:

**a. Structures 150 Feet (46m) or Less in Any Horizontal Direction.** If the structure/bridge/extensive obstruction is 150 feet (46m) or less horizontally, at least one steady burning light (L-810) should be displayed on the highest point at each end of the major axis of the obstruction. If this is impractical because of the overall shape, display a double obstruction light in the center of the highest point.

**b. Structures Exceeding 150 Feet (46m) in at Least One Horizontal Direction.** If the structure/bridge/extensive obstruction exceeds 150 feet (46m) horizontally, display at least one steady burning light for each 150 feet (46m), or fraction thereof, of the

overall length of the major axis. At least one of these lights should be displayed on the highest point at each end of the obstruction. Additional lights should be displayed at approximately equal intervals not to exceed 150 feet (46m) on the highest points along the edge between the end lights. If an obstruction is located near a landing area and two or more edges are the same height, the edge nearest the landing area should be lighted.

**c. Structures Exceeding 150 Feet (46m) AGL.** Steady burning red obstruction lights should be installed on the highest point at each end. At intermediate levels, steady burning red lights should be displayed for each 150 feet (46m) or fraction thereof. The vertical position of these lights should be equidistant between the top lights and the ground level as the shape and type of obstruction will permit. One such light should be displayed at each outside corner on each level with the remaining lights evenly spaced between the corner lights.

**d. Exceptions.** Flashing red beacons (L-864) may be used instead of steady burning obstruction lights if early or special warning is necessary. These beacons should be displayed on the highest points of an extensive obstruction at intervals not exceeding 3,000 feet (915m). At least three beacons should be displayed on one side of the extensive obstruction to indicate a line of lights.

**e. Ice Shields.** Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulations from damaging the light units. The light should be mounted in a manner to ensure an unobstructed view of at least one light by a pilot approaching from any direction.





## CHAPTER 6. MEDIUM INTENSITY FLASHING WHITE OBSTRUCTION LIGHT SYSTEMS

### 60. PURPOSE

Medium intensity flashing white (L-865) obstruction lights may provide conspicuity both day and night. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

### 61. STANDARDS

The medium intensity flashing white light system is normally composed of flashing omnidirectional lights. Medium intensity flashing white obstruction lights may be used during daytime and twilight with automatically selected reduced intensity for nighttime operation. When this system is used on structures 500 feet (153m) AGL or less in height, other methods of marking and lighting the structure may be omitted. Aviation orange and white paint is always required for daytime marking on structures exceeding 500 feet (153m) AGL. This system is not normally recommended on structures 200 feet (61m) AGL or less.

The use of a 24-hour medium intensity flashing white light system in urban/populated areas is not normally recommended due to their tendency to merge with background lighting in these areas at night. This makes it extremely difficult for some types of aviation operations, i.e., med-evac, and police helicopters to see these structures. The use of this type of system in urban and rural areas often results in complaints. In addition, this system is not recommended on structures within 3 nautical miles of an airport.

### 62. RADIO AND TELEVISION TOWERS AND SIMILAR SKELETAL STRUCTURES

**a. Mounting Lights.** The number of levels recommended depends on the height of the structure, including antennas and similar appurtenances.

**1. Top Levels.** One or more lights should be installed at the highest point to provide 360-degree coverage ensuring an unobstructed view.

**2. Appurtenances 40 feet (12m) or less.** If a rod, antenna, or other appurtenance 40 feet (12m) or less in height is incapable of supporting the medium intensity flashing white light, then it may be placed at the base of the appurtenance. If the mounting location does not allow unobstructed viewing of the medium intensity flashing white light by a pilot, then additional lights should be added.

**3. Appurtenances Exceeding 40 feet (12m).** If a rod, antenna, or other appurtenance exceeds 40 feet (12m) above the tip of the main structure, a medium intensity flashing white light should be placed within 40 feet (12m) from the top of the appurtenance. If the appurtenance (such as a whip antenna) is incapable of supporting the light, one or more lights should be mounted on a pole adjacent to the appurtenance. Adjacent installations should not exceed the height of the appurtenance and be within 40 feet (12m) of the tip to allow the pilot an unobstructed view of at least one light.

**b. Intermediate Levels.** At intermediate levels, two beacons (L-865) should be mounted outside at diagonally or diametrically opposite positions of intermediate levels. The lowest light level should not be less than 200 feet (61m) AGL.

**c. Lowest Levels.** The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by an FAA aeronautical study, the lowest level of lights may be eliminated.

**d. Structures 500 Feet (153m) AGL or Less.** When white lights are used during nighttime and twilight only, marking is required for daytime. When operated 24 hours a day, other methods of marking and lighting are not required.

**e. Structures Exceeding 500 Feet (153m) AGL.** The lights should be used during nighttime and twilight and may be used 24 hours a day. Marking is always required for daytime.

**f. Ice Shields.** Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulations from damaging the light units. The light should be mounted in a manner to ensure an unobstructed view of at least one light by a pilot approaching from any direction.

### 63. CONTROL DEVICE

The light intensity is controlled by a device that changes the intensity when the ambient light changes. The system should automatically change intensity steps when the northern sky illumination in the Northern Hemisphere on a vertical surface is as follows:

**a. Twilight-to-Night.** This should not occur before the illumination drops below five foot-candles (53.8

lux) but should occur before it drops below two foot-candles (21.5 lux).

**b. Night-to-Day.** The intensity changes listed in subparagraph 63a above should be reversed when changing from the night to day mode.

#### **64. CHIMNEYS, FLARE STACKS, AND SIMILAR SOLID STRUCTURES**

**a. Number of Light Units.** The number of units recommended depends on the diameter of the structure at the top. Normally, the top level is on the highest point of a structure. However, the top level of chimney lights may be installed as low as 20 feet (6m) below the top to minimize deposit build-up due to emissions. The number of lights recommended are the minimum. When the structure diameter is:

1. *20 Feet (6m) or Less.* Three light units per level.
2. *Exceeding 20 Feet (6m) But Not More Than 100 Feet (31m).* Four light units per level.
3. *Exceeding 100 Feet (31m) But Not More Than 200 Feet (61m).* Six light units per level.
4. *Exceeding 200 Feet (61m).* Eight light units per level.

#### **65. GROUP OF OBSTRUCTIONS**

When individual objects within a group of obstructions are not the same height and are spaced a maximum of 150 feet (46m) apart, the prominent objects within the group should be lighted in accordance with the standards for individual obstructions of a corresponding height. If the outer structure is shorter than the prominent, the outer structure should be lighted in accordance with the standards for individual obstructions of a corresponding height. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. In addition, at least one medium intensity flashing white light should be installed at the top of a prominent center obstruction or on a special tower located near the center of the group.

#### **66. SPECIAL CASES**

Where lighting systems are installed on structures located near highways, waterways, airport approach areas, etc., caution should be exercised to ensure that the lights do not distract or otherwise cause a hazard to motorists, vessel operators, or pilots on an approach to an airport. In these cases, shielding may be necessary.

This shielding should not derogate the intended purpose of the lighting system.

#### **67. PROMINENT BUILDINGS AND SIMILAR EXTENSIVE OBSTRUCTIONS**

When objects within a group of obstructions are approximately the same overall height above the surface and are located a maximum of 150 feet (46m) apart, the group of obstructions may be considered an extensive obstruction. Install light units on the same horizontal plane at the highest portion or edge of prominent obstructions. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. Lights should be displayed to indicate the extent of the obstruction as follows:

**a. Structures 150 Feet (46m) or Less in Any Horizontal Direction.** If the structure/extensive obstruction is 150 feet (46m) or less horizontally, at least one light should be displayed on the highest point at each end of the major axis of the obstruction. If this is impractical because of the overall shape, display a double obstruction light in the center of the highest point.

**b. Structures Exceeding 150 Feet (46m) in at Least One Horizontal Direction.** If the structure/extensive obstruction exceeds 150 feet (46m) horizontally, display at least one light for each 150 feet (46m) or fraction thereof, of the overall length of the major axis. At least one of these lights should be displayed on the highest point at each end of the obstruction. Additional lights should be displayed at approximately equal intervals not to exceed 150 feet (46m) on the highest points along the edge between the end lights. If an obstruction is located near a landing area and two or more edges are the same height, the edge nearest the landing area should be lighted.

**c. Structures Exceeding 150 Feet (46m) AGL.** Lights should be installed on the highest point at each end. At intermediate levels, lights should be displayed for each 150 feet (46m), or fraction thereof. The vertical position of these lights should be equidistant between the top lights and the ground level as the shape and type of obstruction will permit. One such light should be displayed at each outside corner on each level with the remaining lights evenly spaced between the corner lights.

CHAPTER 7. HIGH INTENSITY FLASHING WHITE OBSTRUCTION LIGHT SYSTEMS

70. PURPOSE

Lighting with high intensity (L-856) flashing white obstruction lights provides the highest degree of conspicuity both day and night. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

71. STANDARDS

Use high intensity flashing white obstruction lights during daytime with automatically selected reduced intensities for twilight and nighttime operations. When high intensity white lights are operated 24 hours a day, other methods of marking and lighting may be omitted. This system should not be recommended on structures 500 feet (153m) AGL or less unless an FAA aeronautical study shows otherwise.

72. CONTROL DEVICE

Light intensity is controlled by a device that changes the intensity when the ambient light changes. The use of a 24-hour high intensity flashing white light system in urban/populated areas is not normally recommended due to their tendency to merge with background lighting in these areas at night. This makes it extremely difficult for some types of aviation operations, i.e., med-evac, and police helicopters to see these structures. The use of this type of system in urban and rural areas often results in complaints.

The system should automatically change intensity steps when the northern sky illumination in the Northern Hemisphere on a vertical surface is as follows:

- a. *Day-to-Twilight.* This should not occur before the illumination drops to 60 foot-candles (645.8 lux), but should occur before it drops below 35 foot-candles (376.7 lux). The illuminance-sensing device should, if practical, face the northern sky in the Northern Hemisphere.
- b. *Twilight-to-Night.* This should not occur before the illumination drops below five foot-candles (53.8 lux), but should occur before it drops below two foot-candles (21.5 lux).
- c. *Night-to-Day.* The intensity changes listed in subparagraph 72 a and b above should be reversed when changing from the night to day mode.

73. UNITS PER LEVEL

One or more light units is needed to obtain the desired horizontal coverage. The number of light units recommended per level (except for the supporting structures of catenary wires and buildings) depends upon the average outside diameter of the specific structure, and the horizontal beam width of the light fixture. The light units should be installed in a manner to ensure an unobstructed view of the system by a pilot approaching from any direction. The number of lights recommended are the minimum. When the structure diameter is:

- a. *20 Feet (6m) or Less.* Three light units per level.
- b. *Exceeding 20 Feet (6m) But Not More Than 100 Feet (31m).* Four light units per level.
- c. *Exceeding 100 Feet (31m).* Six light units per level.

74. INSTALLATION GUIDANCE

Manufacturing specifications provide for the effective peak intensity of the light beam to be adjustable from zero to 8 degrees above the horizon. Normal installation should place the top light at zero degrees to the horizontal and all other light units installed in accordance with Table 2:

Light Unit Elevation Above the Horizontal	
Height of Light Unit Above Terrain	Degrees of Elevation Above the Horizontal
Exceeding 500 feet AGL	0
401 feet to 500 feet AGL	1
301 feet to 400 feet AGL	2
300 feet AGL or less	3

TBL 2

- a. *Vertical Aiming.* Where terrain, nearby residential areas, or other situations dictate, the light beam may be further elevated above the horizontal. The main beam of light at the lowest level should not strike the ground closer than 3 statute miles (5km) from the structure. If additional adjustments are necessary, the lights may be individually adjusted upward, in 1-degree increments, starting at the bottom. Excessive elevation may reduce its conspicuity by raising the beam above a collision course flight path.
- b. *Special Cases.* Where lighting systems are installed on structures located near highways, waterways, airport approach areas, etc., caution should be exercised to ensure that the lights do not distract or otherwise cause a hazard to motorists, vessel operators, or pilots on an approach to an airport. In these cases,

shielding or an adjustment to the vertical or horizontal light aiming may be necessary. This adjustment should not derogate the intended purpose of the lighting system. Such adjustments may require review action as described in Chapter 1, paragraph 5.

**c. Relocation or Omission of Light Units.** Light units should not be installed in such a manner that the light pattern/output is disrupted by the structure.

**1. Lowest Level.** The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by an FAA aeronautical study, the lowest level of lights may be eliminated.

**2. Two Adjacent Structures.** Where two structures are situated within 500 feet (153m) of each other and the light units are installed at the same levels, the sides of the structures facing each other need not be lighted. However, all lights on both structures must flash simultaneously, except for adjacent catenary support structures. Adjust vertical placement of the lights to either or both structures' intermediate levels to place the lights on the same horizontal plane. Where one structure is higher than the other, complete level(s) of lights should be installed on that part of the higher structure that extends above the top of the lower structure. If the structures are of such heights that the levels of lights cannot be placed in identical horizontal planes, then the light units should be placed such that the center of the horizontal beam patterns do not face toward the adjacent structure. For example, structures situated north and south of each other should have the light units on both structures installed on a northwest/southeast and northeast/southwest orientation.

**3. Three or More Adjacent Structures.** The treatment of a cluster of structures as an individual or a complex of structures will be determined by the FAA as the result of an aeronautical study, taking into consideration the location, heights, and spacing with other structures.

#### **75. ANTENNA OR SIMILAR APPURTENANCE LIGHT**

When a structure lighted by a high intensity flashing light system is topped with an antenna or similar appurtenance exceeding 40 feet (12m) in height, a medium intensity flashing white light (L-865) should be placed within 40 feet (12m) from the tip of the

appurtenance. This light should operate 24 hours a day and flash simultaneously with the rest of the lighting system.

#### **76. CHIMNEYS, FLARE STACKS, AND SIMILAR SOLID STRUCTURES**

The number of light levels depends on the height of the structure excluding appurtenances. Three or more lights should be installed on each level in such a manner to ensure an unobstructed view by the pilot. Normally, the top level is on the highest point of a structure. However, the top level of chimney lights may be installed as low as 20 feet (6m) below the top to minimize deposit build-up due to emissions.

#### **77. RADIO AND TELEVISION TOWERS AND SIMILAR SKELETAL STRUCTURES**

**a. Mounting Lights.** The number of levels recommended depends on the height of the structure, including antennas and similar appurtenances. At least three lights should be installed on each level and mounted to ensure that the effective intensity of the full horizontal beam coverage is not impaired by the structural members.

**b. Top Level.** One level of lights should be installed at the highest point of the structure. If the highest point is a rod or antenna incapable of supporting a lighting system, then the top level of lights should be installed at the highest portion of the main skeletal structure. When guy wires come together at the top, it may be necessary to install this level of lights as low as 10 feet (3m) below the top. If the rod or antenna exceeds 40 feet (12m) above the main structure, a medium intensity flashing white light (L-865) should be mounted on the highest point. If the appurtenance (such as a whip antenna) is incapable of supporting a medium intensity light, one or more lights should be installed on a pole adjacent to the appurtenance. Adjacent installation should not exceed the height of the appurtenance and be within 40 feet (12m) of the top to allow an unobstructed view of at least one light.

**c. Ice Shields.** Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulations from damaging the light units.

#### **78. HYPERBOLIC COOLING TOWERS**

Light units should be installed in a manner to ensure an unobstructed view of at least two lights by a pilot approaching from **any** direction.

**a. Number of Light Units.** The number of units recommended depends on the diameter of the structure

at the top. The number of lights recommended in the following table are the minimum. When the structure diameter is:

1. *20 Feet (6m) or Less.* Three light units per level.

2. *Exceeding 20 Feet (6m) But Not More Than 100 Feet (31m).* Four light units per level.

3. *Exceeding 100 Feet (31m) But Not More Than 200 Feet (61m).* Six light units per level.

4. *Exceeding 200 Feet (61m).* Eight light units per level.

**b. Structures Exceeding 600 Feet (183m) AGL.** Structures exceeding 600 feet (183m) AGL should have a second level of light units installed approximately at the midpoint of the structure and in a vertical line with the top level of lights.

#### **79. PROMINENT BUILDINGS AND SIMILAR EXTENSIVE OBSTRUCTIONS**

When objects within a group of obstructions are approximately the same overall height above the surface and are located not more than 150 feet (46m) apart, the group of obstructions may be considered an extensive obstruction. Install light units on the same horizontal plane at the highest portion or edge of prominent obstructions. Light units should be placed

to ensure that the light is visible to a pilot approaching from **any** direction. These lights may require shielding, such as louvers, to ensure minimum adverse impact on local communities. Extreme caution in the use of high intensity flashing white lights should be exercised.

**a. If the Obstruction is 200 feet (61m) or Less in Either Horizontal Dimension,** install three or more light units at the highest portion of the structure in a manner to ensure that at least one light is visible to a pilot approaching from **any** direction. Units may be mounted on a single pedestal at or near the center of the obstruction. If light units are placed more than 10 feet (3m) from the center point of the structure, use a minimum of four units.

**b. If the Obstruction Exceeds 200 Feet (61m) in One Horizontal Dimension,** but is 200 feet (61m) or less in the other, two light units should be placed on each of the shorter sides. These light units may either be installed adjacent to each other at the midpoint of the edge of the obstruction or at (near) each corner with the light unit aimed to provide 180 degrees of coverage at each edge. One or more light units should be installed along the overall length of the major axis. These lights should be installed at approximately equal intervals not to exceed a distance of 100 feet (31m) from the corners or from each other.

**c. If the Obstruction Exceeds 200 Feet (61m) in Both Horizontal Dimensions,** light units should be equally spaced along the overall perimeter of the obstruction at intervals of 100 feet (31m) or fraction thereof.



## CHAPTER 8. DUAL LIGHTING WITH RED/MEDIUM INTENSITY FLASHING WHITE SYSTEMS

### 80. PURPOSE

This dual lighting system includes red lights (L-864) for nighttime and medium intensity flashing white lights (L-865) for daytime and twilight use. This lighting system may be used in lieu of operating a medium intensity flashing white lighting system at night. There may be some populated areas where the use of medium intensity at night may cause significant environmental concerns. The use of the dual lighting system should reduce/mitigate those concerns. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

### 81. INSTALLATION

The light units should be installed as specified in the appropriate portions of Chapters 4, 5, and 6. The number of light levels needed may be obtained from Appendix 1.

### 82. OPERATION

Lighting systems should be operated as specified in Chapter 3. Both systems should not be operated at the same time; however, there should be no more than a 2-second delay when changing from one system to the other. Outage of one of two lamps in the uppermost red beacon (L-864 incandescent unit) or outage of any uppermost red light shall cause the white obstruction light system to operate in its specified "night" step intensity.

### 83. CONTROL DEVICE

The light system is controlled by a device that changes the system when the ambient light changes. The system should automatically change steps when the northern sky illumination in the Northern Hemisphere on a vertical surface is as follows:

**a. *Twilight-to-Night.*** This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).

**b. *Night-to-Day.*** The intensity changes listed in subparagraph 83 a above should be reversed when changing from the night to day mode.

### 84. ANTENNA OR SIMILAR APPURTENANCE LIGHT

When a structure utilizing this dual lighting system is topped with an antenna or similar appurtenance exceeding 40 feet (12m) in height, a medium intensity flashing white (L-865) and a red flashing beacon (L-864) should be placed within 40 feet (12m) from the tip of the appurtenance. The white light should operate during daytime and twilight and the red light during nighttime. These lights should flash simultaneously with the rest of the lighting system.

### 85. OMISSION OF MARKING

When medium intensity white lights are operated on structures 500 feet (153m) AGL or less during daytime and twilight, other methods of marking may be omitted.





**CHAPTER 9. DUAL LIGHTING WITH RED/HIGH INTENSITY FLASHING WHITE SYSTEMS****90. PURPOSE**

This dual lighting system includes red lights (L-864) for nighttime and high intensity flashing white lights (L-856) for daytime and twilight use. This lighting system may be used in lieu of operating a flashing white lighting system at night. There may be some populated areas where the use of high intensity lights at night may cause significant environmental concerns and complaints. The use of the dual lighting system should reduce/mitigate those concerns. Recommendations on lighting structures can vary depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, number of structures and overall layout of design.

**91. INSTALLATION**

The light units should be installed as specified in the appropriate portions of Chapters 4, 5, and 7. The number of light levels needed may be obtained from Appendix 1.

**92. OPERATION**

Lighting systems should be operated as specified in Chapters 4, 5, and 7. Both systems should not be operated at the same time; however, there should be no more than a 2-second delay when changing from one system to the other. Outage of one of two lamps in the uppermost red beacon (L-864 incandescent unit) or outage of any uppermost red light shall cause the white obstruction light system to operate in its specified "night" step intensity.

**93. CONTROL DEVICE**

The light intensity is controlled by a device that changes the intensity when the ambient light changes.

The system should automatically change intensity steps when the northern sky illumination in the Northern Hemisphere on a vertical surface is as follows:

**a. Day-to-Twilight.** This should not occur before the illumination drops to 60 foot-candles (645.8 lux) but should occur before it drops below 35 foot-candles (376.7 lux). The illuminance-sensing device should, if practical, face the northern sky in the Northern Hemisphere.

**b. Twilight-to-Night.** This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).

**c. Night-to-Day.** The intensity changes listed in subparagraph 93 a and b above should be reversed when changing from the night to day mode.

**94. ANTENNA OR SIMILAR APPURTENANCE LIGHT**

When a structure utilizing this dual lighting system is topped with an antenna or similar appurtenance exceeding 40 feet (12m) in height, a medium intensity flashing white light (L-865) and a red flashing beacon (L-864) should be placed within 40 feet (12m) from the tip of the appurtenance. The white light should operate during daytime and twilight and the red light during nighttime.

**95. OMISSION OF MARKING**

When high intensity white lights are operated during daytime and twilight, other methods of marking may be omitted.



## CHAPTER 10. MARKING AND LIGHTING OF CATENARY AND CATENARY SUPPORT STRUCTURES

### 100. PURPOSE

This chapter provides guidelines for marking and lighting catenary and catenary support structures. The recommended marking and lighting of these structures is intended to provide day and night conspicuity and to assist pilots in identifying and avoiding catenary wires and associated support structures.

### 101. CATENARY MARKING STANDARDS

Lighted markers are available for increased night conspicuity of high-voltage (69KV or greater) transmission line catenary wires. These markers should be used on transmission line catenary wires near airports, heliports, across rivers, canyons, lakes, etc. The lighted markers should be manufacturer certified as recognizable from a minimum distance of 4,000 feet (1219m) under nighttime conditions, minimum VFR conditions or having a minimum intensity of at least 32.5 candela. The lighting unit should emit a steady burning red light. They should be used on the highest energized line. If the lighted markers are installed on a line other than the highest catenary, then markers specified in paragraph 34 should be used in addition to the lighted markers. (The maximum distance between the line energizing the lighted markers and the highest catenary above the lighted marker should be no more than 20 feet (6m).) Markers should be distinctively shaped, i.e., spherical, cylindrical, so they are not mistaken for items that are used to convey other information. They should be visible in all directions from which aircraft are likely to approach. The area in the immediate vicinity of the supporting structure's base should be clear of all items and/or objects of natural growth that could interfere with the line-of-sight between a pilot and the structure's lights. Where a catenary wire crossing requires three or more supporting structures, the inner structures should be equipped with enough light units per level to provide a full coverage.

**a. Size and Color.** The diameter of the markers used on extensive catenary wires across canyons, lakes, rivers, etc., should be not less than 36 inches (91cm). Smaller 20-inch (51cm) markers are permitted on less extensive power lines or on power lines below 50 feet (15m) above the ground and within 1,500 feet (458m) of an airport runway end. Each marker should be a solid color such as aviation orange, white, or yellow.

#### **b. Installation.**

**1. Spacing.** Lighted markers should be spaced equally along the wire at intervals of approximately 200 feet (61m) or a fraction thereof. Intervals between

markers should be less in critical areas near runway ends, i.e., 30 to 50 feet (10m to 15m). If the markers are installed on a line other than the highest catenary, then markers specified in paragraph 34 should be used in addition to the lighted markers. The maximum distance between the line energizing the lighted markers and the highest catenary above the markers can be no more than 20 feet (6m). The lighted markers may be installed alternately along each wire if the distance between adjacent markers meets the spacing standard. This method allows the weight and wind loading factors to be distributed.

**2. Pattern.** An alternating color scheme provides the most conspicuity against all backgrounds. Mark overhead wires by alternating solid colored markers of aviation orange, white, and yellow. Normally, an orange marker is placed at each end of a line and the spacing is adjusted (not to exceed 200 feet (61m)) to accommodate the rest of the markers. When less than four markers are used, they should all be aviation orange.

### 102. CATENARY LIGHTING STANDARDS

When using medium intensity flashing white (L-866), high intensity flashing white (L-857), dual medium intensity (L-866/L-885) or dual high intensity (L-857/885) lighting systems, operated 24 hours a day, other marking of the support structure is not necessary.

**a. Levels.** A system of three levels of sequentially flashing light units should be installed on each supporting structure or adjacent terrain. Install one level at the top of the structure, one at the height of the lowest point in the catenary and one level approximately midway between the other two light levels. The middle level should normally be at least 50 feet (15m) from the other two levels. The middle light unit may be deleted when the distance between the top and the bottom light levels is less than 100 feet (30m).

**1. Top Levels.** One or more lights should be installed at the top of the structure to provide 360-degree coverage ensuring an unobstructed view. If the installation presents a potential danger to maintenance personnel, or when necessary for lightning protection, the top level of lights may be mounted as low as 20 feet (6m) below the highest point of the structure.

**2. Horizontal Coverage.** The light units at the middle level and bottom level should be installed so as to provide a minimum of 180-degree coverage centered perpendicular to the flyway. Where a catenary crossing is situated near a bend in a river, canyon, etc., or is not perpendicular to the flyway, the

horizontal beam should be directed to provide the most effective light coverage to warn pilots approaching from either direction of the catenary wires.

**3. Variation.** The vertical and horizontal arrangements of the lights may be subject to the structural limits of the towers and/or adjacent terrain. A tolerance of 20 percent from uniform spacing of the bottom and middle light is allowed. If the base of the supporting structure(s) is higher than the lowest point in the catenary, such as a canyon crossing, one or more lights should be installed on the adjacent terrain at the level of the lowest point in the span. These lights should be installed on the structure or terrain at the height of the lowest point in the catenary.

**b. Flash Sequence.** The flash sequence should be middle, top, and bottom with all lights on the same level flashing simultaneously. The time delay between flashes of levels is designed to present a unique system display. The time delay between the start of each level of flash duration is outlined in FAA AC 150/5345-43, Specification for Obstruction Lighting Equipment.

**c. Synchronization.** Although desirable, the corresponding light levels on associated supporting towers of a catenary crossing need not flash simultaneously.

**d. Structures 500 feet (153m) AGL or Less.** When medium intensity white lights (L-866) are operated 24 hours a day, or when a dual red/medium intensity system (L-866 daytime & twilight/L-885 nighttime) is used, marking can be omitted. When using a medium intensity white light (L-866) or a flashing red light (L-885) during twilight or nighttime only, painting should be used for daytime marking.

**e. Structures Exceeding 500 Feet (153m) AGL.** When high intensity white lights (L-857) are operated 24 hours a day, or when a dual red/high intensity system (L-857 daytime and twilight/L-885 nighttime) is used, marking can be omitted. This system should not be recommended on structures 500 feet (153m) or less unless an FAA aeronautical study shows otherwise. When a flashing red obstruction light (L-885), a medium intensity (L-866) flashing white lighting system or a high intensity white lighting system (L-857) is used for nighttime and twilight only, painting should be used for daytime marking.

### 103. CONTROL DEVICE

The light intensity is controlled by a device (photo cell) that changes the intensity when the ambient light changes. The lighting system should automatically change intensity steps when the northern sky illumination in the Northern Hemisphere on a vertical surface is as follows:

**a. Day-to-Twilight (L-857 System).** This should not occur before the illumination drops to 60 foot-candles (645.8 lux), but should occur before it drops below 35 foot-candles (376.7 lux). The illuminant-sensing device should, if practical, face the northern sky in the Northern Hemisphere.

**b. Twilight-to-Night (L-857 System).** This should not occur before the illumination drops below 5 foot-candles (53.8 lux), but should occur before it drops below 2 foot-candles (21.5 lux).

**c. Night-to-Day.** The intensity changes listed in subparagraph 103 a. and b. above should be reversed when changing from the night to day mode.

**d. Day-to-Night (L-866 or L-885/L-866).** This should not occur before the illumination drops below 5 foot-candles (563.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).

**e. Night-to-Day.** The intensity changes listed in subparagraph d. above should be reversed when changing from the night to day mode.

**f. Red Obstruction (L-885).** The red lights should not turn on until the illumination drops below 60 foot-candles (645.8 lux) but should occur before reaching a level of 35 foot-candles (367.7 lux). Lights should not turn off before the illuminance rises above 35 foot-candles (367.7 lux), but should occur before reaching 60 foot-candles (645.8 lux).

### 104. AREA SURROUNDING CATENARY SUPPORT STRUCTURES

The area in the immediate vicinity of the supporting structure's base should be clear of all items and/or objects of natural growth that could interfere with the line-of-sight between a pilot and the structure's lights.

### 105. THREE OR MORE CATENARY SUPPORT STRUCTURES

Where a catenary wire crossing requires three or more supporting structures, the inner structures should be equipped with enough light units per level to provide a full 360-degree coverage.

**CHAPTER 11. MARKING AND LIGHTING MOORED BALLOONS AND KITES****110. PURPOSE**

The purpose of marking and lighting moored balloons, kites, and their cables or mooring lines is to indicate the presence and general definition of these objects to pilots when converging from any normal angle of approach.

**111. STANDARDS**

These marking and lighting standards pertain to all moored balloons and kites that require marking and lighting under 14 CFR, part 101.

**112. MARKING**

Flag markers should be used on mooring lines to warn pilots of their presence during daylight hours.

**a. Display.** Markers should be displayed at no more than 50-foot (15m) intervals and should be visible for at least 1 statute mile.

**b. Shape.** Markers should be rectangular in shape and not less than 2 feet (0.6m) on a side. Stiffeners should be used in the borders so as to expose a large area, prevent drooping in calm wind, or wrapping around the cable.

**c. Color Patterns.** One of the following color patterns should be used:

**1. Solid Color.** Aviation orange.

**2. Orange and White.** Two triangular sections, one of aviation orange and the other white, combined to form a rectangle.

**113. PURPOSE**

Flashing obstruction lights should be used on moored balloons or kites and their mooring lines to warn pilots of their presence during the hours between sunset and sunrise and during periods of reduced visibility. These lights may be operated 24 hours a day.

**a. Systems.** Flashing red (L-864) or white beacons (L-865) may be used to light moored balloons or kites. High intensity lights (L-856) are not recommended.

**b. Display.** Flashing lights should be displayed on the top, nose section, tail section, and on the tether cable approximately 15 feet (4.6m) below the craft so as to define the extremes of size and shape. Additional lights should be equally spaced along the cable's overall length for each 350 feet (107m) or fraction thereof.

**c. Exceptions.** When the requirements of this paragraph cannot be met, floodlighting may be used.

**114. OPERATIONAL CHARACTERISTICS**

The light intensity is controlled by a device that changes the intensity when the ambient light changes. The system should automatically turn the lights on and change intensities as ambient light condition change. The reverse order should apply in changing from nighttime to daytime operation. The lights should flash simultaneously.



**CHAPTER 12. MARKING AND LIGHTING EQUIPMENT AND INFORMATION**

**120. PURPOSE**

This chapter lists documents relating to obstruction marking and lighting systems and where they may be obtained.

**121. PAINT STANDARD**

Paint and aviation colors/gloss, referred to in this publication should conform to Federal Standard FED-STD-595. Approved colors shall be formulated without the use of Lead, Zinc Chromate or other heavy metals to match International Orange, White and Yellow. All coatings shall be manufactured and labeled to meet Federal Environmental Protection Act Volatile Organic Compound(s) guidelines, including the National Volatile Organic Compound Emission Standards for architectural coatings.

**a. Exterior Acrylic Waterborne Paint.** Coating should be a ready mixed, 100% acrylic, exterior latex formulated for application directly to galvanized surfaces. Ferrous iron and steel or non-galvanized surfaces shall be primed with a manufacturer recommended primer compatible with the finish coat.

**b. Exterior Solventborne Alkyd Based Paint.** Coating should be ready mixed, alkyd-based, exterior enamel for application directly to non-galvanized surfaces such as ferrous iron and steel. Galvanized surfaces shall be primed with a manufacturer primer compatible with the finish coat.

**Paint Standards Color Table**

COLOR	NUMBER
Orange	12197
White	17875
Yellow	13538

*TBL 3*

**Note-**

1. Federal specification T1-P-59, aviation surface paint, ready mixed international orange.
2. Federal specification T1-102, aviation surface paint, oil titanium zinc.
3. Federal specification T1-102, aviation surface paint, oil, exterior, ready mixed, white and light tints.

**122. AVAILABILITY OF SPECIFICATIONS**

Federal specifications describing the technical characteristics of various paints and their application techniques may be obtained from:

GSA- Specification Branch  
 470 L'Enfant Plaza  
 Suite 8214  
 Washington, DC 20407  
 Telephone: (202) 619-8925

**123. LIGHTS AND ASSOCIATED EQUIPMENT**

The lighting equipment referred to in this publication should conform to the latest edition of one of the following specifications, as applicable:

**a. Obstruction Lighting Equipment.**

1. AC 150/5345-43, FAA Specification for Obstruction Lighting Equipment.
2. Military Specifications MIL-L-6273, Light, Navigational, Beacon, Obstacle or Code, Type G-1.
3. Military Specifications MIL-L-7830, Light Assembly, Markers, Aircraft Obstruction.

**b. Certified Equipment.**

1. AC 150/5345-53, Airport Lighting Certification Program, lists the manufacturers that have demonstrated compliance with the specification requirements of AC 150/5345-43.
2. Other manufacturers' equipment may be used provided that equipment meets the specification requirements of AC 150/5345-43.

**c. Airport Lighting Installation and Maintenance.**

1. AC 150/5340-21, Airport Miscellaneous Lighting Visual Aids, provides guidance for the installation, maintenance, testing, and inspection of obstruction lighting for airport visual aids such as airport beacons, wind cones, etc.
2. AC 150/5340-26, Maintenance of Airport Visual Aid Facilities, provides guidance on the maintenance of airport visual aid facilities.

**d. Vehicles.**

1. AC 150/5210-5, Painting, Marking, and Lighting of Vehicles Used on an Airport, contains provisions for marking vehicles principally used on airports.
2. FAA Facilities. Obstruction marking for FAA facilities shall conform to FAA Drawing Number D-5480, referenced in FAA Standard FAA-STD-003, Paint Systems for Structures.

**124. AVAILABILITY**

The standards and specifications listed above may be obtained free of charge from the below-indicated office:

**a. Military Specifications:**

Standardization Document Order Desk  
700 Robbins Avenue  
Building #4, Section D  
Philadelphia, PA 19111-5094

**b. FAA Specifications:**

Manager, ASD-110  
Department of Transportation  
Document Control Center  
Martin Marietta/Air Traffic Systems  
475 School St., SW.  
Washington, DC 20024  
Telephone: (202) 646-2047  
FAA Contractors Only

**c. FAA Advisory Circulars:**

Department of Transportation  
TASC  
Subsequent Distribution Office, SVC-121.23  
Ardmore East Business Center  
3341 Q 75th Avenue  
Landover, MD 20785  
Telephone: (301) 322-4961



## CHAPTER 13. MARKING AND LIGHTING WIND TURBINE FARMS

### 130. PURPOSE

This chapter provides guidelines for the marking and lighting of wind turbine farms. For the purposes of this advisory circular, wind turbine farms are defined as a wind turbine development that contains more than three (3) turbines of heights over 200 feet above ground level. The recommended marking and lighting of these structures is intended to provide day and night conspicuity and to assist pilots in identifying and avoiding these obstacles.

### 131. GENERAL STANDARDS

The development of wind turbine farms is a very dynamic process, which constantly changes based on the differing terrain they are built on. Each wind turbine farm is unique; therefore it is important to work closely with the sponsor to determine a lighting scheme that provides for the safety of air traffic. The following are guidelines that are recommended for wind turbine farms. Consider the proximity to airports and VFR routes, extreme terrain where heights may widely vary, and local flight activity when making the recommendation.

a. Not all wind turbine units within an installation or farm need to be lighted. Definition of the periphery of the installation is essential; however, lighting of interior wind turbines is of lesser importance unless they are taller than the peripheral units.

b. Obstruction lights within a group of wind turbines should have unlighted separations or gaps of no more than ½ statute mile if the integrity of the group appearance is to be maintained. This is especially critical if the arrangement of objects is essentially linear.

c. Any array of flashing or pulsed obstruction lighting should be synchronized or flash simultaneously.

d. Nighttime wind turbine obstruction lighting should consist of the preferred FAA L-864 aviation red-colored flashing lights.

e. White strobe fixtures (FAA L-865) may be used in lieu of the preferred L-864 red flashing lights, but must be used alone without any red lights, and must be positioned in the same manner as the red flashing lights.

f. The white paint most often found on wind turbine units is the most effective daytime early warning device. Other colors, such as light gray or blue, appear to be significantly less effective in

providing daytime warning. Daytime lighting of wind turbine farms is not required, as long as the turbine structures are painted in a bright white color or light off-white color most often found on wind turbines.

**132. WIND TURBINE CONFIGURATIONS** – Prior to recommending marking and lighting, determine the configuration and the terrain of the wind turbine farm. The following is a description of the most common configurations.

a. Linear – wind turbine farms in a line-like arrangement, often located along a ridge line, the face of a mountain or along borders of a mesa or field. The line may be ragged in shape or be periodically broke, and may vary in size from just a few turbines up to 20 miles long.

b. Cluster – turbine farms where the turbines are placed in circles like groups on top of a mesa, or within a large field. A cluster is typically characterized by having a pronounced perimeter, with various turbines placed inside the circle at various, erratic distances throughout the center of the circle.

c. Grid – turbine farms arranged in a geographical shape such as a square or a rectangle, where each turbine is set a consistent distance from each other in rows, giving the appearance that they are part of a square like pattern.

### 133. MARKING STANDARDS

The bright white or light off-white paint most often found on wind turbines has been shown to be most effective, and if used, no lights are required during the daytime. However, if darker paint is used, wind turbine marking should be supplemented with daytime lighting, as required.

### 134. LIGHTING STANDARDS

a. Flashing red (L864), or white (L-865) lights may be used to light wind turbines. Studies have shown that red lights are most effective, and should be the first consideration for lighting recommendations of wind turbines.

b. Obstruction lights should have unlighted separations or gaps of no more than ½ mile. Lights should flash simultaneously. Should the synchronization of the lighting system fail, a lighting outage report should be made in accordance with paragraph 23 of this advisory circular. Light fixtures should be placed as high as possible on the turbine nacelle, so as to be visible from 360 degrees.

c. Linear Turbine Configuration. Place a light on each turbine positioned at each end of the line or string of turbines. Lights should be no more than ½ statute mile, or 2640 feet from the last lit turbine. In the event the last segment is significantly short, push the lit turbines back towards the starting point to present a well balanced string of lights. High concentrations of lights should be avoided.

d. Cluster Turbine Configuration. Select a starting point among the outer perimeter of the cluster. This turbine should be lit, and a light should be placed on the next turbine so that no more than a ½ statute mile gap exists. Continue this pattern around the perimeter. If the distance across the cluster is greater than 1 mile, and/or the terrain varies by more than 100 feet, place one or more lit turbines at locations throughout the center of the cluster.

e. Grid Turbine Configuration. Select each of the defined corners of the layout to be lit, and then utilize the same concept of the cluster configuration as outlined in paragraph d.

f. Special Considerations. On occasion, one or two turbines may be located apart from the main grouping of turbines. If one or two turbines protrude from the general limits of the turbine farm, these turbines should be lit.

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**APPENDIX 1: Specifications for Obstruction Lighting Equipment Classification**
**APPENDIX**

Type	Description
L-810	Steady-burning Red Obstruction Light
L-856	High Intensity Flashing White Obstruction Light (40 FPM)
L-857	High Intensity Flashing White Obstruction Light (60 FPM)
L-864	Flashing Red Obstruction Light (20-40 FPM)
L-865	Medium Intensity Flashing White Obstruction Light (40-FPM)
L-866	Medium Intensity Flashing White Obstruction Light (60-FPM)
L-864/L-865	Dual: Flashing Red Obstruction Light (20-40 FPM) and Medium Intensity Flashing White Obstruction Light (40 FPM)
L-885	Red Catenary 60 FPM
FPM = Flashes Per Minute	

*TBL 4*

PAINING AND/OR DUAL LIGHTING OF CHIMNEYS, POLES, TOWERS, AND SIMILAR STRUCTURES

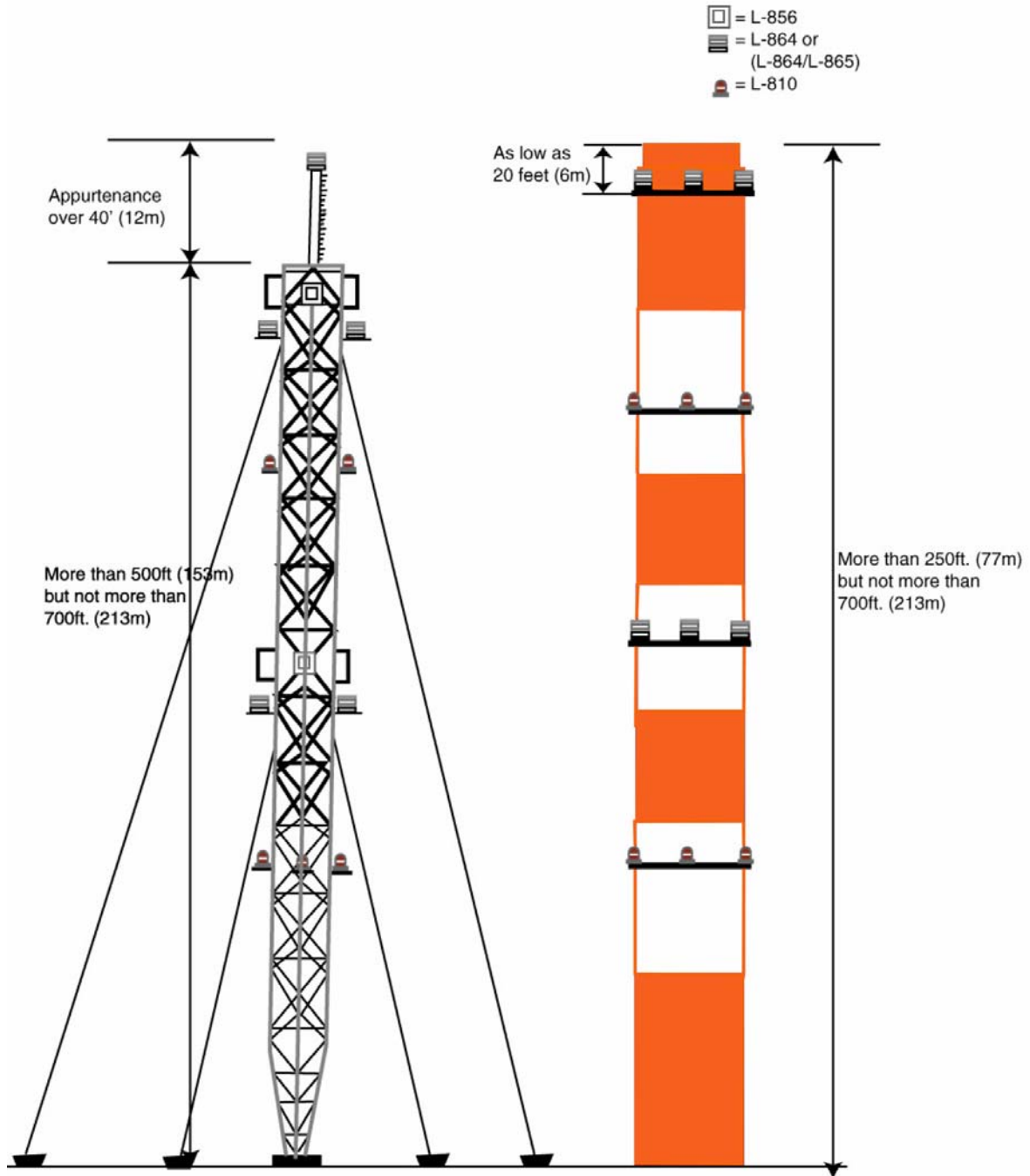


FIG 1

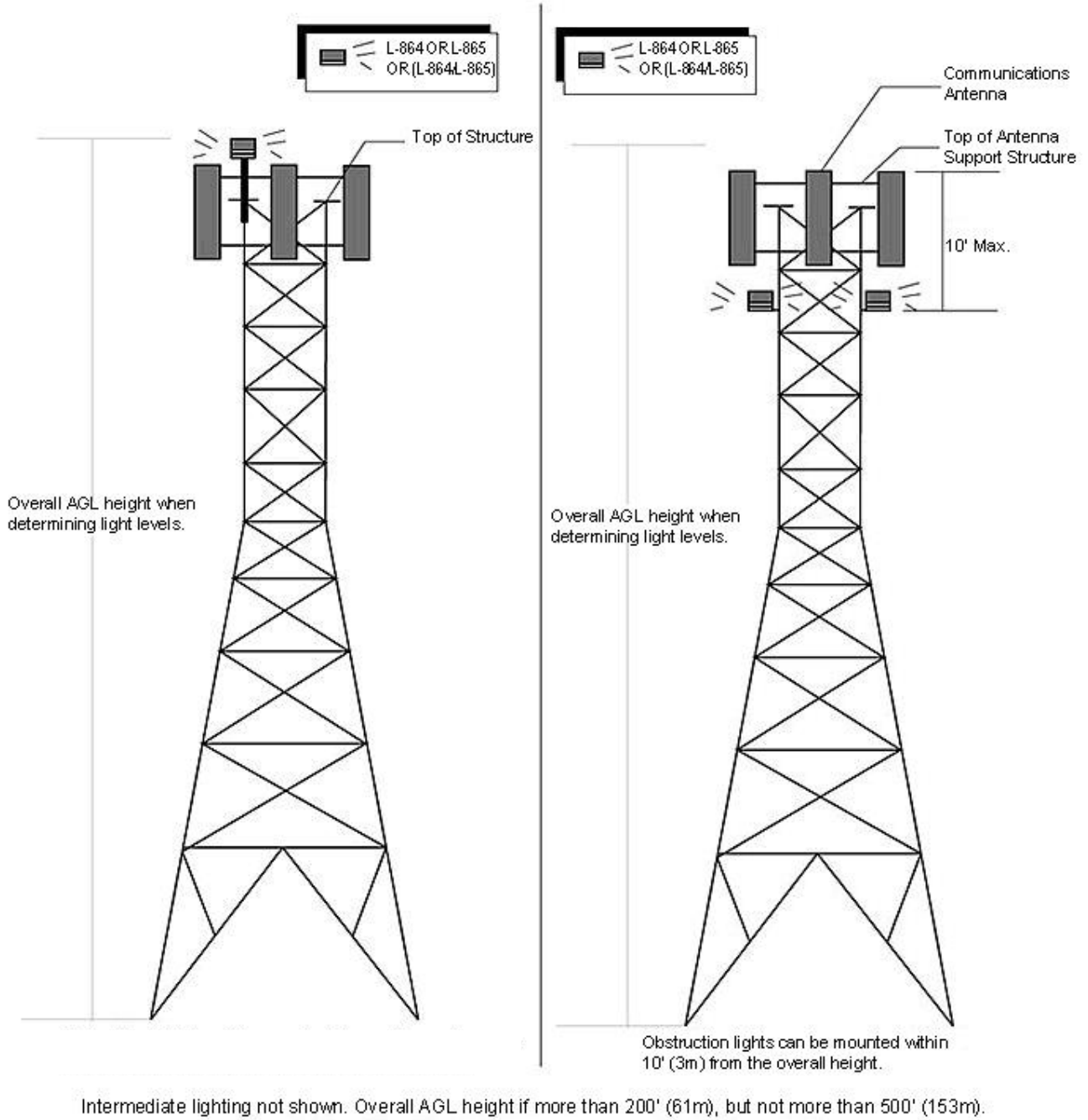


FIG 2

PAINTING AND LIGHTING OF WATER TOWERS, STORAGE TANKS, AND SIMILAR STRUCTURES

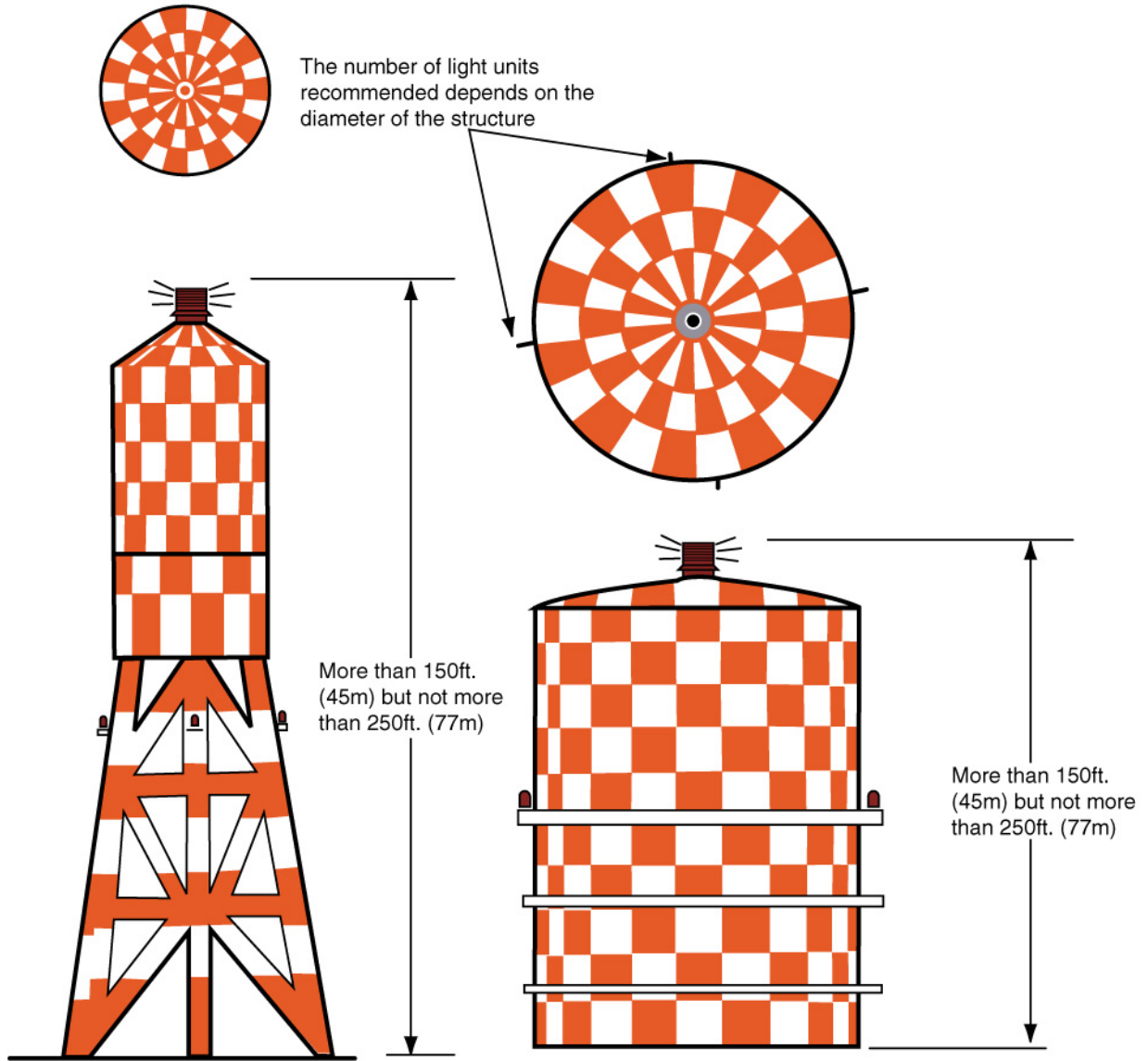


FIG 3

**PAINTING AND LIGHTING OF WATER TOWERS ANDE SIMILAR STRUCTURES**

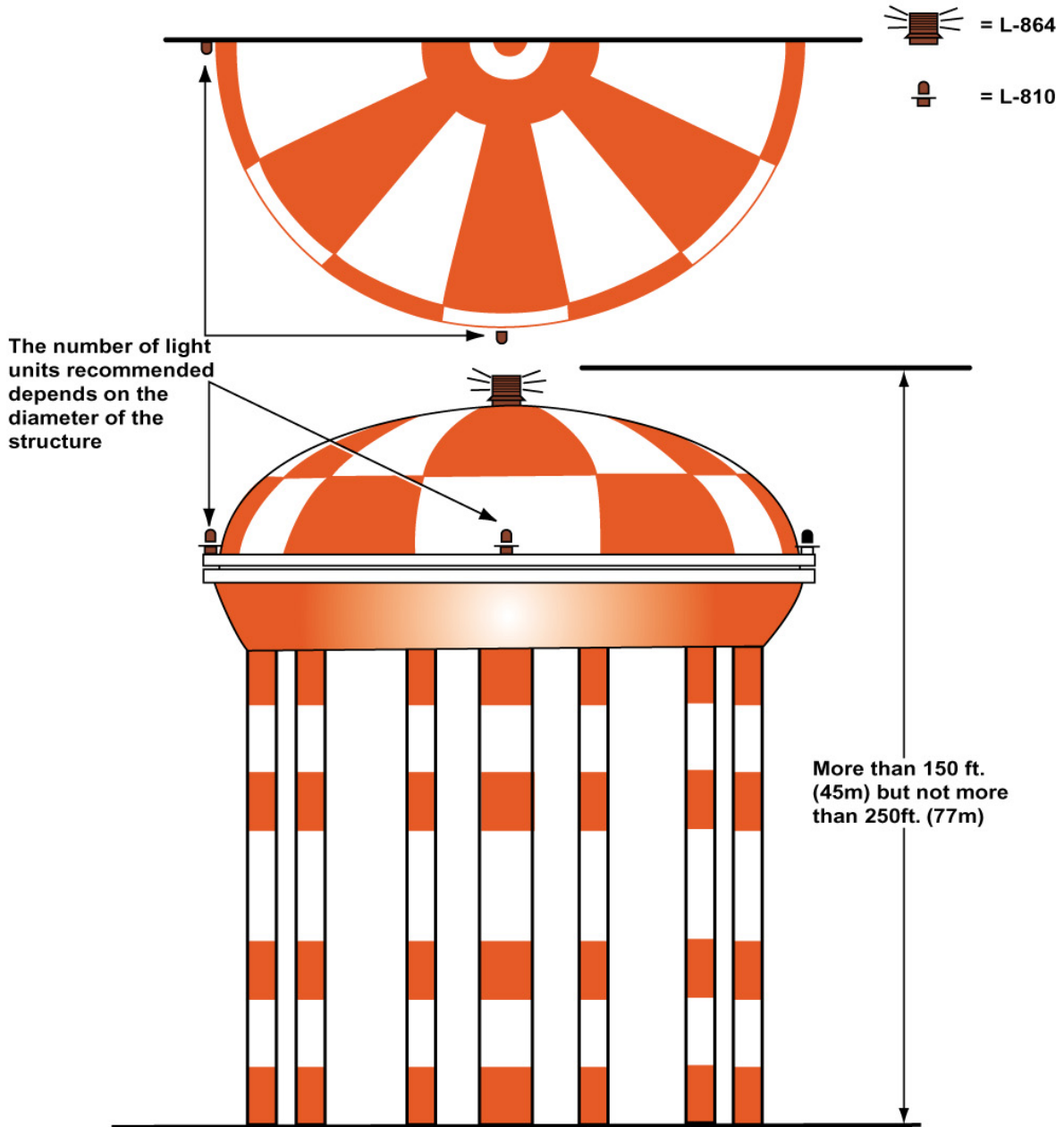


FIG 4

PAINING OF SINGLE PEDESTAL WATER TOWER BY TEARDROP PATTERN

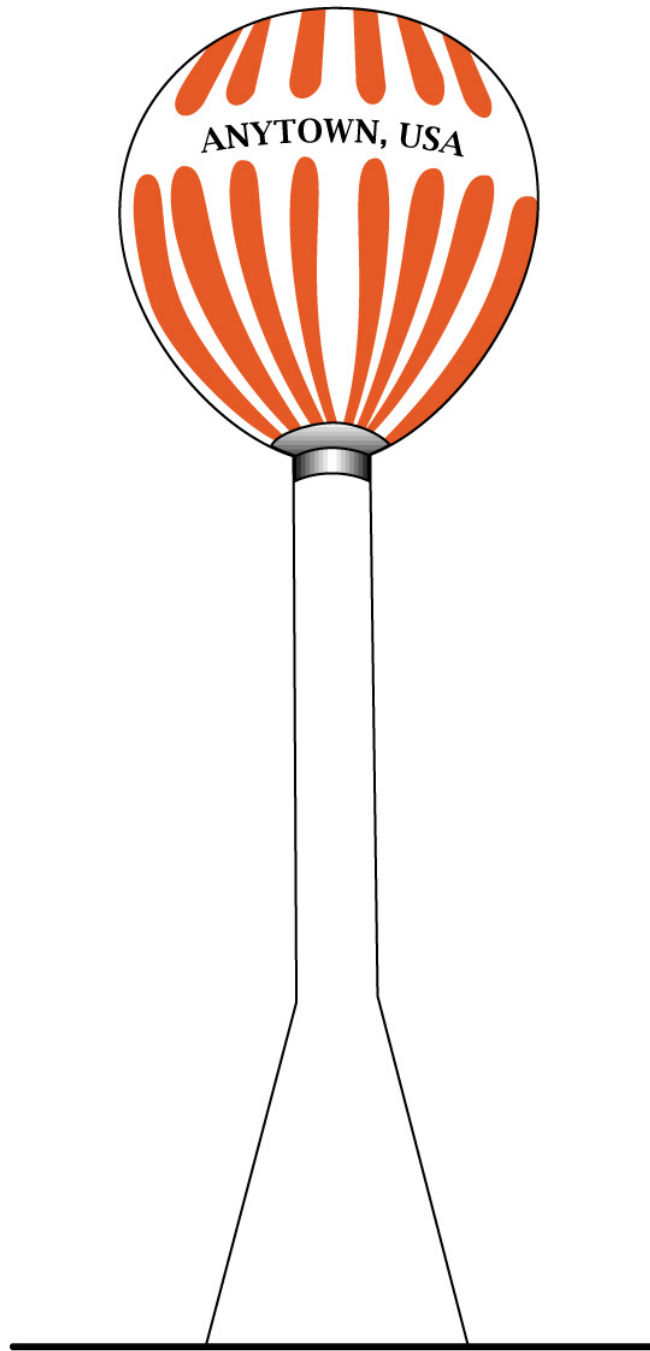
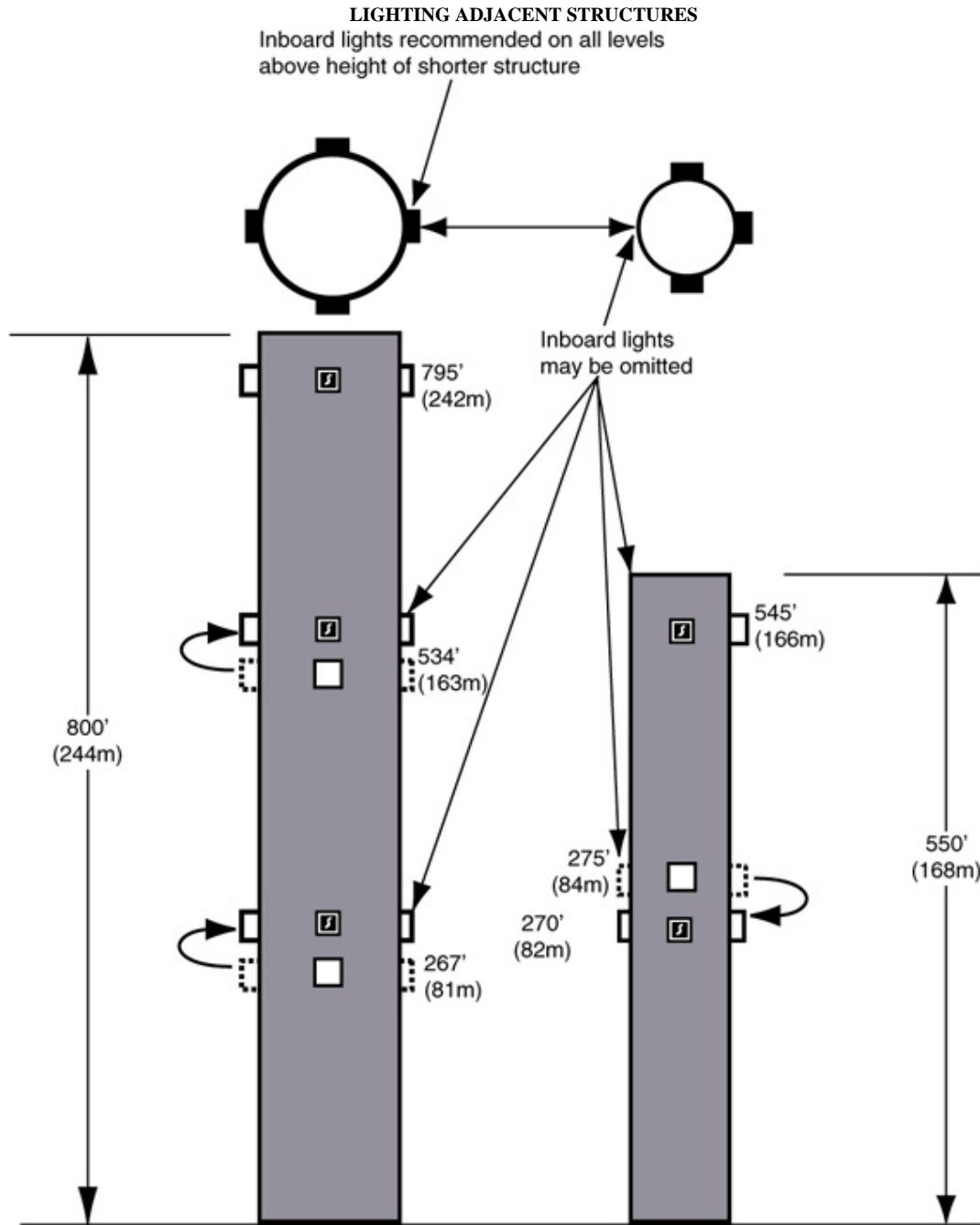


FIG 5





Minor adjustments in vertical placement may be made to place lights on same horizontal plane. Lights on both structures be synchronized

FIG 6

Lighting Adjacent Structure

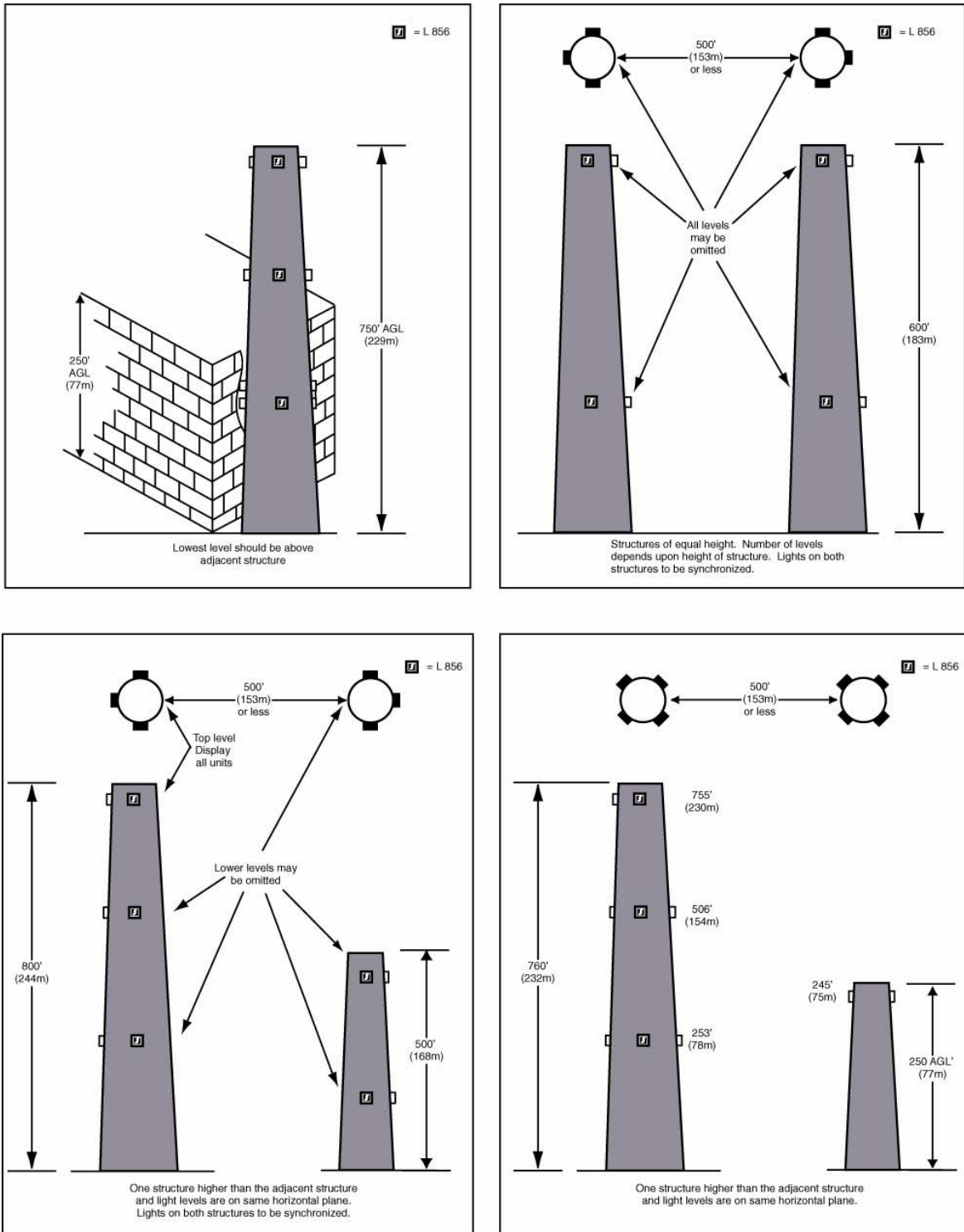


FIG 7

Lighting Adjacent Structure

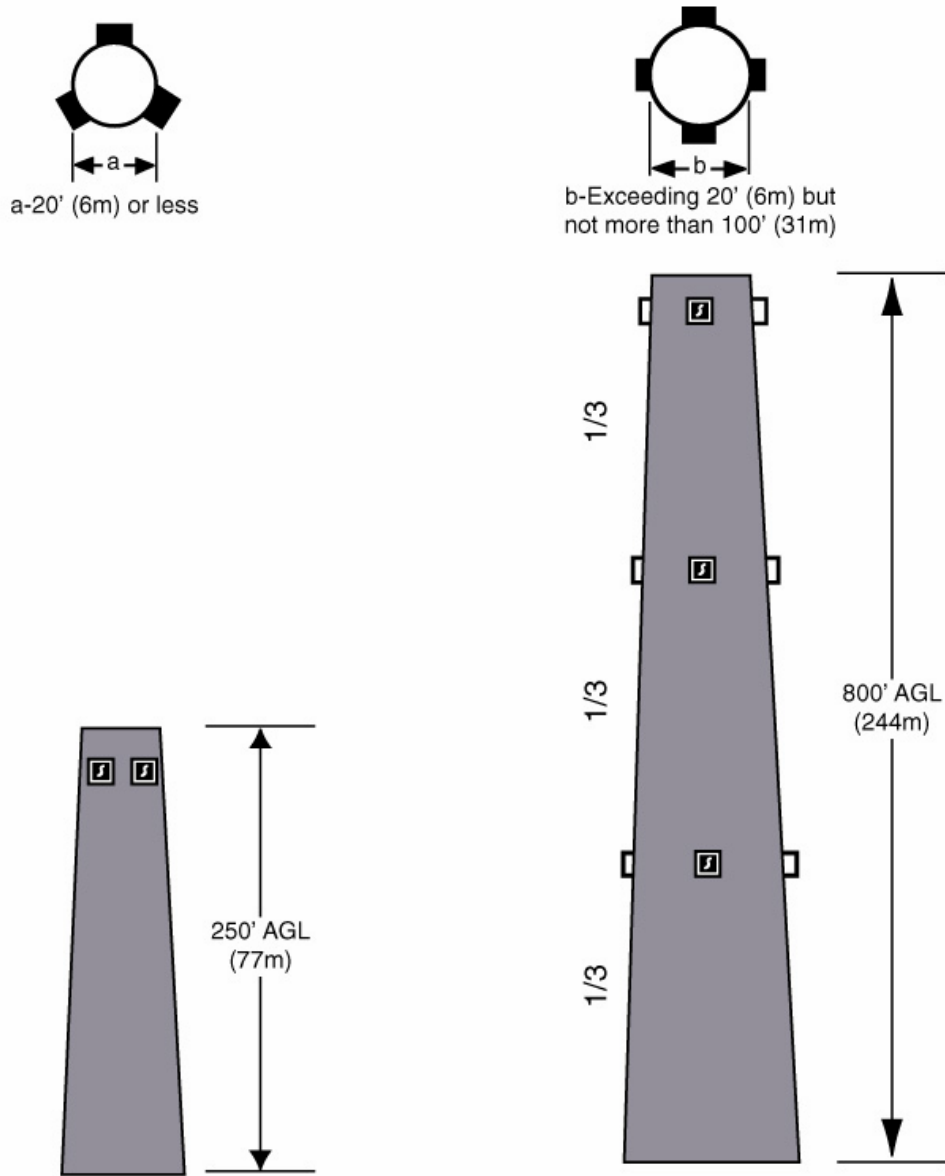


FIG 8

**HYPERBOLIC COOLING TOWER**

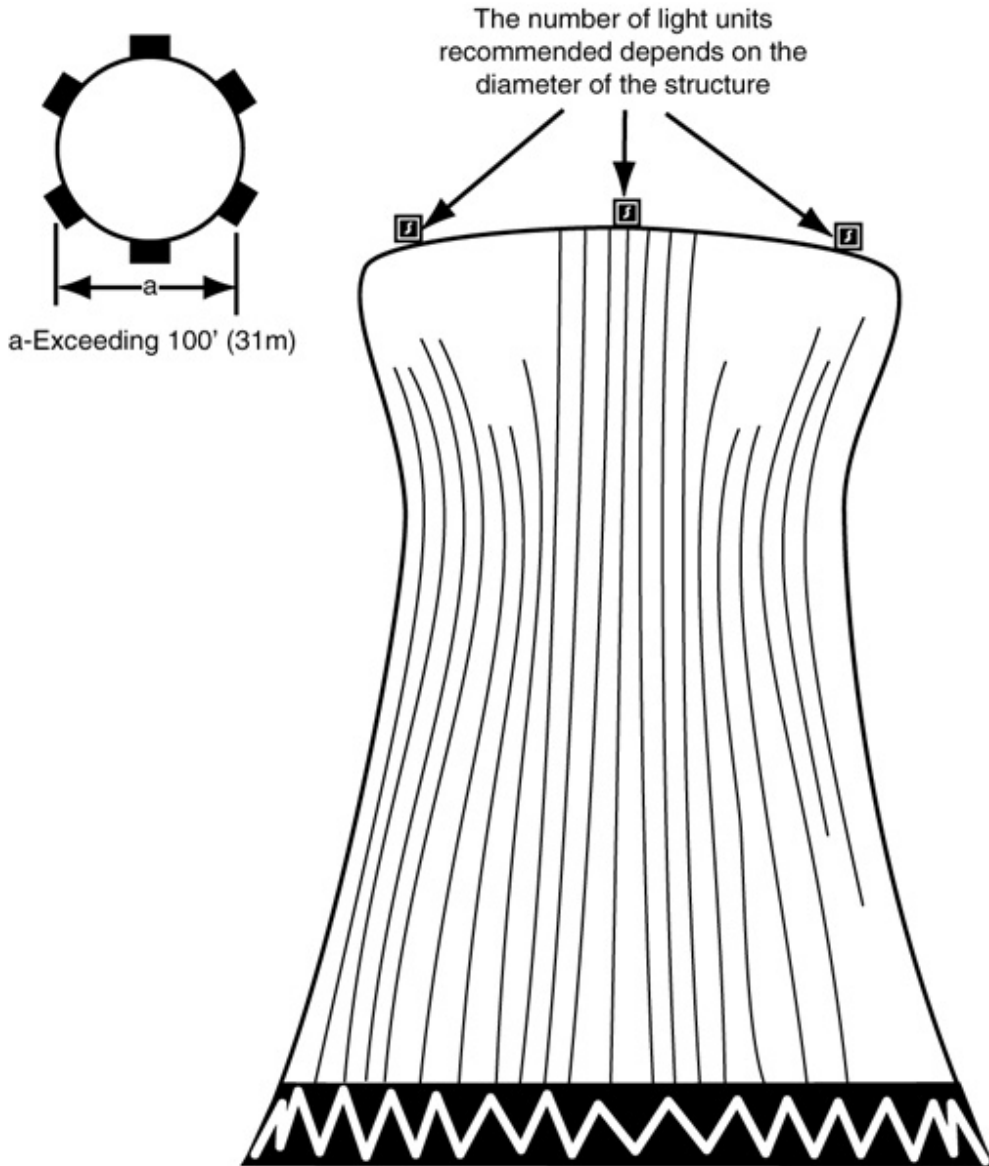


FIG 9

BRIDGE LIGHTING

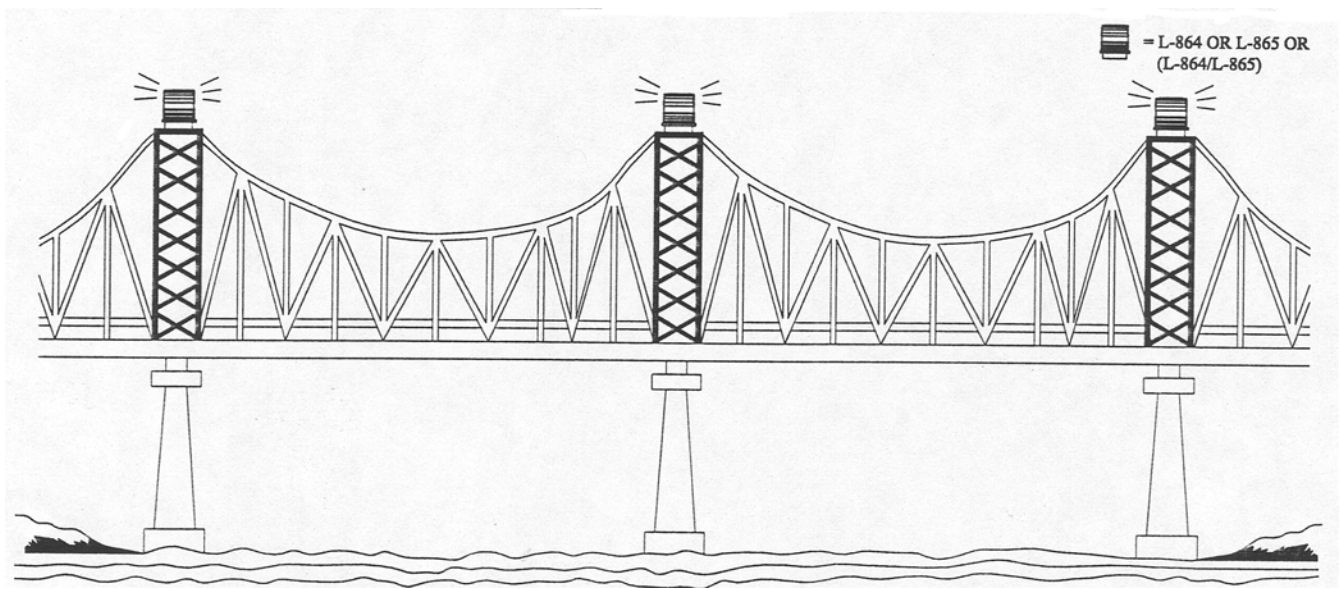
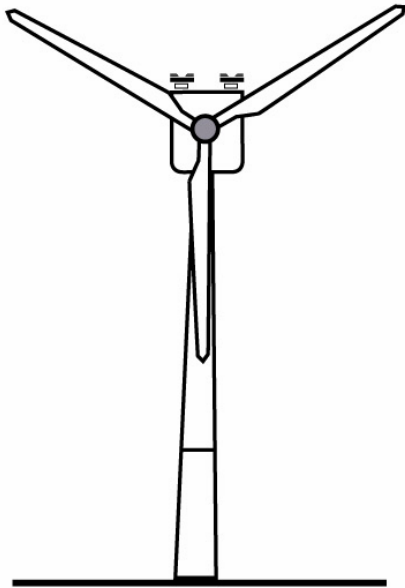


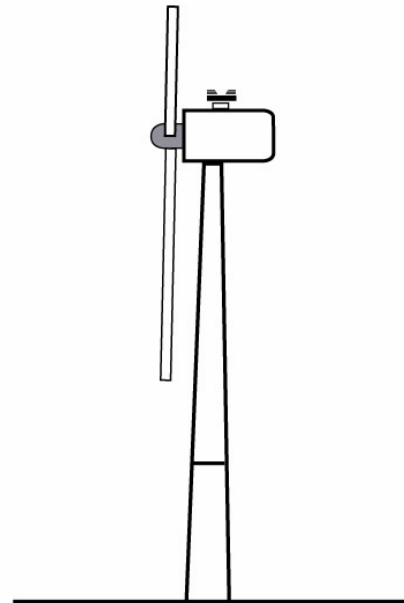
FIG 10

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TYPICAL LIGHTING OF A STAND ALONE WIND TURBINE



Front View



Side View

FIG 11

WIND TURBINE GENERATOR

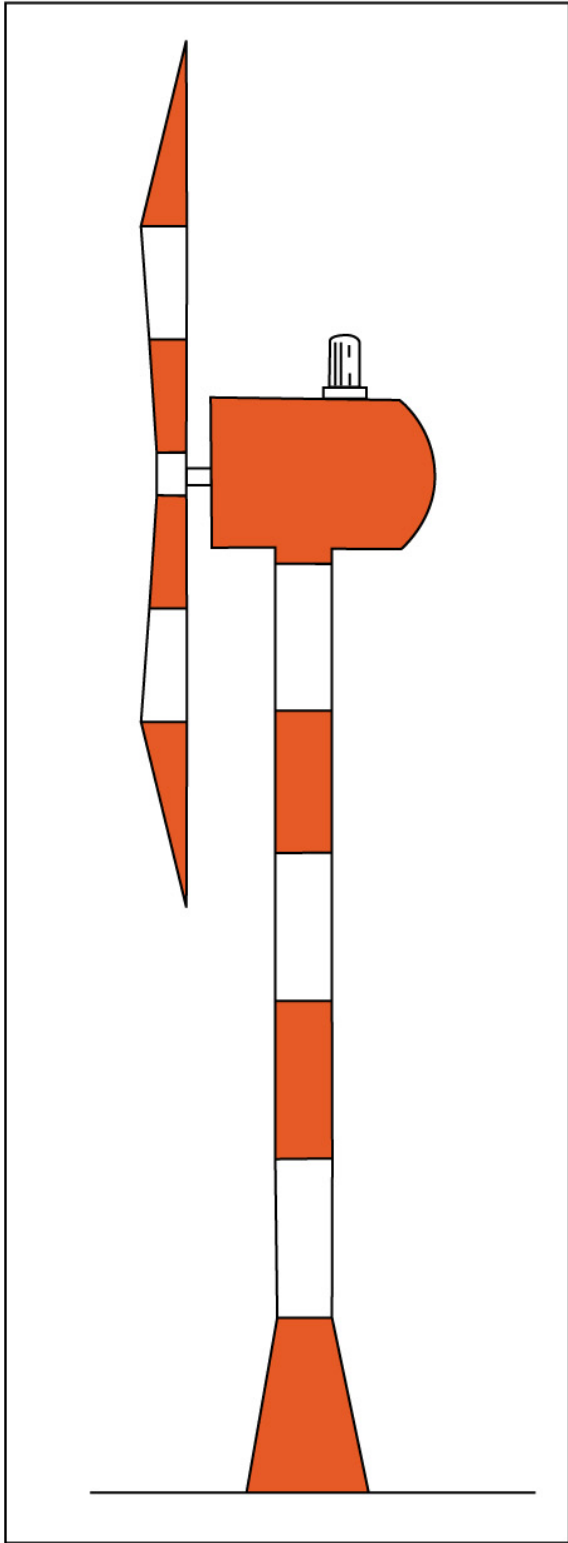
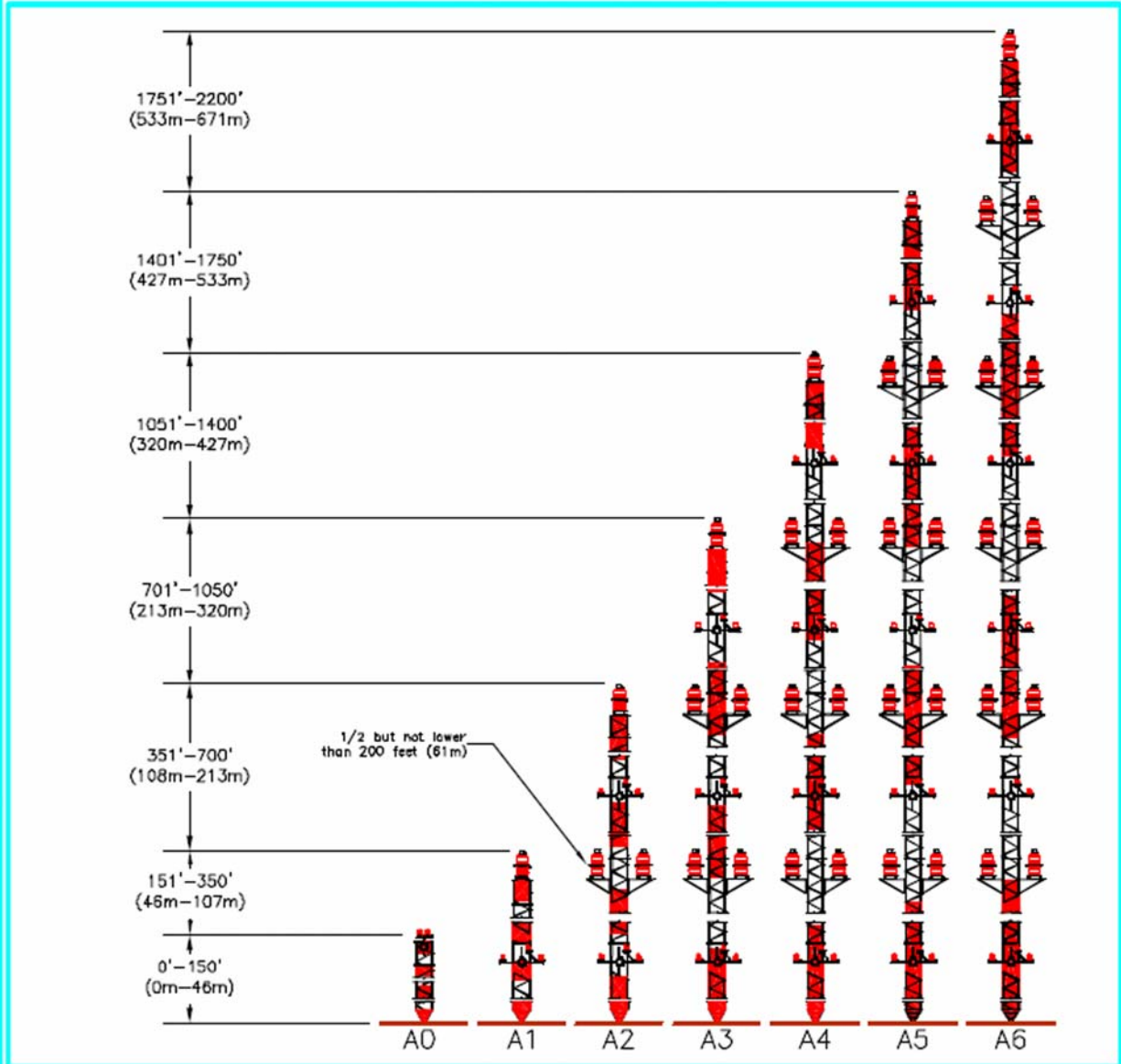


FIG 12

# RED OBSTRUCTION LIGHTING STANDARDS (FAA Style A)

Day Protection = Aviation Orange/White Paint  
Night Protection = 2,000cd Red Beacon and sidelights





-  – L-864 Flashing Beacon
-  – L-810 Obstruction Light

FIG 13



# MEDIUM INTENSITY WHITE OBSTRUCTION LIGHTING STANDARDS (FAA Style D)

Day/Twilight Protection = 20,000cd White Strobe  
Night Protection = 2,000cd White Strobe  
Painting of tower is typically not required.

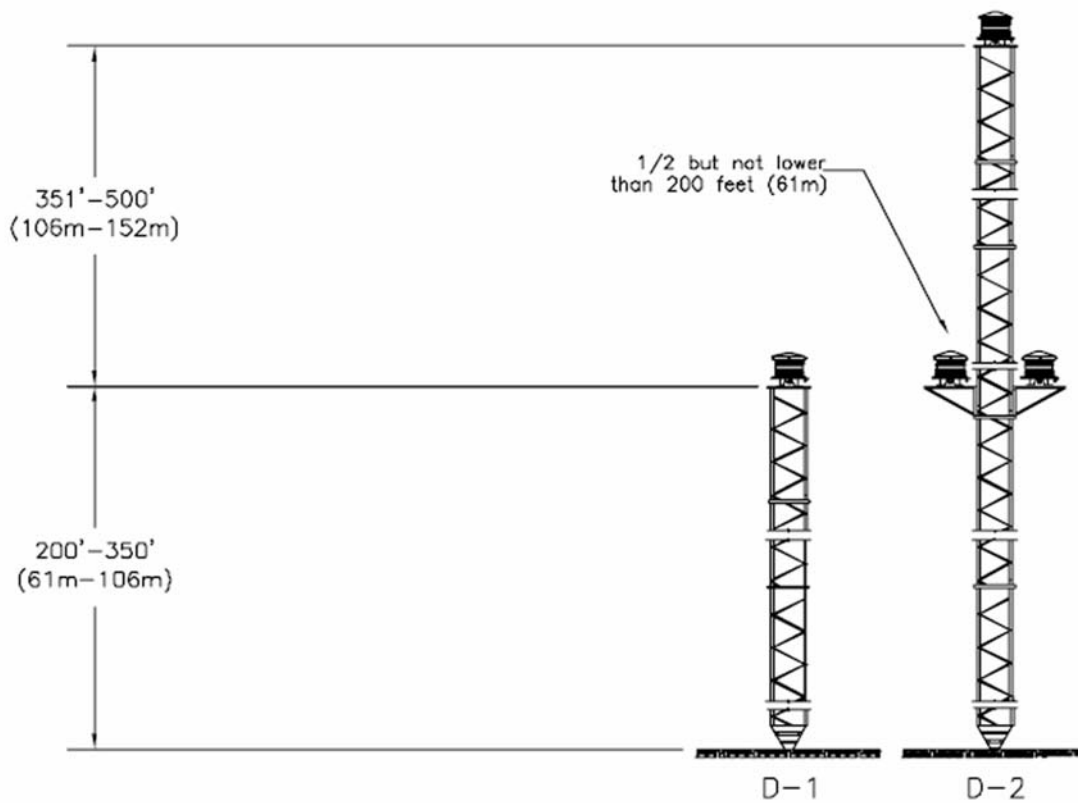


FIG 14

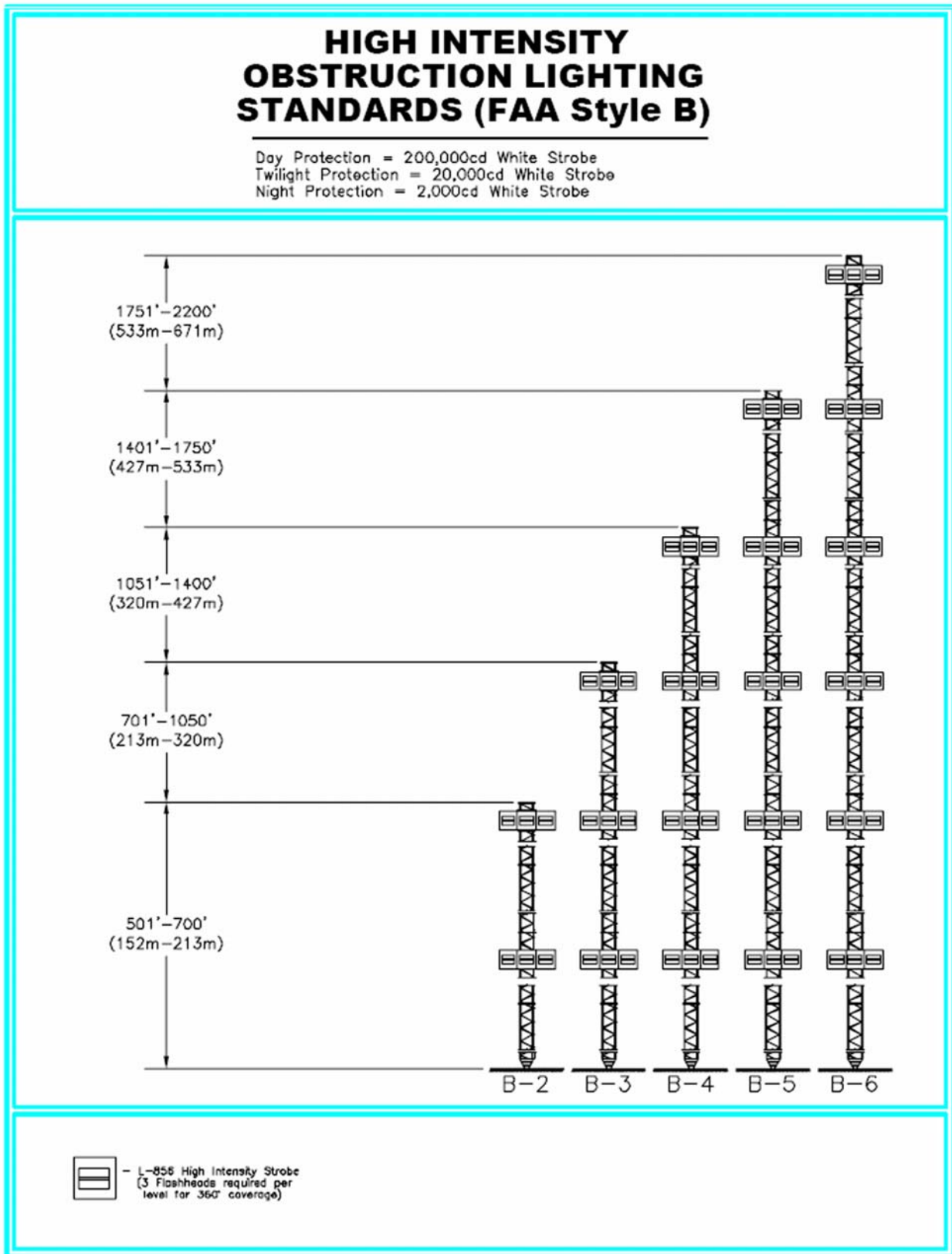


FIG 15

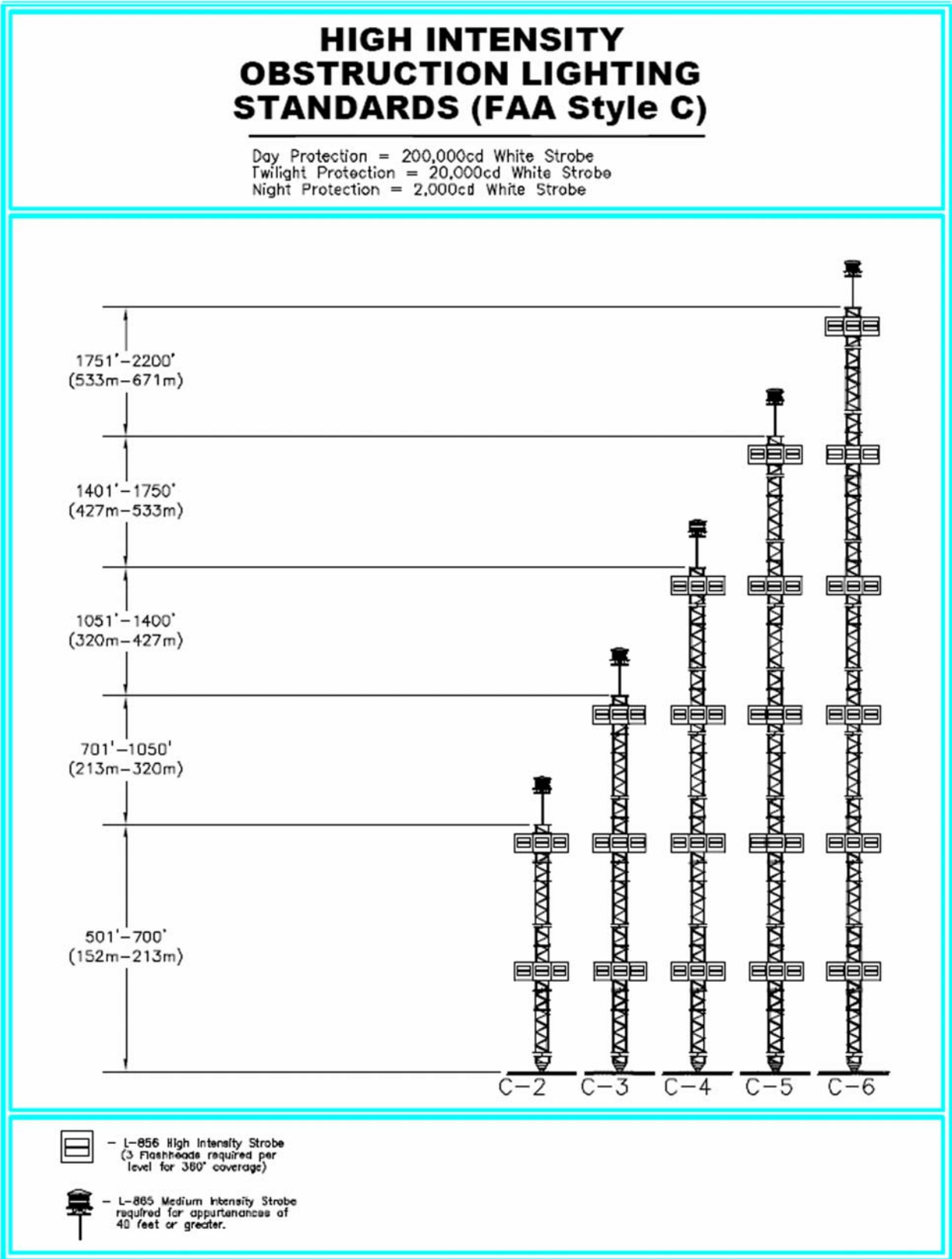
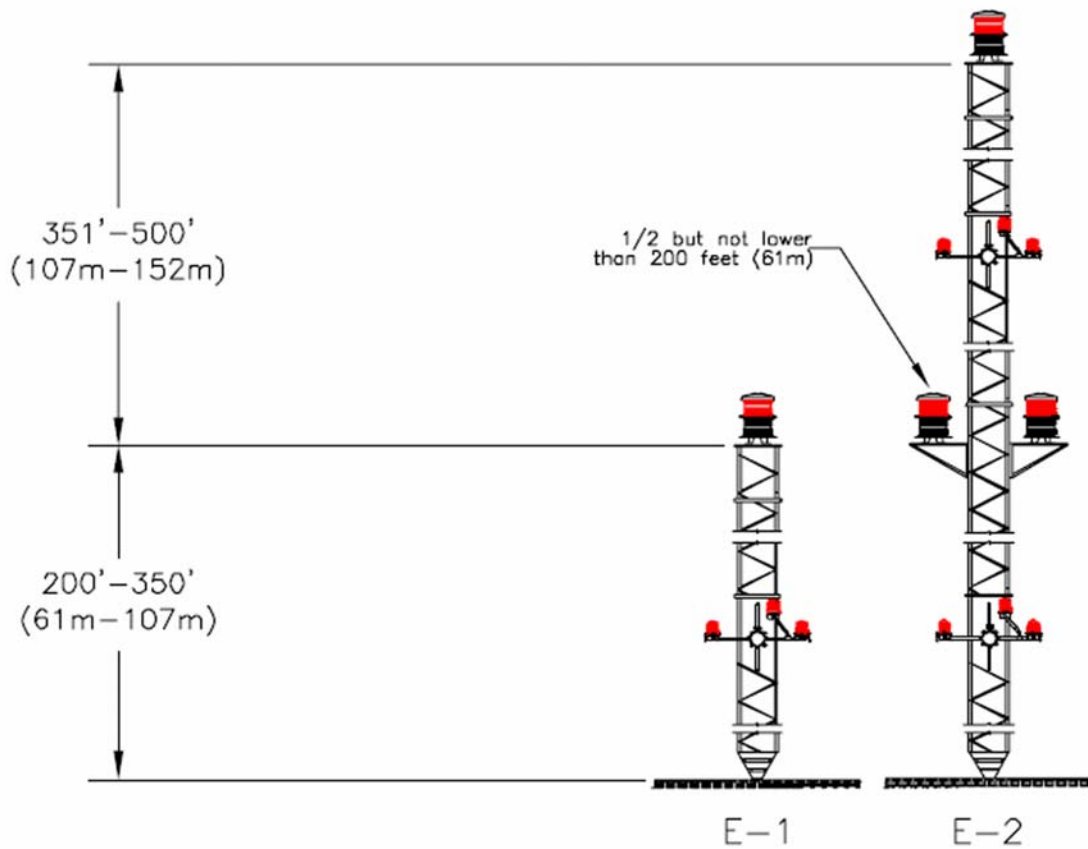


FIG 16

# MEDIUM INTENSITY DUAL OBSTRUCTION LIGHTING STANDARDS (FAA Style E)

Day/Twilight Protection = 20,000cd White Strobe  
Night Protection = 2,000cd Red Strobe and sidelights  
Painting of tower is typically not required.





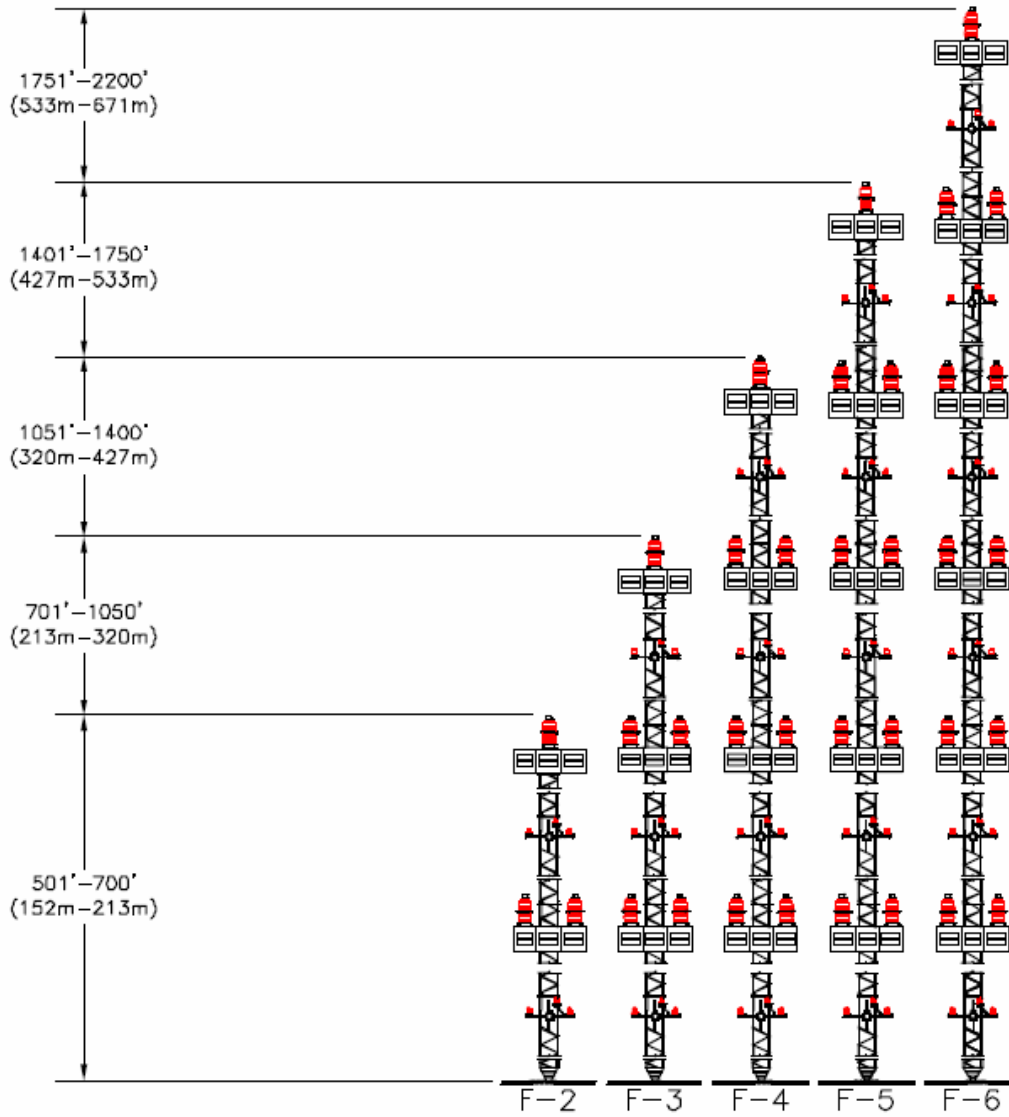
-  - L-864/L-865 Flashing Dual (White/Red) Strobe
-  - L-810 Obstruction Light

FIG 17

# DUAL HIGH INTENSITY OBSTRUCTION LIGHTING STANDARDS (FAA Style F)

Day Protection = 200,000cd White Strobe  
Twilight Protection = 20,000cd White Strobe  
Night Protection = 2,000cd Red Beacon and sidelights






-  - L-854 Flashing Beacon
-  - L-810 Obstruction Light
-  - L-858 High Intensity Strobe (3 Flashheads required per level for 360° coverage)

FIG 18



## APPENDIX 2. Miscellaneous

### 1. RATIONALE FOR OBSTRUCTION LIGHT INTENSITIES.

Sections 91.117, 91.119 and 91.155 of the FAR Part 91, General Operating and Flight Rules, prescribe aircraft speed restrictions, minimum safe altitudes, and basic visual flight rules (VFR) weather minimums for

governing the operation of aircraft, including helicopters, within the United States.

### 2. DISTANCE VERSUS INTENSITIES.

TBL 5 depicts the distance the various intensities can be seen under 1 and 3 statute miles meteorological visibilities:

Distance/Intensity Table

<i>Time Period</i>	<i>Meteorological Visibility Statute Miles</i>	<i>Distance Statute Miles</i>	<i>Intensity Candelas</i>
<b>Night</b>		<b>2.9 (4.7km)</b>	<b>1,500 (+/- 25%)</b>
	<b>3 (4.8km)</b>	<b>3.1 (4.9km)</b>	<b>2,000 (+/- 25%)</b>
		<b>1.4 (2.2km)</b>	<b>32</b>
<b>Day</b>		<b>1.5 (2.4km)</b>	<b>200,000</b>
	<b>1 (1.6km)</b>	<b>1.4 (2.2km)</b>	<b>100,000</b>
		<b>1.0 (1.6km)</b>	<b>20,000 (+/- 25%)</b>
<b>Day</b>		<b>3.0 (4.8km)</b>	<b>200,000</b>
	<b>3 (4.8km)</b>	<b>2.7 (4.3km)</b>	<b>100,000</b>
		<b>1.8 (2.9km)</b>	<b>20,000 (+/- 25%)</b>
<b>Twilight</b>	<b>1 (1.6km)</b>	<b>1.0 (1.6km) to 1.5 (2.4km)</b>	<b>20,000 (+/- 25%)?</b>
<b>Twilight</b>	<b>3 (4.8km)</b>	<b>1.8 (2.9km) to 4.2 (6.7km)</b>	<b>20,000 (+/- 25%)?</b>

*Note-*

1. DISTANCE CALCULATED FOR NORTH SKY ILLUMINANCE.

TBL 5

### 3. CONCLUSION.

Pilots of aircraft travelling at 165 knots (190 mph/306kph) or less should be able to see obstruction lights in sufficient time to avoid the structure by at least 2,000 feet (610m) horizontally under all conditions of operation, provided the pilot is operating in accordance with FAR Part 91. Pilots operating between 165 knots (190 mph/303 km/h) and 250 knots (288 mph/463 kph) should be able to see the obstruction lights unless the weather deteriorates to 3 statute miles (4.8 kilometers) visibility at night, during which time period 2,000 candelas would be required to see the lights at 1.2 statute miles (1.9km). A higher intensity, with 3 statute miles (4.8 kilometers) visibility at night, could generate a residential annoyance factor. In addition, aircraft in these speed ranges can normally be expected to operate under instrument flight rules (IFR) at night when the visibility is 1 statute mile (1.6 kilometers).

### 4. DEFINITIONS.

a. Flight Visibility. The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.

*Reference-*

AIRMAN'S INFORMATION MANUAL  
PILOT/CONTROLLER GLOSSARY.

b. Meteorological Visibility. A term that denotes the greatest distance, expressed in statute miles, that selected objects (visibility markers) or lights of moderate intensity (25 candelas) can be seen and identified under specified conditions of observation.

**5. LIGHTING SYSTEM CONFIGURATION.**

- a. *Configuration A.* Red lighting system.
- b. *Configuration B.* High Intensity White Obstruction Lights (including appurtenance lighting).
- c. *Configuration C.* Dual Lighting System - High Intensity White & Red (including appurtenance lighting).

- d. *Configuration D.* Medium Intensity White Lights (including appurtenance lighting).
- e. *Configuration E.* Dual Lighting Systems - Medium Intensity White & Red (including appurtenance lighting).

*Example-*

*“CONFIGURATION B 3” DENOTES A HIGH INTENSITY LIGHTING SYSTEM WITH THREE LEVELS OF LIGHT.*