



Malvern Water Works

Project No. 25014



ADDENDUM NO. 2 TO THE CONTRACT DOCUMENTS

MALVERN WATER WORKS, MALVERN, AR

25014 MALVERN WASTEWATER IMPROVEMENTS, CONTRACT 4 SULLENBERGER LIFT STATION

This Addendum No. 2 issued by Crist Engineers, Inc. is hereby made a part of the Contract Documents to the same extent as though it were originally included therein. Please read the following items and acknowledge receipt of this addendum on the proposal form when submitting bids.

1. Conditional Approved Equal

Engineer's acceptance of pre-approved or approved equal submissions will not relieve Contractor from his responsibility for any deviation from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and Engineer has given written approval to the specific deviation, nor shall any acceptance by Engineer relieve contractor from responsibility for errors or omissions in pre-approved or approved equal submissions.

a. Section 333913 – Sanitary Sewer Manholes, Frames & Covers

page 5, Section 2.10.D.:

"Coating shall have a dry film thickness of 9 to 16 mils (single layer) for Carboline Bitumastic 300M and 60 mils minimum thickness (single layer) for Vortex Structure Guard.

page 5, Section 2.10.E.:

"Interior coal tar epoxy coating shall be Carboline Bitumastic 300M, Vortex Structure Guard or approved equal"

b. Section 432513 – Close-Couple Submersible Centrifugal Pump:

page 1, Revise Section 1.1.C

“The closed-coupled submersible centrifugal pumps shall be manufactured by Xylem Flygt, Wilo, Pentair, KSB or pre-approved equal. Pumps shall be as specified herein.”

page 3, Revise Section 2.1.B, model:

“KSB KRTD 200-405/754XFG2-K”

Motor Horsepower: “87 HP”

2. **Contract Documents**

a. Document 000110 Table of Contents, Revise to Add Sections:

312301 – Excavation, Backfill and Compaction for Structures (consisting of 9 pages)

312319 – Dewatering and Drainage (consisting of 4 pages)

b. Section 014000, page 8, revise to add:

“1.21 ENTERGY ARKANSAS, LLC

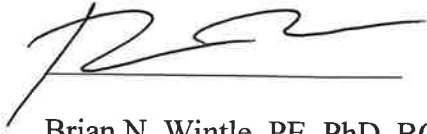
- A. The Contractor may need to coordinate the delivery of the new transformer, drop, et al. for the new service to the Project site and assist Entergy Arkansas, LLC with off-loading of transformer or other equipment. The Contractor may be required to construct the conduits and transformer pad in such a manner as it relates to the construction schedule to accommodate delivery.
1. The Owner will be responsible for the new account and cost associated with purchasing and delivering the new transformer from Entergy Arkansas, LLC.
 2. The Owner has coordinated with Entergy Arkansas, LLC for the relocation of utility poles with associated with a utility easement at the Project site.
- B. It is the responsibility of the Contractor to coordinate activities with the those identified on the plans or others identified by Entergy Arkansas, LLC. The current estimated lead time on the transformer delivery is approximately 30 weeks with installation to occur thereafter.

- C. All costs related to coordinating with Entergy Arkansas, LLC, insurance, construction methods required herein, or otherwise for a complete installation of any electrical service provided to the site shall be considered subsidiary to Project Electrical, Complete lump sum pay item. The Contractor shall not receive any additional compensation to comply with any requirements or coordination of Entergy.
 - D. Protect and avoid all overhead lines or electrical towers or poles whenever conducting work within Entergy's easement. The Contractor shall adhere to all national electric code (NEC) and/ or OSHA requirements when conducting work near high voltage transmission lines.
 - E. Coordinate with and properly support all distribution poles where required."
- c. Section 099100.10, page 1, Revise Section 1.01.A:
- "Furnish and install all labor, materials, equipment and incidentals required to supply and install the concrete coating system on the Headworks (10/20) Lift Station Wet-Well as indicated on the Drawings."
- d. Section 269999, page 33, Revise Section 2.20.E.1:
- "Current Rating: ~~8000~~ 800 A"
- e. Add Section 312301 – Excavation, Backfill and Compaction for Structures Addendum No. 2.
- f. Add 312319 – Dewatering and Drainage Addendum No. 2.
- 3. Plans**
- a. Clarification: Sheet E100, site general notes, No. 4. The Owner has coordinated with the utility, as described in Section 014000 (revised herein). Work outside of what has been identified in Section 014000 is the responsibility of the Contractor.

End of Addendum No. 2

All other provisions of the Plans and Contract Documents shall remain in full force and effect.

Issued by CRIST ENGINEERS, INC.



Brian N. Wintle, PE, PhD, BCEE



Please EMAIL this form to Crist Engineers, Inc. at:

abrown@cristengineers.com; mallen@cristengineers.com; bwintle@cristengineers.com

Please call Brian N. Wintle at 501-664-1552 if you have any questions.

The Bidder shall acknowledge receipt of Addendum No. 2 by return EMAIL.

Bidder shall acknowledge Addendum No. 2 on Section 004100 Bid Form (C-410).

Acknowledged by: _____

Please Print

Please Sign

Organization of Company Name:

SECTION 312301

EXCAVATION, BACKFILL, AND COMPACTION FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Excavating, backfilling, and compacting for structures.
- B. Preparation of subgrade for building slabs and foundation.
- C. Capillary water barrier for support of building slabs is included as part of this work.
- D. Undercut areas of subgrade that are spongy and yielding.
- E. Select Backfill under Structures

1.2 REFERENCES AND RELATED SECTIONS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 312300 – Trench and Excavation Safety System.
- C. Section 312319 – Dewatering and Drainage.
- D. Arkansas Department of Transportation (ARDOT) - Standard Specifications for Highway Construction, latest edition.
- E. ASTM C33 – Standard Specification for Concrete Aggregates.
- F. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor).
- G. ASTM D1557 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (Modified Proctor).
- H. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- I. ASTM D1241 – Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses.
- J. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.3 DEFINITIONS

- A. Excavation: Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Unauthorized Excavation: Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations of dimensions without specific direction of the Engineer.

1. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense.
- C. Additional Excavation: When excavation has reached required subgrade elevations, notify Engineer, who will make an inspection of conditions. If Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by Engineer.
- D. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular subbase, capillary water barrier, or topsoil materials.
- E. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.
- F. Rock Excavation: Rock excavation is defined as material that cannot be excavated with conventional heavy duty excavating equipment such as bulldozer or track excavator equipment with rock teeth, or equipment of similar power and capability.

1.4 QUALITY ASSURANCE

- A. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
- B. Contractor will employ and pay for a qualified independent geotechnical testing and inspection laboratory approved by Engineer and Owner to perform soil testing and inspection service during earthwork operations.
- C. When initial testing indicates unacceptable work or materials, retesting will be paid for by the Contractor until acceptable results are achieved.
- D. All operations shall conform to applicable local and state codes and regulations including OSHA requirements.

1.5 PROJECT CONDITIONS

- A. Erect sheeting, shoring and bracing as necessary for protection of persons, improvements and excavations.
- B. Coordinate backfill operations with installation of utilities.

1.6 SUBMITTALS

- A. Provide per Section 013300 – Submittal Procedures.
- B. Submit product data for the following:
 1. Vapor barrier.
- C. Submit samples of the following, if so requested by the Engineer or Owner:
 1. 20-lb. samples, sealed in air-tight containers of each proposed fill material.
- D. Submit test reports required under field quality control, in addition to the following:
 1. Laboratory analysis of each soil and base course material proposed for fill and backfill from on-site and borrow sources.

2. One optimum moisture-maximum density curve for each soil material.
3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

PART 2 - PRODUCTS

2.1 GRANULAR FILL

- A. Free-draining, well-graded crushed rock or gravel as identified below.
- B. Provide 8 inches of granular fill for structural backfill shall be free of asbestos, organic materials, clay balls, and shall be AASHTO #57, 6, 67, 68, 7 (angular interlocking, screened coarse aggregate) or engineer approved locally provided GM, GP, SW, SP that contains no more than 12% fines material.
- C. 6 oz geotextile separator fabric in accordance with Section 313219 shall be used when separating between all native or subbase materials except for exposed rock or shale.

2.2 TOP SOIL

- A. Contractor shall obtain top soil from the required excavation if suitable. Import if necessary.
- B. Top soil material shall be free of large roots or branches, stumps, brush, rubbish, or other objectionable matter.
- C. Top soil shall refer to soils possessing the characteristics that produce growth of grasses or other vegetation.

2.3 SELECT FILL

- A. Select Fill shall be an approved, low-plasticity sandy clay (CL), clayey sand (SC), gravelly clay (CL), or clayey gravel (GC) with a liquid limit (LL) less than 40 and a plasticity index (PI) less than 18, with a maximum rock size of 2 inches or an alternate accepted by the Engineer.

2.4 SELECT GRANULAR FILL

- A. Select Granular Fill should consist of the following approved materials:
 1. Crushed stone aggregate base (ARDOT Standard Specifications Section 303).
 2. Concrete Sand (ASTM C33 Fine Aggregate).
 3. Gravel classifying as GW, GP, GM, GP-GM, or GM-GC as per ASTM D2487.
 4. Sand classifying as SW, SP, SM, SP-SM or SM-SC as per ATM D2487.
 5. Approved crushed aggregate fines.
 6. Alternates approved by the Engineer.

2.5 FLOWABLE FILL

- A. In accordance with ARDOT Standards.

2.6 VAPOR BARRIER

- A. Vapor barrier shall be 10 mil thickness polyethylene sheet.

2.7 WATER FOR COMPACTION

- A. Water used in compaction shall be clean, potable water and shall have a pH of 7.0 to 9.0. Water shall be free of acid, alkali, or organic materials.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine project site and investigate existing subsurface conditions to determine nature, kind and character of materials and conditions to be encountered, including rock.
- B. Prior to commencing excavation operations, disconnect and cap or protect existing utility services, if any, in accordance with the requirements of the owning companies and applicable ordinances and regulations. Investigate locations of underground electrical duct banks.
- C. Provide for surface drainage.
- D. Keep excavations free of water during entire progress of the work.
- E. Prior to backfilling grade beams and below grade walls, verify that beams, walls and footings have properly cured, as required.
- F. Verify that forms, trash, debris and applicable temporary shoring have been removed.
- G. Verify that walls are supported at top and bottom before backfilling.
- H. Protection of the site during the period of grading shall be the responsibility of the Contractor. Protect the work site from flooding, ponding, or inundation during site clearing, excavation, and grading. Make temporary provisions during rain to adequately direct surface drainage away from and off the work site. Dispose of the water in a manner to prevent damage to adjacent property and in accordance with regulatory agency requirements.
- I. Use plastic sheeting to prevent unprotected slopes from becoming saturated. Install check-dams, desilting basins, riprap, sand bags, or other devices or methods necessary to control erosion.
- J. Following periods of rainfall, the Owner, Engineer, or his authorized agent will visually assess rain related damage. Rain related damage will be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions identified by the Owner, Engineer, and/or his authorized agent.
- K. Where soil has been adversely affected by rain related damage, it shall be over-excavated and replaced with compacted fill or other remedial grading as directed by the Engineer.

3.2 EXCAVATION AND SUBGRADE PREPARATION

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete forms, installation of services, and other construction and for inspection.
- B. Do not disturb bottom of excavation. Excavate by hand to final grade just before

concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

- C. A Geotechnical Engineer shall be retained by the Contractor, at Contractor's own expense, to observe proof rolling and suitability of subgrade soils to meet the recommendations of the Geotechnical Investigation.
- D. Excavate beneath structures to lines, grades, and elevations as shown. Over-excavation shall be restored by the Contractor at his own expense. Use complete granular fill or flowable fill material for over-excavated areas.
- E. Proof roll all existing soil areas under pavements, buildings, and other structural site improvements with a 20,000-pound pneumatic tired roller or loaded dump truck. Areas which can be successfully proof rolled without excessive rutting or pumping are acceptable. Where proof rolling cannot be successfully accomplished, scarify and compact to stable condition. If stable condition cannot be achieved, notify the Engineer and remove unsuitable soils replacing with select fill or flowable fill.
- F. Remove weak or highly organic soils noted by proof rolling or probing. Replace with compacted select fill or flowable fill material.
- G. Do not extend structure fill beyond structure lines or as shown. In undercut areas, extend undercut and backfill a minimum of 5 feet from edge of structure.
- H. Blasting is not allowed at the treatment plant site. Do not bring explosives onto the plant site or use in work.
- I. Stability of Excavations:
 - 1. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
 - 2. Shoring and Bracing: Establish requirements for trench shoring and bracing to conform with OSHA, local codes and authorities having jurisdiction. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.3 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area. No fill shall be placed in water or upon saturated soils.
- B. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps well points, sumps suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
- C. Sediment-laden water which need to be dewatered, should be pumped through a geotextile material before the water is discharged. The filter bag should be disposed of by the contractor. The dewatering operation should be inspected several times

daily to ensure that the pumping procedure is adequately controlling the excess water and to ensure the filter bag is not clogged. If the filter bag becomes clogged, replace with a new one.

- D. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
- E. See Section 312319 – Dewatering and Drainage.

3.4 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials satisfactory for backfill and fill where directed. Place, grade, and shape stockpiles for proper drainage. Unsuitable undercut shall be stockpiled for later use or disposed of as directed by the Owner or Engineer.
- B. Locate and retain soil material away from edge of excavations. Do not store within drip line of trees.
- C. Dispose of excess excavated soil material and materials not satisfactory for use as backfill or fill.

3.5 BACKFILL

- A. Schedule backfilling to expedite construction progress.
- B. Under building slabs, provide granular fill over an acceptable subbase material and provide a capillary water barrier system immediately under slabs.
- C. Backfill in manner to prevent excessive pressure against previously completed work and to prevent damage or displacement to utility systems.
- D. Place backfill materials for building foundation walls as follows:
 - 1. Exterior Face of Grade Beams: Place backfill in layers of approximately 8 inches loose lifts and compact to 98 percent of Standard Proctor Density (ASTM D698) at a moisture of 2% below to 3% above optimum.
 - 2. Place backfill at walls as soon as forms are removed. Keep wall excavations dry at all times. If rain occurs before backfill is placed, remove water from excavations immediately.
- E. Backfill structure walls by tamping to uniform density to prevent settling. Do not over compact.
 - 1. Where top of below grade structure backfill is not covered with paving or other impervious barrier, place 8-inch thick lifts compacted to 95-percent of Standard Proctor Density (ASTM D698) at a moisture of 2% below to 3% above optimum.
 - a. Allow for four (4) inches of topsoil placement.
- F. Backfill excavations as promptly as work permits, but not until completion of the following:
 - 1. Acceptance of construction below finish grade including, where applicable,

- damp-proofing, waterproofing, and perimeter insulation.
2. Inspection, testing approval, and recording locations of underground utilities have been performed and recorded.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials.
5. Removal of trash and debris from excavation.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3.6 PLACEMENT AND COMPACTION

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.
- B. Proof roll all existing soil areas under pavements, buildings and other structural site improvements.
- C. Place backfill and fill materials in layers not more than eight (8) inches in loose depth for material compacted by heavy compaction equipment, and not more than four (4) inches in loose depth for material compacted by powered, hand-operated tampers.
- D. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content.
- E. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification.
- F. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- G. Place fill materials evenly adjacent to structures, piping, or conduit to required elevations. Prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift.
- H. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.
 1. Under pavements, and exterior slabs, compact the upper portion of the natural subgrade soils and fill material to not less than 95% of maximum Standard Proctor dry density (ASTM D698). Compact select fill layer to not less than 95% of maximum Modified Proctor dry density (ASTM D1557).
 2. Under structures and building areas, place granular fill material in maximum 8-inch loose lifts, moisture conditioned to 0% to 4% of optimum moisture content, and compacted to a minimum of 95% Modified Proctor dry density (ASTM D1557).
- I. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

3.7 GRADING

- A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.
- B. Grading Outside Building Lines: Grade areas adjacent to buildings and structures to drain away from structures and to prevent ponding.
- C. Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grade within a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.8 BUILDING SLAB BASE

- A. Building slab base, where shown on Drawings, consists of placement of granular or select fill drainage course and vapor barrier in layers of indicated thickness, over compacted subgrade surface to support concrete building slabs.
- B. Place granular drainage course material on prepared subgrade in two layers of uniform thickness, conforming to indicated cross-section and thickness. Compaction shall be by powered or hand tampers to 100-percent of maximum density. Install vapor barrier on top of the drainage course layer. Lap edges of vapor barrier a minimum of six (6) inches. Protect vapor barrier from punctures and displacement prior to and during concrete placement.

3.9 FIELD QUALITY CONTROL

- A. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
- B. If in the opinion of Engineer, based on testing service reports and inspection, subgrade or fills that have been placed are below specified density, additional compaction and testing shall be performed at the Contractor's expense until specified density is obtained.

3.10 MAINTENANCE

- A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances. After finish grading, make surface free of cleared vegetation, rubbish, and other construction wastes. Dispose of all exposed roots and excavated or surface rocks. Do not dispose of rocks on the work site by burying.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- E. Borrow Areas: Where material has been removed from any area of the Site for use as

borrow, the area shall be left clean of all trash, debris, tree stumps, brush and rocks larger than 6 inches in the largest direction. The Borrow Site shall be graded to slopes conforming to the adjacent terrain, and no areas left which will permit water to stand following rainfall events. The entire disturbed surface area of borrow areas shall be finished with top soil, seed and fertilizer as provided in these Specifications.

END OF SECTION

SECTION 312319

DEWATERING AND DRAINAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Obtain and pay for all permits required for temporary dewatering and drainage. Display and maintain original permits in a prominent location at the site prior to construction of the drainage system.
- B. Furnish the services of a licensed professional engineer, registered in the state in which the project is located, to prepare dewatering and drainage system designs and submittals.
- C. Furnish, install, operate, monitor, maintain and remove temporary dewatering and drainage systems as necessary to lower and maintain groundwater levels below subgrades of excavation to permit construction in-the-dry. Prevent surface water runoff from entering or accumulating in excavation.
- D. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with local and State requirements, permits, and any special provisions of Sections 014000 and 015713.
- E. Repair damage caused by dewatering and drainage system operations.
- F. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

1.2 RELATED WORK

- A. Section 013300 – Submittal Procedures
- B. Section 011400 – Work Restrictions
- C. Section 014000 – Special Project Procedures
- D. Section 015713 – Temporary Erosion and Sediment Control
- E. Section 311000 – Site Clearing and Grubbing
- F. Section 312000 – Grading and Earthwork
- G. Section 312300 – Trench and Excavation Safety System
- H. Section 312301 – Excavation, Backfill and Compaction for Structures

1.3 SUBMITTALS

- A. Submit in accordance with Section 013300 all temporary dewatering and drainage system designs. Dewatering and drainage system designs shall be prepared by a licensed professional engineer, registered in the state in which the Work is located, having a minimum of five years of professional experience in the design and construction of dewatering and drainage systems. Submittal will be for information purposes only. Contractor shall retain responsibility for adequacy and safety of construction means, methods and techniques.
- B. In accordance with Section 013300, submit copies of all required permits prior to installing and operating dewatering and drainage systems.

1.4 DEFINITIONS

- A. Where the phrase "in-the-dry" is used in these specifications, it shall be defined as in situ

soil moisture content of no more than two (2) percentage points above the optimum moisture content for that soil.

1.5 DESIGN AND PERFORMANCE RESPONSIBILITY

- A. The Contractor is responsible for the design and execution of methods for controlling surface water and groundwater.
- B. The Contractor is responsible for repairing damage to properties, buildings or structures, sewers and other utility installations, pavements, and work that may result from dewatering or surface water control operations.
- C. Design review and field monitoring activities by the Owner or the Engineer shall not relieve the Contractor of responsibility for the work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise approved, pipe for observation wells, if required, shall consist of 1-in. I.D. minimum, Schedule 80 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.020-in.

PART 3 - EXECUTION

3.1 GENERAL

- A. Control surface water and groundwater such that excavation to final grade is made in-the-dry and bearing soils are maintained undisturbed. Prevent softening, or instability of, or disturbance to, the subgrade due to water seepage.
- B. Provide protection against flotation for all work.
- C. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for pre-drainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units, and other details of the work are expected to vary with soil/water conditions at a particular location.
- D. At least two (2) weeks prior to the start of construction in any areas of anticipated dewatering, submit to the Engineer for review a proposed plan for removal of water, a method(s) of excavation, and a method(s) of excavation support. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by the Engineer. It is expected that the initial plan may require modification to suit any variable soil/water conditions encountered on the construction site.

3.2 SURFACE WATER CONTROL

- A. Control surface water runoff to prevent flow into excavations. Provide temporary measures such as dikes, ditches and sumps.
- B. Collect precipitation or surface runoff in shallow ditches around the perimeter of the excavation, drain to sump, and pump from the excavation to maintain in-the-dry conditions.

3.3 EXCAVATION DEWATERING

- A. Provide and maintain adequate equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept in-the-dry, so as to maintain all undisturbed subgrade conditions throughout construction below grade, including backfill and fill placement. It is recommended to keep ground water levels 2-feet below the bottom of the excavation.
- B. Pipe and conduit shall not be installed in water or allowed to be submerged prior to backfilling. Pipe and conduit that becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.
- C. Excavation for foundations and structures shall be maintained in-the-dry for a minimum of ninety-six (96) hours after concrete placement. In no event shall water be allowed to enter an excavation and rise to cause unbalanced pressure on foundations and structures until the concrete or mortar has set at least twenty-four (24) hours.
- D. Dewatering and drainage operations shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, the unsuitable subgrade material shall be removed and replaced with concrete, compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its original undisturbed condition.

3.4 WELL POINT SYSTEM

- A. As part of the dewatering system, a vacuum wellpoint system may be required around the excavation to dewater granular soils. Each wellpoint and riser pipe shall be surrounded by a sand filter. Sand shall be of such a gradation that, after initial development of wellpoints, the quantity and size of soil particles discharged shall be negligible. The wellpoint system shall be capable of operating continuously under the highest possible vacuum.
- B. The installation of the well point system shall be done under the supervision of a qualified representative of the wellpoint equipment supplier.

3.5 DISPOSAL OF DRAINAGE

- A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with the sedimentation and erosion control plans as specified in Section 015713. Existing or new sanitary sewer systems shall not be used to dispose of drainage unless the written permission of the utility or Owner is obtained.
- B. Dispose of drainage to prevent flow or seepage back into excavated areas. Disposal area shall be approved by the Engineer.

3.6 GROUNDWATER OBSERVATION WELLS

- A. Prior to excavating 10-ft. or more below original grade, install one (1) groundwater observation well at the center, or adjacent to each structure under construction for the purpose of measuring water levels during excavation. The observation well shall consist of a screen, casing and cap, all of approved size and materials of construction. Place observation well in a 2-1/2-in. bore hole, which shall be carried to or below final bottom grade

of the structure. Backfill the annular space surrounding the intake point and the riser pipe with mortar sand. Seal the well top to prevent infiltration from surface water. Locate and install the observations well in such a manner as to insure proper reflection of subsurface water levels adjacent to the well.

- B. Maintain the observation well until the adjacent structure is completed and backfilled. Observe and record daily the groundwater elevation in each observation well. Furnish measurements daily to the Engineer. Redevelop or replace plugged observation wells as necessary to reflect true groundwater levels.

END OF SECTION