

Section 01564

CONTROL OF GROUND WATER AND SURFACE WATER

1.0 GENERAL

1.01 SECTION INCLUDES

- A Dewatering, depressurizing, draining, and maintaining trench and structure excavations and foundation beds in dry and stable condition.
- B Protecting work against surface runoff and rising flood waters.
- C Disposing of removed water.
- D References to Technical Specifications:
 - 1. Section 01200 – Measurement & Payment Procedures
 - 2. Section 01350 – Submittals
 - 3. Section 01570 – Trench Safety Systems
 - 4. Section 01565 – TPDES Requirements
 - 5. Section 01566 – Source Controls for Erosion & Sedimentation
- E Referenced Standards:
 - 1. Occupational Safety and Health Administration (OSHA)
 - 2. Texas Commission on Environmental Quality (TCEQ)
 - 3. Code of Ordinances, City of Pearland, Texas
 - 4. Water Well Drillers and Pump Installers Advisory Council (WWD/PI)
- F Definitions:
 - 1. Ground Water Control Systems - installations external to the excavation such as well points, eductors, or deep wells. Ground water control includes dewatering and depressurization.
 - a. Dewatering - lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations and disposing of removed water. The intent of dewatering is to increase stability of excavated slopes; prevent dislocation of material from slopes or bottoms of excavations; reduce lateral loads on sheeting and bracing; improve excavating and hauling characteristics of excavated material; prevent failure or heaving of the bottom of excavations; and to provide suitable conditions for placement of backfill materials and construction of structures and other installations.
 - b. Depressurization - reduction in piezometric pressure within strata not controlled by dewatering alone, as required to prevent failure or heaving of excavation bottom.
 - 2. Surface Water Control - diversion and drainage of surface water runoff and rain water away from the excavation.
 - 3. Excavation Drainage - keeping excavations free of surface and seepage water.

1.02 MEASUREMENT AND PAYMENT

- A Measurement for and control of ground water for open cut pipe excavations shall be on a linear foot basis and shall not exceed the length of open cut pipe installation in the area requiring ground water control.
- B Unless indicated as a Bid Item, no separate payment will be made for control of ground water for any condition(s) other than those described in this Section, 1.02A. No separate payment will be made for control of surface water. Include the cost to control non-pipe excavation ground water and surface water in price for Work requiring such controls.
- C Refer to Section 01200 – Measurement & Payment Procedures.

1.03 SUBMITTALS

- A Make Submittals required by this Section under the provisions of Section 01350 – Submittals.
- B Submit a Ground Water and Surface Water Control Plan for review by the Engineer prior to start of any field work. The plan shall be signed by a Professional Engineer registered in the State of Texas. The plan shall include the following:
 - 1. Results of subsurface investigation and description of the extent and characteristics of water bearing layers subject to ground water control.
 - 2. Names of equipment suppliers and installation subcontractors.
 - 3. A description of proposed ground water control systems indicating arrangement, location, depth and capacities of system components, installation details and criteria, and operation and maintenance procedures.
 - 4. A description of proposed monitoring and control system indicating depths and locations of piezometers and monitoring wells, monitoring installation details and criteria, type of equipment and instrumentation with pertinent data and characteristics.
 - 5. A description of proposed filters including types, sizes, capacities and manufacturer's application recommendations.
 - 6. Design calculations demonstrating adequacy of proposed systems for intended applications. Define potential area of influence of ground water control operation near contaminated areas.
 - 7. Operating requirements, including piezometric control elevations for dewatering and depressurization.
 - 8. Excavation drainage methods including typical drainage layers, sump pump application and other necessary means.
 - 9. Surface water control and drainage installations.
 - 10. Proposed methods and locations for disposing of removed water.
- C Submit the following records upon completed initial installation:
 - 1. Installation and development reports for well points, eductors, and deep wells.

2. Installation reports and baseline readings for piezometers and monitoring wells.
 3. Baseline analytical test data of water from monitoring wells.
 4. Initial flow rates.
- D Submit the following records on a weekly basis during operations:
1. Records of flow rates and piezometric elevations obtained during monitoring of dewatering and depressurization. Refer to this Section, 3.02 “Requirements for Eductor, Well Points, or Deep Wells”.
 2. Maintenance records for ground water control installations, piezometers, and monitoring wells.
- E Submit the following records at end of the Work. Decommissioning (abandonment) reports for monitoring wells and piezometers installed by other during the design phase and left for Contractor's monitoring and use.

1.04 PERFORMANCE REQUIREMENTS

- A Conduct subsurface investigations to identify groundwater conditions and to provide parameters for design, installation, and operation of groundwater control systems.
- B Design a ground water control system, compatible with the requirements of OSHA Standards - 29 CFR, Part 1926, and Section 01570 - Trench Safety Systems of these Technical Specifications, to produce the following results:
1. Effectively reduce the hydrostatic pressure affecting excavations.
 2. Develop a substantially dry and stable subgrade for subsequent construction operations.
 3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.
 4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
 5. Maintain stability of sides and bottom of excavations.
- C Ground water control systems may include single-stage or multiple-stage well point systems, eductor and ejector-type systems, deep wells, or combinations of these equipment types.
- D Provide drainage of seepage water and surface water, as well as water from any other source entering the excavation. Excavation drainage may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.
- E Provide ditches, berms, pumps and other methods necessary to divert and drain surface water from excavation and other work areas.
- F Locate ground water control and drainage systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.

- G Assume sole responsibility for ground water control systems and for any loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the ground water control operations. Modify ground water control systems or operations if they cause or threaten to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells, or affect potentially contaminated areas. Repair damage caused by ground water control systems or resulting from failure of the system to protect property as required.
- H Provide an adequate number of piezometers installed at the proper locations and depths as required to provide meaningful observations of the conditions affecting the excavation, adjacent structures, and water wells.
- I Provide environmental monitoring wells installed at the proper locations and depths as required to provide adequate observations of hydrostatic conditions and possible contaminant transport from contamination sources into the work area or into the ground water control system.
- J Decommission piezometers and monitoring wells installed during design phase studies and left for Contractors monitoring and use.

1.05 ENVIRONMENTAL REQUIREMENTS

- A Comply with requirements of agencies having jurisdiction.
- B Comply with TCEQ regulations and WWD/PI Advisory Council for development, drilling, and abandonment of wells used in dewatering system.
- C Obtain permit from TCEQ under the Texas Pollutant Discharge Elimination System (TPDES), for storm water discharge from construction sites. Refer to Section 01565 – TPDES, 3.02 “Certification Requirements”.
- D Obtain all necessary permits from agencies with control over the use of groundwater and matters affecting well installation, water discharge, and use of existing storm drains and natural water sources. Because the review and permitting process may be lengthy, take early action to pursue and submit for the required approvals.
- E Monitor ground water discharge for contamination while performing pumping in the vicinity of potentially contaminated sites.
- F Implement control of ground and surface water under the provisions of Section 01566 – Source Controls for Erosion & Sedimentation.

2.0 PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A Equipment and materials are at the option of Contractor as necessary to achieve desired results for dewatering. Selected equipment and materials are subject to review

of the Engineer through Submittals required in Section 01350 – Submittals, 1.06 “Operations and Maintenance Data”.

- B Eductors, well points, or deep wells, where used, must be furnished, installed and operated by an experienced contractor regularly engaged in ground water control system design, installation, and operation.
- C Equipment and instrumentation for monitoring and control of the ground water control system includes piezometers and monitoring wells, and devices, such as flow meters, for observing and recording flow rates.
- D All equipment must be in good repair and operating order.
- E Sufficient standby equipment and materials shall be kept available to ensure continuous operation, where required.

3.0 EXECUTION

3.01 GROUND WATER CONTROL

- A Perform a subsurface investigation by borings as necessary to identify water bearing layers, piezometric pressures, and soil parameters for design and installation of ground water control systems. Perform pump tests, if necessary to determine the drawdown characteristics of the water-bearing layers. The results shall be presented in the Ground Water and Surface Water Control Plan. Refer to this Section, 1.03B.
- B Provide labor, material, equipment, techniques and methods to lower, control and handle ground water in a manner compatible with construction methods and site conditions. Monitor effectiveness of the installed system and its effect on adjacent property.
- C Install, operate, and maintain ground water control systems in accordance with the Plan. Notify Engineer in writing of any changes made to accommodate field conditions and changes to the Work. Provide revised drawings and calculations with such notification.
- D Provide for continuous system operation, including nights, weekends, and holidays. Arrange for appropriate backup if electrical power is primary energy source for dewatering system.
- E Monitor operations to verify that the system lowers ground water piezometric levels at a rate required to maintain a dry excavation resulting in a stable subgrade for prosecution of subsequent operations.
- F Where hydrostatic pressures in confined water bearing layers exist below excavation, depressurize those zones to eliminate risk of uplift or other instability of excavation or installed works. Allowable piezometric elevations shall be defined in the Plan.

- G Maintain water level below subgrade elevation. Do not allow levels to rise until foundation concrete has achieved design strength.
- H During backfilling, dewatering may be reduced to maintain water level a minimum of 5 feet below prevailing level of backfill. However, do not allow that water level to result in uplift pressures in excess of 80 percent of downward pressure produced by weight of structure or backfill in place. Do not allow water levels to rise into cement stabilized sand until at least 48 hour after placement.
- I Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove pipe drain when it has served its purpose. If removal of pipe is impractical, provide grout connections at 50-foot intervals and fill pipe with cement-bentonite grout or cement-sand grout when pipe is removed from service.
- J Extent of construction ground water control for structures with a permanent perforated underground drainage system may be reduced, such as for units designed to withstand hydrostatic uplift pressure. Provide a means of draining the affected portion of underground system, including standby equipment. Maintain drainage system during operations and remove it when no longer required.
- K Remove system upon completion of construction or when dewatering and control of surface or ground water is no longer required.
- L Compact backfill as required by the Contract Documents.

3.02 REQUIREMENTS FOR EDUCTOR, WELL POINTS, OR DEEP WELLS

- A For aboveground piping in ground water control system, include a 12-inch minimum length of clear, transparent piping between every eductor well or well point and discharge header so that discharge from each installation can be visually monitored.
- B Install sufficient piezometers or monitoring wells to show that all trench or shaft excavations in water bearing materials are predrained prior to excavation. Provide separate piezometers for monitoring of dewatering and for monitoring of depressurization. Install piezometers and monitoring wells for tunneling as appropriate for Contractor's selected method of work.
- C Install piezometers or monitoring wells not less than one week in advance of beginning the associated excavation.
- D Dewatering may be omitted for portions of underdrains or other excavations, but only where auger borings and piezometers or monitoring wells show that soil is predrained by an existing system such that the criteria of the Ground Water and Surface Water Control Plan are satisfied.

- E Replace installations that produce noticeable amounts of sediments after development.
- F Provide additional ground water control installations or change the methods in the event that the installations according to the Ground Water and Surface Water Control Plan do not provide satisfactory results based on the performance criteria defined by the Plan and by this Section. Submit a revised Plan according to this Section, 1.03A.
- G Mechanical dewatering equipment shall comply with Chapter 19 NOISE, Code of Ordinances, City of Pearland, Texas.

3.03 EXCAVATION DRAINAGE

- A Contractor may use excavation drainage methods if necessary to achieve well drained, stable trench conditions. The excavation drainage may consist of the following methods or combination of methods:
 - 1. Sump pumping in combination with:
 - a. Layer of crushed stone and filter fabric.
 - b. Sand and gravel drains.
 - 2. Wells for ground water control.
- B Use sump pumping and a drainage layer, as defined in ASTM D 2321, placed on the foundation beneath pipe bedding or thickened bedding layer of Class I material.

3.04 MAINTENANCE AND OBSERVATION

- A Conduct daily maintenance and observation of piezometers or monitoring wells while the ground water control installations or excavation drainage are operating in an area. Keep system in good operating condition.
- B Replace damaged and destroyed piezometers or monitoring wells with new piezometers or wells as necessary to meet observation schedule.
- C Cut off piezometers or monitoring wells in excavation areas where piping is exposed, only as necessary to perform observation as excavation proceeds. Continue to maintain and make observations, as specified.
- D Remove and grout piezometers inside or outside the excavation area when ground water control operations are complete. Remove and grout monitoring wells when directed by the Engineer.

3.05 MONITORING AND RECORDING

- A Monitor and record average flow rate of operation for each deep well, or for each wellpoint or eductor header used in dewatering system. Also monitor and record water level and ground water recovery. These records shall be obtained daily until steady conditions are achieved, and twice weekly thereafter.

- B Observe and record elevation of water level daily as long as ground water control system is in operation, and weekly thereafter until the Work is completed or piezometers or wells are removed, except when Engineer determines that more frequent monitoring and recording are required. Comply with Engineer's direction for increased monitoring and recording and take measures as necessary to ensure effective dewatering for intended purpose.

3.06 SURFACE WATER CONTROL

- A Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps or other approved means. The requirement includes temporary works required to protect adjoining properties from surface drainage caused by construction operations.
- B Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by agencies having jurisdiction. Provide settling basins when required by such agencies.
- C Provide additional surface water control measures or change the methods in the event that the measures according to the Ground Water and Surface Water Control Plan do not provide satisfactory results based on the performance criteria defined by the Plan and by this Section. Submit a revised Plan according to this Section, 1.03B.

END OF SECTION