

**SECTION 31 42 00  
DEWATERING AND DRAINAGE**

**PART 1 - GENERAL**

**1.01 RELATED DOCUMENTS**

- A. Drawings and General Provisions of the Contract, including General and Supplemental Conditions and Specification Sections, apply to this Section.

**1.02 DESCRIPTION OF WORK**

- A. The Work specified in this Section includes Designing, furnishing, installing, operating, monitoring, maintaining and removing temporary dewatering and drainage systems as required and lower and control water levels to at least 2 feet below the lowest level of the excavation to permit construction in the dry. Contractor shall obtain and pay for all permits required for temporary dewatering and drainage systems. All work including costs for all permits to be included in the Contractors base bid.
- B. Furnish the services of a licensed professional engineer (P.E.) registered in the State of Connecticut, to prepare dewatering and drainage system designs and submittals.
- C. Furnish, maintain and remove temporary surface water control measures that are adequate to drain and prevent surface water entering excavation.
- D. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with State and local requirements and permits.
- E. Protect all adjacent facilities and structures from damage due to dewatering and drainage system equipment and operations.
- F. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

**1.03 RELATED WORK**

- A. Section 31 20 05 "Erosion and Sediment Control"
- B. Section 31 43 00 "Handling Contaminated Groundwater"
- C. Section 31 41 00 "Shoring"
- D. Section 31 23 16 "Excavation"

**1.04 SUBMITTALS**

- A. At least (30) thirty days prior to the start of construction in any areas of anticipated dewatering, submit to the Owner for review and approval, a proposed dewatering and drainage plan. The dewatering and drainage submittal should include shop drawings and a written description of the proposed system layout, design methodology including calculations and the installation methods to be used. The submittal shall include descriptions of the dewatering and drainage system, observation wells and methods of removal, equipment drilling methods, hole sizes, filter sand placement techniques, sealing materials, development techniques, use of existing monitoring wells, etc. The plan shall identify the anticipated area influenced by the dewatering system and address impacts to adjacent existing and proposed structures. The Contractor shall not proceed with construction in any of these areas until the dewatering plan has been reviewed and

approved by the Owner. It is expected that the proposed dewatering plan may have to be modified to suit the variable soil/water conditions encountered along the route.

- B. Dewatering and drainage system designs shall be prepared by a licensed P.E., registered in the State of Connecticut, having a minimum of 5 years of professional experience in the design and construction of dewatering and drainage systems.
- C. The Contractor shall coordinate dewatering and drainage submittals with the corresponding excavation and excavation support submittals.
- D. The proposed construction Erosion and Sediment Control Plan has been approved by the Town of East Hartford Planning and Zoning Commission:
  - Dewatering BMPs must be followed as described in the Connecticut Guidelines for Soil Erosion and Sediment Control.
  - Follow all BMPs as described in the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities).

#### 1.05 DEFINITIONS

- A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as an excavation subgrade where the groundwater level has been lowered to at least 2 feet below the lowest level of the excavation, is stable with no ponding water, mud, muck and shall be able to support construction equipment without rutting or disturbance and shall be suitable for the placement and compaction of fill material, pipe or concrete foundations.

#### 1.06 DESIGN AND PERFORMANCE RESPONSIBILITY

- A. The Contractor shall be solely responsible for the proper design and execution of methods for controlling surface water and groundwater.
- B. Contractor shall be solely responsible for damage to properties, buildings or structures, sewers, water mains and other utility installations, pavement and Work that may result from dewatering or surface water control operations.
- C. Any design review and field monitoring activities by the Owner or the Engineer shall not relieve the Contractor of his/her responsibilities for the Work.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Pipe for observation wells, if required, shall consist of minimum 1-in I.D., Schedule 80 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.020-in.
- B. Piping, pumping equipment and all other materials required to control surface water and groundwater in excavations shall be suitable for the intended purpose.

**PART 3 - EXECUTION**

**3.01 GENERAL**

- A. Methods of groundwater control may include but is not limited to perimeter trenches and sump pumping, perimeter groundwater cut off, well points, ejectors, deep wells and combinations thereof.
- B. Control surface water and groundwater such that excavation to final grade is made in-the-dry, the bearing soils are maintained undisturbed and softening / instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of Work shall be prohibited.
- C. The Contractor shall consider the impact of anticipated subsurface soil / water when selecting methods of excavation and temporary dewatering and drainage systems. When groundwater levels are above the proposed bottoms of excavation, a pumped dewatering excavation will be required for predrainage of the soils to at least 2.0 feet below the lowest level of the excavation until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. The 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. Dewatering and drainage operations shall be conducted in a manner that does not cause loss of ground or disturbance to the soil that supports overlying or adjacent utilities or structures.
- E. Locate groundwater control system components where they will not interfere with construction activities adjacent to the Work area or interfere with the installation and monitoring of geotechnical instrumentation including observation wells. Excavations for sumps or drainage ditches shall not be made within or below 1H:1V slopes extending downward and out from the edges of existing or proposed foundation elements or from the downward vertical footprint of the pipe.
- F. Install, monitor and report data from observation wells as shown on Contract Drawings. Evaluate the collected data relative to groundwater control system performance and modify systems as necessary to dewater the site in accordance with the Contract requirements.

**3.02 SURFACE WATER CONTROL**

- A. Construct surface water control measures to prevent flow of surface water into excavations. Provide temporary measures such as dikes, ditches and sumps.
- B. Subgrades shall be sloped to prevent ponding of water.
- C. Subgrades which become disturbed due to surface water shall be removed and refilled as directed by the Owner at no additional cost to the Owner.

**3.03 EXCAVATION DEWATERING**

- A. At all times during construction, the Contractor shall furnish and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations. Excavations shall be kept in-the-dry, so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise

damaged by allowing water levels to return to natural elevations.

- B. Pipe and masonry shall not be laid in water or submerged within 24 hours after being placed or prior to backfilling. Water shall not flow over new masonry within 4 days after placement. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper condition prior to reinstalling the pipe and conduit.
- C. Excavation for foundations and structures shall be maintained in-the-dry for a minimum of 4 days 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 24 hours.
- D. Dewatering and drainage operations shall at all times be conducted in such a manner as to preserve the natural undisturbed capacity of the subgrade soils at least 2 feet below the bottom of excavations.
- E. If the subgrade of the trench bottom or excavation becomes disturbed due to the Contractor's dewatering system not working properly, the Contractor shall excavate below normal grade as directed by the Owner and refill with crushed stone, compacted structural fill, etc. at the Contractor's expense to restore the bearing capacity of the subgrade to its original undisturbed condition.
- F. If the method of dewatering does not-properly dewater the trench as specified, the Contractor shall install groundwater observation wells as directed by the Owner and at no additional cost to the Owner and not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 2 feet below the bottom of the final excavation within the trench limits.
- G. Where the groundwater level is above the proposed bottom of the excavation level, it is expected that some type of pumped dewatering system will be required for pre-drainage of the soils prior to final excavation and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged. It is further expected that the type of system, spacing of dewatering units and other details of the Work will vary depending on soil / water conditions at a particular location.
- H. Dewatering units used in the Work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until the pipe or structure is adequately backfilled. Stand-by pumps and a source of standby power shall be provided.
- I. Water entering the excavation from precipitation or surface runoff shall be collected, drained to a sump and pumped from the excavation to maintain a bottom free from standing water.
- J. The Contractor shall furnish, provide, install, operate, maintain, move and subsequently remove as often as necessary or required, all the pumps, piping, hoses, flumes, dams, equipment, labor and materials necessary or required for controlling surface and subsurface water entering the trenches, excavations and Work areas, regardless of source or quantity, during the construction of the proposed facilities and the subsequent filtration of said waters prior to discharge.
- K. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- L. Dewatering facilities shall be suitably positioned or located so as to offer little or no interference with existing utilities, structures, etc., construction Work, completed or on-going and the proper ingress or egress to

residences, businesses and factories affected by such dewatering facilities. Drainage shall be disposed of in a suitable area only so that flow or seepage back into the excavated area will be prevented.

- M. Dewatering facilities, procedures, measures, equipment, etc. which cause, or threaten to cause, damage to the Work, completed or under construction, or other existing facilities, shall be expeditiously modified or replaced so as to prevent further damage or threatened damage. The Contractor shall be responsible for determining the modifications or replacements to be made, at no additional expense to the Owner. The Contractor shall be responsible for the repair or replacement of any facilities of whatever nature, new, existing, or under construction receiving damage caused by or incidental to the operations of the Contractor, at no additional cost to the Owner. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
- N. The Contractor shall continuously monitor pump effluents so as to ensure and prevent the unnoticed prolonged displacement, extraction or migration of particulate matter from the bottoms and sides of trenches or excavations resulting in the immediate or latent subsidence of same, which in turn, threaten to cause to threaten the Work, completed or in progress, or other utilities, structures, adjacent properties, buildings, pavements or other surfaces, and the like.
- O. Pumping water wells, well points, sumps, etc. shall be provided with suitable filters, screens and/or gravel packs to prevent the loss of fine particulates.
- P. The recharge of groundwater to its static level shall be accomplished in a manner so as to maintain the undisturbed state of the foundation soils, prevent disturbance of fill and backfill material and prevent flotation or movement of structures.
- Q. The Contractor shall clean any and all new or existing sanitary sewers or storm drains and appurtenant facilities receiving any sediment from, by or incidental to the Contractor's dewatering operations during the prosecution of the Work, at no additional costs to the Owner.
- R. The Contractor shall employ such measures or methods as necessary or directed to avert surface runoff from entering trenches or excavation. Excavations and trench bottoms shall be maintained free of standing water.
- S. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system shall be removed by the Contractor.
- T. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

#### 3.04 WELLPOINT SYSTEMS

- A. Where necessary, install a vacuum wellpoint system around the excavation to dewater the excavation. Each wellpoint and riser pipe shall be surrounded by a sand or gravel filter. Sand shall be of such a gradation that, after initial development of the wellpoints, the quantity and size of soil particles discharged shall be negligible. Wellpoint systems shall be capable of operating continuously under the highest possible vacuum.
- B. Installation of well point systems shall be in accordance with the approved submittal in the presence of the Engineer.

#### 3.05 DEEP WELLS

- A. Where necessary, install a deep well system around the excavation to dewater or depressurize the excavation. Each well shall be surrounded by a sand or gravel filter with adequate gradation such that after development, the quantity and size of soil particles discharged are negligible. Sufficient number of wells shall be installed to lower or depressurize the groundwater level to allow excavation to proceed in-the-dry.
- B. Installation of deep well shall be in accordance with the approved submittal in the presence of the Engineer.

**3.06 OBSERVATION WELLS**

- A. Install observation wells as required under this Section or in accordance with the approved submittal to monitor groundwater levels beneath and around the excavated area until adjacent structures and pipelines are completed and backfilled.
- B. Observation Well Locations and Depths:
  - 1. Wells shall be installed at locations shown on the Contract Drawings or as approved by the Engineer. They shall be located in critical areas with respect to groundwater control to monitor performance of dewatering systems designed by the Contractor's Licensed Professional Engineer.
  - 2. Observation wells required shall be installed to a depth of at least 10-ft below the deepest level of excavation, unless otherwise approved by the Engineer, and to whatever depth is necessary to indicate that the groundwater control system designed by the Contractor's Licensed Professional Engineer is performing as intended. Additional observation wells may be required by the Engineer if deemed necessary to monitor the performance of the Contractor's groundwater control system at no additional cost to the Owner.
  - 3. Locations and depths of observation wells are subject to approval by the Engineer.
- C. Protect the observation wells at ground surface by providing a lockable box or outer protective casing with lockable top and padlock. Design the surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.
  - 1. Provide two copies of keys for each padlock to the Engineer for access to each well.
  - 2. Observation wells shall be developed so as to provide a reliable indication of groundwater levels. Wells shall be re-developed if well clogging is observed, in the event of apparent erroneous readings, or as directed by the Engineer.
  - 3. Submittal observation well installation logs, top of casing elevation, and well locations to the Engineer within 24 hours of completion of well installation.
- D. Observation Well Maintenance
  - 1. The Contractor shall maintain each observation well until adjacent structures and pipelines are completed and backfilled. Clean out or replace any observation well which ceases to be operable before adjacent Work is completed.
  - 2. It is the Contractor's obligation to maintain observation wells and repair or replace them at no additional

cost to the Owner, whether or not the observation wells are damaged by the Contractor's operations or by third parties.

E. Monitoring and Reporting of Observation Well Data

1. The Contractor shall begin daily monitoring of groundwater levels in Work areas prior to initial operation of drainage and dewatering system. Daily monitoring in areas where groundwater control is in operation shall continue until the time that adjacent structures and pipelines are completed and backfilled and until the time that groundwater control systems are turned off.
2. The Contractor is responsible for processing and reporting observation well data to the Engineer on a daily basis. Data is to be provided to the Engineer on a form, which shall include the following information: observation well number, depth to groundwater, total depth of well, top of casing elevation, groundwater level elevation and date and time of reading.

3.07 DISPOSAL OF DRAINAGE

- A. All water regardless of source or quantity which interferes with the Work shall be removed and treated in the proper manner. The Contractor shall not directly discharge water from trenches or excavations or other dewatering activities to existing watercourses, waterbodies or drainage facilities tributary thereto. All dewatering discharge shall be made through suitable and proper filtration system prior to entering any existing storm drainage facilities. THE REQUIREMENTS OF THE "CONNECTICUT GUIDELINES FOR SOIL EROSION AND SEDIMENT CONTROL" SHALL BE STRICTLY ADHERED TO.
- B. All water pumped or drained from the Work shall be disposed of in a manner consistent with the Specifications, that will not result in undue interference with other Work, completed or under construction, or damage to adjacent properties, pavements or other surfaces, buildings or structures and utilities.
- C. Where feasible and appropriate, dewatering wastewaters shall be infiltrated into the ground. Dewatering wastewaters discharged to surface waters shall be discharged in a manner that minimizes the discoloration of the receiving waters. Each plan shall include a description of the operations and structural practices that will be used to ensure that all dewatering wastewaters will not cause scouring or erosion or contain suspended solids in amounts that could reasonably be expected to cause pollution of waters of the State.

3.08 REMOVAL OF SYSTEMS

- A. At the completion of the excavation and backfilling Work, and when approved by the Engineer, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the Contractor. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.
- B. Leave in place any casings for deep wells, wellpoints or observation wells located within the plan limits of structures or pipelines or within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward projected plan limits of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities or existing structures.
- C. Where casings are pulled, holes shall be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 3-ft below finished ground level or 1-ft below foundation

level so as not to interfere with finished structures or pipelines.

- D. When directed by the Engineer, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

END OF SECTION