
PART 1 GENERAL**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.
- B. Geotechnical reference documents
 - * 1. "Transbay Tower Geotechnical Data Report," dated June 17, 2013.
 - 2. "Transbay Tower – Lateral Earth Pressures for Shoring Design" prepared by Arup dated March 8, 2013

1.2 SUMMARY

- A. The work specified in this section includes designing, furnishing, installing, maintaining, operating and removing dewatering systems and control, as required to lower groundwater levels and hydrostatic pressures associated with excavation and construction; and storage, treatment, and discharge of dewatering effluent in accordance with applicable regulations and standards.
 - 1. Dewatering system.
 - 2. Surface water control system.
 - 3. System operation and maintenance.
 - 4. Water disposal.
- B. Related Sections:
 - 1. Section 31 00 00 "Earthwork" for excavating and backfilling and for controlling surface-water runoff and ponding.
 - 2. Section 31 55 00 "Excavation Support System"

1.3 REFERENCES

- A. State of California, Department of Water Resources
 - 1. Well Driller Reports
- B. California Stormwater Quality Association (CASQA)
 - 1. Stormwater Best Management Practice (BMP) Handbook, January 2003
- C. ASTM International:
 - 1. ASTM C33 – Standard Specification for Concrete Aggregates.
 - 2. ASTM D5299-99(2005) - Standard Guide for Decommissioning of Ground Water wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities
 - 3. ASTM D6725-04 – Standard Practice for Direct Push Installation of Prepacked Screen Monitoring wells in Unconsolidated Aquifers
 - 4. ASTM D5092-04e1 – Standard Practice for Design and Installation of Ground Water Monitoring wells
 - 5. ASTM D6724-04 – Standard Guide for Installation of Direct Push Ground Water Monitoring wells
- D. U.S. Department of the Interior, Bureau of Reclamation (USBR)
 - 1. Ground Water Manual: A Guide for the Investigation, Development, and Management of Ground-Water Resources, April 2005
- E. Standard Specifications of the City and County of San Francisco, Department of Public Works, Bureau of Engineering (SSDPWSF), dated November 2000

1.4 SYSTEM DESCRIPTION

- A. System Responsibility: Contractor is responsible to select, design, install, operate, monitor, maintain and remove the dewatering system.

- B. Potential Dewatering Methods: Sump pumping, single or multiple-stage well point systems, eductor and ejector-type systems, deep wells, interception, diversion, combinations thereof, or other techniques as approved by the Owner's Representative.
- C. Location: Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, improvements and construction operations performed under this Contract or other contracts
- D. Surface Water Control: Provide for intercepting and diverting precipitation and surface water away from excavations through the use of dikes, curb walls, ditches, berms, pipes, sumps and other Best Management Practices (BMP) devices, in accordance with CASQA's Stormwater BMP Handbook.
- E. Drainage of excavated areas: provide and maintain adequately sized ditches to collect surface and seepage water which may enter the excavations. Divert the water into sumps and pump or drain it into temporary holding tanks.
- F. Water Discharge: Discharge collected water in accordance with requirements of San Francisco Bureau of Environmental Management (BEM). These requirements may include containing the collected water in holding tanks temporarily until suspended soil particles and other solids have settled to the bottom before discharging it so that the water contains no soil particles or other solids when discharged.
- G. Monitoring: Provide monitoring wells and monitoring equipment to obtain the data necessary to evaluate and control the performance of the dewatering system.
 - 1. Install monitoring wells to observe ground water conditions at various levels during excavation and below the final excavation subgrade.
 - 2. Contractor shall identify elevations where groundwater must be monitored. Monitoring may be required at several elevations to provide indications of hydrostatic pressures and ground water elevations when water is present at different strata.
- H. Furnish standby equipment stored at Project site and ready for immediate use in the event of failure of dewatering equipment. Provide the following standby equipment, but not less than one of each type:
 - 1. Dewatering Centrifugal Pumps: 50 percent; maximum 2 pumps.
 - 2. Dewatering Turbine Pumps: One for every 5 installed pumps; maximum 2 pumps.
 - 3. Pump Power Units: 50 percent; maximum 2 units.
 - 4. Dewatering Jet Eductor Pressure Pumps: 50 percent; maximum 2 pumps.
 - 5. Portable Electric Generators (if used): 100 percent; maximum 2 generators.
 - 6. Commercial Electric Power: 100 percent standby electric generating equipment.

1.5 DESIGN

- A. Design the dewatering systems to comply with the following requirements:
 - 1. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.
 - 2. Lower water table within areas of excavation to an average depth not less than five feet below the bottom of the excavation at any given time, or to an average depth not less than five feet but not greater than ten feet below the bottom of the maximum proposed excavation shown on the Drawings. Maintain the level below the bottom of the maximum proposed excavation until the construction stage indicated on the structural drawings.
 - 3. Groundwater levels around the excavation shall be maintained within three (3.0) feet from the pre-excavation levels. In the event the water levels begin to drop below the specified limit, the Contractor shall be responsible to implement appropriate measures to control groundwater levels within the specified limits.
 - 4. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift, heaving, or other instability of excavation.
 - 5. Lower the groundwater level only in the excavation areas. Prevent loss of fines, quick condition, or softening of foundation subgrade.
 - 6. Maintain stability of sides and bottoms of excavations and shafts.
- B. Design surface water control systems to:

1. Collect and remove surface water and seepage entering excavation in accordance with applicable regulations and standards.

1.6 SUBMITTALS

- A. Submit the following according to Conditions of the Construction Contract and Division 1 Specification Sections.
- B. Contractor's Drawings and Dewatering Design Report:
 1. Indicate the proposed type of dewatering system.
 2. Indicate dewatering system arrangement, layout, locations, and depths of system components, including well depths, dewatering pump locations.
 3. Provide complete description of equipment and instrumentation to be used, with installation, operation, and maintenance procedures.
 4. Indicate types and sizes of filters, such as filter sand gradations.
 5. Provide information on well screen lengths, pipe sizes and capacities, grades, and valves.
 6. Provide complete description of surface water control devices.
 7. Indicate primary and standby power system location and capacity.
 8. Indicate layout and depth of monitoring wells, piezometers and flow measuring devices for system performance measurement.
 9. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
 10. Include description of emergency procedures to follow when system failure or other problems arise.
 11. Indicate the methods and location for disposal of pumped and drained water.
- C. Product Data: Submit data for each of the following:
 1. Dewatering Pumps: Indicate sizes, capacities, priming method, engine and motor characteristics.
 2. Pumping equipment for control of surface water within excavation.
 3. Gout: Contractor's mix design.
 4. Electronic monitoring equipment to replace 24-hour supervision of dewatering system by personnel; see Article 3.6 A.
- D. Design Data:
 1. Indicate design values, analyses, and calculations to demonstrate the adequacy of the proposed system and equipment.
 2. Include description and profile of geology, soil, and groundwater conditions.
 3. Provide duration of time dewatering is required for a given well, amount of drawdown that dewatering system will cause, and area of influence of dewatering.
- E. Field Reports: Test and monitoring reports as specified in Field Quality Control article.

1.7 CLOSEOUT SUBMITTALS

- A. Division 1 - Contract Closeout: Requirements for submittals.
- B. Project Record Documents: Record actual locations and depths of capped wells and piping abandoned in place.

1.8 QUALITY ASSURANCE

- A. Comply with authorities having jurisdiction for the following:
 1. Drilling and abandoning of wells used for dewatering systems.
 2. Water discharge and disposal from pumping operations.
- B. Prior to any subsurface drilling activities, including installing dewatering or monitoring wells, Contractor needs to submit an application for Monitoring Well Construction/Destruction or Soil Borings to Monitoring Wells Program,

Environmental Health Section, City and County of San Francisco Department of Public Health, 1390 Market Street, Suite 910, San Francisco, CA 94102, Telephone: (415) 252-3849, Fax: (415) 252-3894.

1. Drillers may not commence work until the application has been approved.
 2. Submit application at least 10 days in advance of drilling
 3. Advance 48 hour notice is required for inspection of the annular seal.
 4. Minimum advanced notice of 24 hours must be provided prior to well development and water sampling.
 5. Submit a copy of the California Department of Water Resources Well Drillers Report, Form 188, to the Water Quality Control Section within 30 days after completion of the work.
- C. Contractor must obtain a wastewater discharge permit from the City of San Francisco for discharging water into the local municipal waste water collection system. The dewatering permit requires chemical testing for characterizing the water to be discharged. Prior to discharging pumped groundwater, the City will require additional groundwater analytical testing for contaminants.
- D. Provide any additional essential information regarding storm water discharge from construction sites for updating the project's National Pollutant Discharge Elimination System (NPDES) permit application.
- E. Use methods of ground water discharge, conveying, and transmission to off-site locations approved by of San Francisco Bureau of Environmental Management (BEM).
- F. The entity assuming responsibility for the dewatering system at the end of this Contract will obtain new permits.

1.9 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum 5 years documented experience and responsible for design, installation, operation, and maintenance of dewatering system for shored excavations greater than 40 feet deep on the west coast of the United States within 2 miles of the shoreline of a bay, sound or inlet.

1.10 MEETINGS

- A. Division 1 - Project Meetings: Meeting requirements.
- B. Convene pre-installation meeting minimum two weeks prior to commencing work of this section.

1.11 SEQUENCING

- A. Division 1 – Summary of Work.
- B. Sequence work to obtain required permits before start of dewatering operations.
- C. Sequence work to install and test monitoring systems minimum 14 days before testing and operating dewatering systems.
- D. Sequence work to install and test dewatering and surface water control systems minimum 7 days before starting excavation.

1.12 COORDINATION

- A. Division 1 - Coordination.
- B. Coordinate work to avoid clashes with columns, walls and other items to be installed as part of the permanent structure.

1.13 PROJECT CONDITIONS

- A. Contractor shall verify the location of existing structures, improvements and utilities.

PART 2 PRODUCTS

2.1 DEWATERING EQUIPMENT

- A. Select dewatering equipment to meet performance requirements specified herein.

2.2 MONITORING EQUIPMENT

- A. Piezometers: Vibrating wire type with sand filter, or push in installation to monitor water elevation, and excess pore pressures.
 - 1. Furnish piezometer complete with signal cable and data logger.
- B. Flow Measurement: Furnish devices as follows:
 - 1. Pitometer installed on discharge of pipe from each well.
 - 2. Pitometer installed to measure flow from entire dewatering system.

2.3 TEMPORARY HOLDING TANKS

- A. Provide temporary holding tanks for sedimentation of soil particles and other solids prior to discharge in accordance with requirements of agencies having jurisdiction.

2.4 ACCESSORIES

- A. Valves and Fittings: Furnish valves and fittings to isolate each well from header pipe and to prevent loss of pump prime.
- B. Filter Sand: ASTM C33; natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded to suit well screen.
- C. Grout: Mixture of Portland cement and bentonite clay or sand suitable for sealing abandoned wells and piping.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Division 1 - Execution: Verification of existing conditions before starting work.
- B. Call the USA North, the Underground Service Alert network, at 8-1-1 or 1-800-227-2600 at least two working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas, which should be outlined with white paint or chalk by the Contractor

3.2 PREPARATION

- A. Obtain appropriate permits prior to installing dewatering system, see Section 1.9 Quality Assurance.

3.3 MONITORING WELLS

- A. Install monitoring wells at locations indicated on Contractor's drawings as specified for dewatering well system.
- B. Test each monitoring well point to verify installation is performing properly.
- C. Install piezometers, calibrate, and test for proper operation.
- D. Protect monitoring well standpipes from damage by construction operations.
- E. Maintain accessibility to monitoring wells continuously during construction operations.
- F. Maintain monitoring wells throughout the duration of the operation of the system.

3.4 DEWATERING SYSTEM

- A. Install dewatering system in accordance with approved Contractor's drawings. Advise the Owner's Representative of changes made to accommodate field conditions, and upon completion of the dewatering system installation, revise and resubmit Contractor's drawings as necessary to indicate the installed configuration.
- B. Drill wells in sizes and to depth indicated in the Contractor's drawings. Provide temporary surface casing when required to stabilize soil while advancing well.
- C. Develop wells by over pumping, surging, or water jetting, as specified by the Contractor's drawings and approved by the Owner's Representative, to remove clay, silt, and sand from well screen and immediate vicinity of bore hole.
- D. Test well for proper water flow through well screen and pumping rate for dewatering system operation. Repeat development until well meets performance requirements.
- E. Cover and seal top of well until pump is installed.

- F. Install pumps in accordance with manufacturer's instructions.
- G. Connect pumps to discharge header. Install valves to permit pump isolation.

3.5 SURFACE WATER CONTROL SYSTEM

- A. Maintain surface water control system to prevent blockage or damming in the event of unexpected precipitation.

3.6 SYSTEM OPERATION AND MAINTENANCE

- A. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components. At Contractor's option, personnel may be replaced with electronic monitoring equipped with an alarm device that notifies personnel that are on-call to respond.
- B. Fill fuel tanks before tanks reach 25 percent capacity.
- C. Start emergency generators at least twice each week to check operating condition.
- D. When dewatering system cannot control water within excavation, notify Owner's Representative and stop excavation:
 - 1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
 - 2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.
- E. Correct unanticipated pressure conditions affecting dewatering system performance.
- F. Do not discontinue dewatering operations without the Owner's Representative's approval.

3.7 WATER DISPOSAL

- A. If required as a result of testing, discharge water from dewatering system into temporary holding tanks prior to discharging in accordance with requirements of agencies having jurisdiction.

3.8 CLEANING

- A. Sewer drains: After making arrangements with the authority having jurisdiction, clean each sewer drain which becomes blocked or the capacity of which is restricted due to discharge from dewatering operations.
- B. Temporary Holding Tanks: Clean settlement from temporary holding tanks, and dispose of sediment in accordance with requirements for disposing of excavated soil.

3.9 SYSTEM REMOVAL

- A. Do not remove dewatering systems unless required by the Owner's Representative.
- B. Do not remove piezometers and monitoring wells unless required by the Owner's Representative.
- C. Cut off and cap abandoned wells minimum 36 inches below completed subgrade elevation.
- D. Fill abandoned piping with grout.

3.10 FIELD QUALITY CONTROL

- A. Division 1 - Quality Control: Field inspecting, testing, adjusting, and balancing and Division 1 - Execution.
- B. Pumping Test:
 - 1. After dewatering system is installed, perform pumping test to determine when the selected pumping rate lowers water level in well below pump intake.
 - 2. Adjust pump speed, discharge volume, or both to ensure proper operation of each pump.
- C. Pumping Data:
 - 1. Observe and record the daily flow rates and time of operation of each pump used in the dewatering system.
 - 2. Provide appropriate devices, such as flow meters, for observing the flow rates.
 - 3. Submit the data, on a form approved by the Owner's Representative, during the period that the dewatering system is in operation. The data shall be submitted once per week, or at more frequent intervals if requested by the Owner's Representative.

- D. Ground Water Elevation:
 - 1. Monitor and record daily ground water elevations at monitoring wells, until groundwater drawdown is stabilized, then change to weekly until as directed by Owner's Representative.
 - 2. Submit the results of groundwater monitoring to the Owner's Representative on a weekly basis.
- E. Discharged Water Testing:
 - 1. Discharged water testing will be conducted by the Owner's Representative.
- F. Submit Initial Installation Reports to the Owner's Representative including the following:
 - 1. Installation and development reports for wells and pumps.
 - 2. Results of well development and pump tests.
 - 3. Installation and baseline reports for monitoring wells and piezometers.
 - 4. Test reports of monitoring well water analysis.
 - 5. Initial dewatering flow rates.
- G. Submit weekly Monitoring Reports to the Owner's Representative as follows:
 - 1. Dewatering flow rates.
 - 2. Piezometer readings.
 - 3. Maintenance records for dewatering and surface water control systems.

END OF SECTION