SP-150323
(New)

SPECIAL PROVISION FOR PIEZOMETERS

Tama County
NHSX-030-6(189)--3H-86

Effective Date
October 17, 2017

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150323.01 DESCRIPTION.

The work covered by this Special Provision consists of furnishing all labor and materials, and performing all operations in connection with the design, installation, protection, and initial monitoring of piezometers, and other incidental work as may be necessary to complete the piezometers and any modifications, as shown on the contract documents.

150323.02 MATERIALS.

A. Casagrande Piezometer Tip.
Casagrande Piezometers shall be a porous tip type piezometer with a screened length and tip elevation as shown on the CS Sheets. Piezometer tip openings shall be uniform in size and pattern, and shall be spaced approximately equally around the circumference of the pipe.

1. Couplings.
Couplings for the Casagrande Piezometer tip shall consist of the same material as the piezometer tip and shall be threaded. The couplings shall conform in design to the couplings recommended by the manufacturer of the piezometer tip.

2. Perforations.
The slot size and open area of the perforations shall be selected by the Contractor to meet the requirements of this Specification.

B. Riser Pipe.
The riser pipe shall be watertight flush-joint Schedule 40 PVC or equivalent. O-rings shall be installed as part of the casing threads. Couplings to the piezometer tip and between riser pipe sections shall be as specified in Article 150323.02, A, 1.

C. Filter Pack.

1. Material for the filter pack around the riser pipes and piezometer tip shall be a washed sand and gravel composed of hard, tough, and durable particles free from adherent coating. The filter pack shall not be crushed stone. The filter pack material shall contain no detrimental quantities of organic matter nor soft, friable, thin, or elongated particles in accordance with the quality requirements in Sections 4110 and 4115 of the Standard Specifications. The filter pack shall not include any particles that cause encrustation of the piezometer tip by dissolution or precipitation. Iron based materials are not acceptable.

2. The filter pack shall be designed by the Contractor and the gradation shall be submitted to the Engineer for approval.

D. Piezometer Cap.
The piezometer cap shall conform to the requirements specified in the water wells standards applicable to the State of Iowa.

E. Concrete.
Concrete shall be Iowa DOT Class C Portland Cement Concrete (Section 2403 of the Standard Specifications).

F. Cement/Bentonite Grout.
Cement/bentonite grout shall consist of Type 1 Portland cement conforming to ASTM C 150, clean potable water, and sodium bentonite powder portioned as follows:

- 94 LB of Portland cement.
- Not more than 7.5 GAL of water.
- 4 LB of bentonite powder.
- Add bentonite following mixing of cement.

G. Bentonite Seal.
Bentonite seal shall consist of pellet form of sodium bentonite.

H. Submittals.
Approval is required for the following submittals prior to installation:

1. Qualifications.
Piezometer installation shall be done by an Iowa DNR Certified Well Contractor. The well contractor and its foreman shall have at least 5 years of continuous experience in the installation of piezometers.

2. Product Data.

- Casagrande piezometer.
- Riser Pipe.
- Approved filter pack material and its gradation, before it is placed.
- Concrete and/or grout for backfill above filter pack.
- Cement grout mixture proportion to be used in plugging abandoned piezometers.

3. Documentation.

- Boring log of each piezometer.

150323.03 CONSTRUCTION.

A. Quality Assurance.

All Work performed by the Contractor shall be in accordance with Division 11 of the Standard Specifications and with the State and Municipal statutory and regulatory requirements for subsurface drilling and piezometer installation.

B. Project/Site Conditions.

1. Subsurface Conditions.

Refer to the Q Sheets for information on the subsurface conditions.

2. Obstructions Encountered.

If obstructions are encountered in the foundation which, in the opinion of the Engineer, render it impracticable to complete the piezometer to the directed depth, the Engineer may adjust the depth. Alternatively, the Engineer may direct the Contractor to abandon the piezometer, plug the hole by backfilling with approved material by an approved procedure, and construct another piezometer at an adjacent site.

3. Water Supply.

Clean, fresh, potable water shall be used for drilling and piezometer installation.

C. Piezometer Location and Details.

Install the piezometers at the locations shown on the Q sheets and listed in the CS Sheets. The elevation of the piezometer tip is listed in the CS Sheets. The piezometer tip and riser pipe shall conform to the piezometer installation detail and the dimensions shown on Sheet Q.20.

D. Drilling and Logging.

Piezometers may be drilled by the hollow stem auger method or other approved method, which will insure proper placement of the piezometer tip, riser pipe, and filter pack. Methods which involve radical displacement of the formation, or which may reduce the yield of the piezometer, will not be permitted. Excavated material shall be disposed of off site at no cost to the Iowa DOT. All boreholes where a piezometer shall be installed shall be logged, and the boring log shall be submitted with the installation log of the piezometer. Boring logs shall be logged per ASTM D 2488 standard with sampling at 5 foot intervals.

E. Installation of Riser Pipe and Piezometer.

1. Assembly.

All riser pipe and piezometer shall be in good condition before installation and all couplings and other accessory parts shall be securely fastened in place. The successive lengths of pipe shall be arranged to provide accurate placement of the piezometer tip in the bore hole. The riser pipe shall be provided with an approved cap, the top of which shall be set at the elevation directed or shown. Centralizers shall be attached to the assembled riser pipe and piezometer tip in such numbers and of a type that they will satisfactorily center the riser pipe and piezometer tip in the bore hole and will hold it securely in position while the filter pack material is being placed.

2. Joints.

Sections of piezometer pipe shall be joined together as specified in Article 150323.02, A, 1. Joints shall be designed and constructed to have the strength of the pipe and a strength capable to support the weight of the entire piezometer as it is lowered into the hole.

3. Installation.

The assembled piezometer shall be placed in the bore hole in such manner as to avoid jarring impacts and to insure that the assembly is centered and not damaged or disconnected. The piezometer shall not be driven or forced into position. The Casagrande Piezometer tip should be suspended in the hole and not resting on the bottom of the hole.

After the piezometer has been placed, a filter pack shall be constructed around the piezometer tip as specified in Article 150323.03, F. The top of the riser pipe shall be held at the designated elevation during placement of the filter pack. Piezometer shall be set plumb and true to line.

F. Filter Pack Placement.

After the piezometer tip and riser pipe have been installed, the filter pack material shall be placed by tremie, when using approved filter pack material, in an approved manner such that segregation will not occur. The material should be placed around all sides of the piezometer tip to assure that the no part of the piezometer is pushed against the side of the bore hole and come in contact with foundation material or prevent the proper thickness of filter from being placed uniformly around the piezometer tip. The filter pack shall have a minimum thickness of 3 inches between the outside of the piezometer tip and the natural formation. The filter pack shall be placed at a constant rate from the start of placement until it has reached the elevation provided on the CS Sheets.

G. Construction of Piezometers Above Existing Grade.

Install the piezometers prior to the embankment fill being placed and incrementally add new riser pipe sections as needed as new fill is being placed (see piezometer detail in Q Sheets). Compact within 3 feet of piezometers with hand-operated equipment (no heavy equipment). Compaction around piezometers should be uniform on all sides to keep piezometers relatively vertical. The axis of the completed piezometer shall not deviate more than 10 degrees from vertical. Flag and protect all piezometer locations. In case of damage to the piezometer, the damaged items shall be replaced at no additional cost to the Iowa DOT.

H. Plugging of Abandoned Piezometers.

1. Piezometers that have become damaged or nonfunctional or are no longer needed at the completion of construction shall be abandoned in accordance with Article 2538.03, D, 8 of the Standard Specifications and with the requirements below.

2. The piezometer shall be grouted from the bottom of the piezometer tip to within 3 feet of ground surface. After the grout has setup the riser pipe shall be cutoff 3 feet below ground. Then the hole shall be backfilled.

I. Reports and Registration.

Include in the reports for each piezometer logs of the boring, elevation of the tip, elevation of the top of riser pipe, filter pack gradation, quantity of filter pack added during development, and report of backfilling. The elevation of changes between materials on these logs shall be to the nearest 0.1 foot. The log of backfill material shall include the filter pack particle size distribution test data, and notes concerning installation. Submit an installation report and register each piezometer installation with the Iowa DNR and any other appropriate public agency in the form required by state statutory and/or regulatory requirements.

J. Initial Monitoring.

The Contractor shall take initial readings within 24 hours after completing installation and testing of each piezometer and prior to placement of any embankment fill. Readings shall consist of a minimum of one reading per 24 hours during placement of fill and all holding periods. Contractor shall submit piezometer readings to the Engineer who will review the data and make a determination of soil strength gain and actual holding periods on embankment fill placement. The following example table lists the data which shall be collected during piezometer monitoring and provided to the Engineer.

Piezometer No.	Date/Time of Reading	Depth to Ground Surface from Top of Casing (feet)	Depth to Water from Top of Casing (feet)	Top of Casing Elevation (feet)	Elevation of Water (feet)	Elevation of Ground Surface (feet)	Height of Fill Placed (feet)

A completed copy of this table of piezometer monitoring shall be submitted to the Engineer at the end of each week. More or less frequent submittals may be required depending on the results of the piezometer monitoring.

150323.04 METHOD OF MEASUREMENT.

Piezometers installed as specified per the contract documents will be paid for as a lump sum.

150323.05 BASIS OF PAYMENT.

Payment for the Piezometers will be at the lump sum price. Payment is full compensation for furnishing, installing, monitoring, and abandonment of each Piezometer as shown in the contract documents. Compensation will be made for 75% of the lump sum price at the time that all piezometers are installed. Compensation will be made for the remaining 25% of the lump sum price upon completion of monitoring and approved abandonment of all piezometers.