

Special Specification 5124

Settlement Gauge



1. DESCRIPTION

Install, maintain, monitor, and abandon Settlement Gauges.

2. MATERIALS

2.1. **Settlement Gauge Elements.** Ensure that all materials and construction methods necessary to complete the installation conform to the requirements of this Item, the plans, and the pertinent requirements of the following Items:

- Item 441, "Steel Structures"
- Item 445, "Galvanizing."

2.1.1. **Base.** Provide a minimum 1/2 in. thick steel plate, 36 in. square in size, and a standard threaded galvanized steel riser pipe welded to the base plate.

2.1.2. **Riser Pipe.** Provide a standard threaded galvanized steel pipe in accordance with ASTM A53 Type F.

3. CONSTRUCTION

3.1. **General.** Furnish, install, maintain, and subsequently abandon settlement gauges at locations designated on the plans, for the purpose of obtaining settlement data for the settlement area. Work also consists of weekly monitoring of settlement gauges during and following placement of drainage sand blanket, Wick Drains, and other associated construction elements.

3.2. **Base Plate Fabrication.** Weld steel riser pipe perpendicular to the 1/2 in. thick steel plate, 36 in. square base at its center. The fabricated Settlement Gauge base plate will be approved before the placement of the sand blanket, Wick Drain installation, and walls and embankment construction.

3.3. **Benchmarks.** Place Benchmarks registering their coordinate locations and elevations to the nearest 0.01 ft. elevation in near proximity to Settlement Gauges before settlement plates installation. Benchmarks must be located enough outside of the zone of stress-settlement influence, from the settlement area, and other on-going construction activities. The method of preserving the control points is subject to review and approval. Approval will not relieve the Contractor from the responsibility for the correctness of the survey work by their subconsultant licensed surveyor. Plan cross-sections must not be permitted as a means to establish benchmarks or initial plate elevation readings for vertical or horizontal control.

3.4. **Installation.** Furnish and install Settlement Gauges as shown on the plans at locations designated on the plans. Place Settlement Gauge base plate on a minimum of 1 in. thick sand leveling course, with the sand leveling course extends a minimum of 1 in. in all directions beyond the edges of the base plate. Extend the metal pipe by adding pipe sections at threaded couplings as the embankment is progressed. Fill the inner annulus between steel pipes with enough lubricant grease to prevent rust from occurring and resulting in binding of the inner pipe to the outer sleeve. Make sure that the top of the extension section is at least 1 ft. above the embankment surface and no higher than 6 ft. Make the exposed length of pipe conspicuous to avoid chance of damage.

The Contractor must notify the Engineer a minimum of one day in advance to and immediately upon completing each installation. Provide updated elevation readings at the end of each day's activities to the Engineer.

- 3.5. **Repair damage to Settlement Gauges.** Conduct operations in such a manner that the gauges are not damaged. Compact fill around the gauge pipes and plates to the same density as the surrounding material. Restore or replace any settlement gauge pipe damaged or destroyed due to fault or negligence on the part of the Contractor at no additional cost. No additional payment will be made for compaction of fill around and over the settlement gauges or for interference with the Contractor's operations resulting from settlement gauge installations. Perform installation operations such that the pipe remains plumb.

If Settlement Gauges become damaged or blocked through failure on the part of the Contractor to use care in his operations, the settlement gauges must be replaced, cleaned out, or reset as directed. Repair damage to Settlement Gauges caused by Contractor operations at the Contractor's expense. Repair work for damage that was not due to the Contractor's operations will not be paid for except as set forth in the Contract or as directed.

- 3.6. **Monitoring and Documentation.** No fill material should be placed around settlement gauges until the elevation of the top of the new riser section has been determined by the Contractor's surveyor. The distance from the top of plate to the top of pipe should be accurately measured and recorded by the Contractor's surveyor. The Contractor's surveyor must obtain settlement readings each week during drainage sand blanket and wick drain installation, wall construction, and embankment fill placement.

Contractor's surveyor may adjust frequency to obtain settlement readings, upon approval, from once a week to once every other week after all embankment components have achieved finish grade elevation. Readings must continue at this frequency until the Engineer advises Contractor that enough time has occurred for settlement compared to settlement curves.

The Engineer will evaluate the settlement readings as they are taken to compare to the site-specific predicted settlement curves, to determine whether the settlement rate has slowed to an acceptable rate such that post-construction settlement would be within predicted and tolerable limits.

Settlement readings at settlement gauges must subsequently continue at a frequency of once every month for a period of 6 additional months, or until suspended by Engineer.

The Engineer may perform occasional concurrent monitoring of selected settlement gauge installations.

- 3.7. **Surcharges and Waiting Periods.** Place surcharge embankments at locations shown on the plans. Unless required otherwise in the Contract, surcharge embankments after embankments are constructed to the grade and cross-section shown on the plans. Surcharge waiting periods apply to surcharge locations shown on the plans and begin after surcharges are constructed to the height shown on the plans. Once the determination is made that the total settlement and reduced rate of settlement has been achieved, or the minimum settle period has expired, the Engineer will advise the Contractor, in writing, that installation of the roadway pavements and appurtenant facilities may commence for the settlement area reflected on the plans.

The Contractor must obtain the approval of the Engineer to discontinue settlement readings and abandon specific settlement gauges in place.

- 3.8. **Abandonment.** Upon approval, abandon all settlement gauges in-place. Cut off and remove all steel pipe to a minimum of 3 ft. below finished grade and then inject under pressure a cement-based grout into both the inner steel riser pipe and the outer steel protective sleeve until completely filled.

4. MEASUREMENT

Settlement gauges installed as prescribed by this Specification will be measured by each settlement gauge complete and installed in place.

5. PAYMENT

Work performed and materials furnished, as prescribed by this Specification and measured under "Measurement," will be paid for at the unit price bid per each "Settlement Gauges," which price will be full compensation for furnishing and installing all settlement gauges and for all manipulation, labor, tools, equipment, and incidentals necessary to complete the work, except as hereinafter specified.