INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS AND TESTS

INSTALLATION AND ABANDONMENT PROCEDURES FOR INCLINOMETER
No. 518-23

1.0 SCOPE.

1.1 This test method covers the procedures for use Installation and Abandonment of Inclinometers

1.2 This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 AASHTO STANDARDS

R 45 Standard Practice for Installing, Monitoring, and Processing Data of the Traveling Type Slope Inclinometer

3.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101, and R 45.

4.0 SIGNIFICANCE AND USE. This ITM is used to install, monitor, and protect the slope indicator borehole by backfilling safely.

5.0 APPARATUS.

5.1 Drilling rig capable of drilling a hole with a minimum diameter of 8 inches in accordance with INDOT Geotechnical Design manual.

5.2 Guide casing, only round plastic or aluminum, with four equally spaced longitudinal grooves on the inside of the casing compatible with the particular torpedo sensor used. Other types of casing may only be used with prior written approval from INDOT.

5.3 Protective device and casing to minimize vandalism and large enough to allow the cable clamp-guide wheel assembly to be installed on top of the casing. A steel pipe with either a threaded cap or lockable hinged lid shall be used.

5.4 Couplings may be extruded plastic with four equally spaced grooves.

5.5 Slurry mixture of neat cement grout consisting of 94 pounds of Portland cement mixed with no more than 6 gallons of water will be permitted. No more than 5% by weight, of additives to improve fluidity will be allowed.

5.6 Slope inclinometer senor and assembly.

6.0 PROCEDURE.

6.1 Drill borehole to a minimum of 10 feet (or as directed by engineer) into sound rock to achieve sufficient rigidity. The inclinometer casing should be extended at least 10 feet past the farthest anticipated failure plane to insure the readings at the end of the casing do not show movement. When rock is not encountered, casing should be installed as directed by the INDOT Geotechnical Engineering Division.

6.2 Clean borehole by flushing with water or blowing compressed air before attempting to install the inclinometer casing. Depending on installation, drilling mud, if used, may be left in place to control caving and allow for proper backfilling.

Note 1 – If the borehole is likely to cave, hollow stem augers may be left in place and pulled after installation of the inclinometer casing. This condition occurs when drilling is either performed through new fill or non-plastic soils. Presence of ground water may also cause the caving.

Note 2 – If drilling mud was used and causes difficultly seating the casing completely in the borehole, this situation may be remedied by filling the casing with potable water

6.3 Assemble and install inclinometer casing as specified by the manufacturer's instruction manual.

Note 3 – Orientation of the casing tracking grooves should be properly maintained throughout installation. The grooves should be oriented parallel and perpendicular to the anticipated direction of movement, or at the discretion of the engineer. The groove orientation of different inclinometers in the same project area shall be consistent to avoid confusion.

Note 4 – Each joint shall be coupled properly to prevent intrusion of slurry backfill.

6.4 Backfill around installed casing with slurry mixture. The slurry mixture shall be pumped into the borehole from the bottom in a continuous operation to prevent voids in the backfill.

Note 5 – Care shall be taken to maintain proper orientation of the slope inclinometer casing while backfilling.

6.5 Installing protective device consists of providing a metal protective outer covers for inclinometer casing. These shall be a minimum of 4 inches diameter pipe, or square metal casing, approximately 3 ft. long, and shall be anchored in a concrete pad 3 ft. in diameter and 1 ft. thick, and shall have less than 2 ft. exposed above the ground surface and shall be supplied with a lockable metal cap.

6.6 Monitor slope inclinometer guide casing with slope inclinometer sensor.

Note 6 – After casing is installed, the initial readings should be deferred at least 24 hours to allow the slurry mixture to settle and the casing to stabilize.

Note 7 – Refer to individual manufacturer's operating manual for recording data and data reduction.

6.7 The borehole shall be properly abandoned when the monitoring period has ended. The casing shall be abandoned using bentonite slurry or neat cement to within 2 feet of the ground surface in accordance aquifer protection guidelines. Care should be taken to ensure the entire casing is adequately grouted and protective casing is removed. The casing shall be terminated and capped with concrete.

7.0 DOCUMENTATION.

7.1 Average of three readings shall establish the reference point.

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