SP-150907
(New)

SPECIAL PROVISIONS
FOR
MODULUS VERIFICATION USING ROLLER MAPPING OF PAVEMENT FOUNDATION LAYERS

Plymouth County
NHSX-075-2(99)--3H-75

Effective Date
October 18, 2022

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.

150907.01 DESCRIPTION.

A. This work consists of in situ verification of modulus for the pavement foundation layers through use of an instrumented roller. Modulus verification using roller mapping shall be performed on the following:

- Top three lifts of select soil subgrade treatment (if special backfill option is used, then both lifts of special backfill and top of compacted soil below the special backfill),
- Areas of cement treatment (to be mapped 24 to 72 hours after treatment).
- Other areas for additional mapping provided by the Engineer (such as remapping of areas or mapping of granular subbase or lower lifts of soil).

B. Modulus verification roller mapping will be accomplished using the Contractor's vibratory smooth drum roller(s) outfitted with an instrumentation kit provided by the Engineer. Modulus verification roller mapping will be completed at the surface representing the top of each compaction lift after meeting the project's compaction specification requirements.

C. Map results will be used by the Engineer to identify low modulus areas for stabilization (cement treatment per Special Provisions for Cement Treated Subgrade or subgrade stabilization material per Section 2113 of the Standard Specifications) or additional mapping.

150907.02 EQUIPMENT.

A. The roller(s) shall meet the following minimum requirements:

1. Machine Type: Self-propelled smooth drum vibratory roller with secure enclosed cab (e.g., Caterpillar CS56B or equivalents).

2. Weight: Operating weight of at least 24,000 pounds.

3. Drum Width: 84 inches.

4. Vibration Settings: Nominal amplitude range of 0.03 inches (low vibration) to 0.08 inches (high vibration) and nominal frequency range of 30 Hz.

B. Roller(s) shall be available for the duration of the pavement foundation layer construction. The Contractor shall determine the number of roller(s) needed for their operations.

C. The modulus verification roller mapping instrumentation kit to be installed by the Engineer on the roller(s) and provided by the Engineer will involve:

1. Mounting a temporary computer screen in the roller cab to display to the roller operator a color-coded modulus map.

2. Mounting a temporary computer box in the cab to transmit data automatically.

3. Mounting temporary RTK-GNSS antennas secured to the top of the roller cab for recording position.

4. Mounting a set of sensors temporarily to the roller to measure modulus.

150907.03 CONSTRUCTION.

A. Perform modulus verification roller mapping on areas noted in Description section.

B. Smooth the surface prior to mapping. Perform mapping in such a way that it covers the full extent of the compaction work area. Overlapping between adjacent roller lanes shall be approximately 10% at a minimum. Keep roller speed and vibration settings (frequency and amplitude) constant during roller operations and within range of the requirements provided during site-specific operator training. Modulus verification roller mapping results will be reported for forward driving direction only unless the roller is calibrated by the Engineer for mapping in reverse direction.

C. Each completed map shall be a minimum length of 300 feet and the entire width of the compaction work area, unless approved otherwise by the Engineer.

D. Modulus verification roller mapping performed on the granular subbase shall be limited to two vibratory roller passes, unless directed by the Engineer, and completed prior to final trimming.

150907.04 SETUP AND TRAINING.

A. Make the roller(s) available for one day (8 hours) to the Engineer for installation of the modulus instrumentation kit provided by the Engineer and one day to remove the kit prior to roller(s) leaving the project site. Coordinate the schedule and location for installation of the kit at least 2 weeks prior to the install date.

B. Required classroom and on-site training will be provided by the Engineer. Coordinate training prior to initiating modulus roller mapping, and then as needed during the remaining operations. Contractor’s personnel available for training shall include the Project Manager and roller operator(s). The Engineer will provide a location for the on-site training. Training shall be a maximum of 4 hours in duration. Coordinate the schedule and location for training at least 2 weeks in advance.

C. Operator training shall include the following:

1. Background information for the specific modulus inspector kit to be installed.

2. Setup and checks for the modulus inspector kit and RTK-GNSS equipment operation.

3. Operation of the mapping system on the roller, i.e., start/stop of data recording, and on-board display options.

4. Operation of computer screen and understanding of real-time results to achieve modulus target values.

150907.05 MEASUREMENTS, OUTPUT, AND REPORTING

A. The modulus verification roller mapping results will be calibrated using independent in situ testing provided by the Engineer. The map reports will include a compaction report showing the color-coded modulus roller mapping results from each work area and will be available electronically, using a smart phone, tablet, or computer, to the Contractor and Engineer personnel. The complete record of results, containing all map reports, will be available to the Contractor through a free web application.

B. The results of the modulus maps will be used by the Engineer to identify low modulus areas for stabilization (cement treatment per Special Provisions for Cement Treated Subgrade or subgrade stabilization material per Section 2113 of the Standard Specifications) or additional mapping. The modulus map report results will be available to the Contractor in near real-time using a project specific web link. The location for stabilization or additional mapping as determined by the Engineer will be based on the mapping record and will be provided to the Contractor. Typical use of cement treatment will be in the top 12 inches of soil, and typical placement of subgrade stabilization material will be on top of the select soil subgrade treatment.

C. Perform modulus verification roller mapping of cement treated areas 24 to 72 hours after treatment.

150907.06 METHOD OF MEASUREMENT.

Measurement for the quantities of the items associated with modulus verification roller mapping operations will be as follows:

A. Roller Equipment for Modulus Verification Roller Mapping
Lump sum.

B. Modulus Verification Roller Mapping Operations.

1. Measurement for the locations noted in the Description section, for each lift mapped in the mapping report:
- **a.** Top of subgrade treatment: Based on the total area as shown in the plans for the subgrade treatment.
- **b.** Areas of cement treatment: Based on areas identified by the Engineer.
- **c.** Other areas for additional mapping: Based on areas provided by the Engineer.

2. Areas not successfully mapped will be deducted. Additional areas mapped by the Contractor while maneuvering or turning the roller will not be measured for payment.

150907.07 BASIS OF PAYMENT.

Payment will be the contract unit price for the items associated with modulus verification roller mapping operations as follows:

A. Roller Equipment for Modulus Verification Roller Mapping

1. Payment for roller equipment will be lump sum contract price.

2. Payment is full compensation for:
- **a.** Providing the roller(s) for the duration of the pavement foundation layers work period.
- **b.** Furnishing trained operators.
- **c.** Making each roller available for hardware kit installation and hardware removal.
- **d.** Making each roller and operator available for training.

B. Modulus Verification Roller Mapping Operations.

1. Per square yard.

2. Payment is full compensation for all work associated with modulus verification roller mapping using the equipped roller(s).