



**SPECIAL PROVISIONS
FOR
ROLLER MAPPING OF ASPHALT MIXTURE COMPACTION**

**Linn County
NHSX-100-1(51)--3H-57**

**Effective Date
January 20, 2016**

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

150067.01 DESCRIPTION.

- A.** This specification describes the Contractor's responsibilities for furnishing properly equipped asphalt rollers, for the purposes of data acquisition and transmittal to the Engineer. Roller Mapping of Asphalt Mixture Compaction involves gathering of data from all rollers in the compaction train. For all rollers, the data to be measured and recorded includes roller location/position, travel direction, date/time, speed, surface temperature, and pass count. For steel drum vibratory rollers, the data also includes measurement and recording of vibration frequency and vibration amplitude. Real Time Kinematic (RTK) based Global Positions System (GPS) with base station corrections shall be used for determining the position of the roller. Results from the roller mapping process shall be displayed to the roller operator on a color coded computer screen in real-time during roller operations and the data saved for transfer and viewing by the Engineer.
- B.** Submit a Work Plan to the Engineer at least 2 weeks prior to the Preconstruction Conference. Describe in the work plan the following:
1. All rollers to be used including:
 - Vendor
 - Roller model,
 - Roller dimensions and weights,
 - Description of roller mapping/measurement system,
 - GPS capabilities,
 - Documentation system,
 - Temperature measurement system, and
 - Software.
 2. Roller data collection methods including sampling rates and intervals and data file types. Submit a sample of the system data file to the Engineer for formatting approval.

3. Transfer of data to the Engineer including method, timing, and personnel responsible. Data transfer shall occur at the end of the project or as otherwise directed by the Engineer.

150067.02 EQUIPMENT.

Supply appropriate numbers (and types) of rollers and other associated equipment necessary to complete the compaction requirements for the specific materials. Ensure that the equipment is in satisfactory mechanical condition and can function properly during production, placement and compaction operations.

A. Rollers.

Ensure all rollers on this project meet the following specific requirements.

1. Equip all rollers with non-contact temperature sensors for measuring pavement surface temperatures.
2. Mount on each roller RTK based GPS radio and receiver units to monitor the drum locations and track the number of passes of the rollers.
3. Equip all rollers with an integrated on-board documentation system that is capable of storing and displaying real-time measured values including location of the roller, number of roller passes, pavement surface temperatures, roller speeds, vibration frequencies and vibration amplitudes of roller drums. The data acquisition unit shall be capable of transferring the stored data by means of "cloud" (remote data server) or a USB port.

B. Data Collection, Export, and Onboard Display.

1. Provide and export the following data in a comma or semicolon delimited ASCII file format:
 - Machine Model, Type, and Serial/Machine Number
 - Roller Drum Dimensions (Width and Diameter to the nearest 0.1 feet)
 - Roller and Drum Weights (pounds)
 - File Name
 - Date Stamp YYYYMMDD, example=20160701
 - Time Stamp HHMMSS.S, example=090504.0 (9 hr. 5 min. 4.0 s.)
 - GPS measurements showing Longitude, Latitude,, and Elevation
 - Longitude (decimal degrees with at least 6 significant digits), example=94.859204
 - Latitude (decimal degrees with at least 6 significant digits), example=45.227773
 - GPS mounting position on roller. Distance from the left edge of the drum to the nearest 0.1 feet where the GPS measurement is taken.
 - Roller Travel Direction (e.g., forward or reverse)
 - Roller Speed (feet per second)
 - Vibration Setting (i.e., On or Off)
 - Vibration Amplitude (inches)
 - Vibration Frequency (hz)
 - Surface Temperature (°F)
2. Ensure that roller mapping equipment can measure roller position, travel direction, date/time, speed, vibration frequency, vibration amplitude, number of roller passes, and surface temperature. Provide a computer screen in the roller cab for viewing measured results. Ensure that results are displayed as color-coded spatial maps based on GPS coordinates, and that such results are stored for transfer to the Engineer for viewing on a laptop/personal computer upon request. Provide the Engineer with a copy of the roller vendor software, if needed for viewing results.

C. Local GPS Base Station.

Provide a Real Time Kinematic Global Positioning System (RTK-GPS) to acquire northing, easting, and elevation data used in mapping of roller measurements. Ensure the system has the capability to collect data in an established project coordinate system. Furnish a local GPS base station used for broadcasting differential correction data to the rollers with a tolerance less than 0.1 feet in the vertical and horizontal.

An acceptable alternative to the RTK-GPS will be a GPS system with Correction Service Subscription (CSS). CSS is a service that can be subscribed to receive VRS signals in order to achieve higher accuracy GPS positioning normally via cellular wireless data services; i.e., without the need for a ground-based base station. Examples of GPS Correction Service subscriptions are: Trimble VRSTM, Trimble VRS NOWTM, and OmniSTAR.

150067.03 CONSTRUCTION.**A. Construction Requirements.**

1. Install and operate equipment in accordance with the manufacturer's specifications.
2. Verify the sensors and GPS is working within the requirements of this Special Provision and as requested by the Engineer.
3. For areas under Class I compaction per Section 2303 of the Standard Specifications, conduct roller mapping with data collection on all driving lanes for each lift during the asphalt compaction operation.

B. Equipment Breakdowns.

In the event of roller breakdowns, roller mapping system malfunctions and/or GPS problems, the Contactor may temporarily operate with conventional rolling operations; but roller mapping data shall be collected and provided for a minimum 80% of the project's mainline lanes.

C. Data submittal.

Furnish to the Engineer an electronic file in ASCII file format with information listed under Article 150067.02, B. Transfer the data to the remote data server or if automatic data transmission is not available, transfer the data to the Engineer immediately following completion of the project. The Engineer may request data at any time during compaction operations. The Engineer may require re-submittals for data not in the correct format.

150067.04 METHOD OF MEASUREMENT.

Roller Mapping of Asphalt Mixture Compaction will not be measured, as it will be paid as a lump sum.

150067.05 BASIS OF PAYMENT.

- A. Payment for Roller Mapping of Asphalt Mixture Compaction will be the contract lump sum price.
- B. Payment is full compensation for all costs related to providing the GPS system, equipped rollers, transmission/transfer of electronic data files, one copy of roller vendor software, and any other equipment required for the roller mapping process. All quality control procedures including rollers and GPS systems representative's technical support and on-site training shall be included in the contract lump sum price.
- C. Delays due to GPS satellite reception of signals to operate the roller mapping equipment or roller breakdowns will not be considered justification for any adjustment to the contract lump sum price or to contract time.