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OKLAHOMA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION
FOR
INTELLIGENT COMPACTION OF ASPHALT

These Special Provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric.

411.01 DESCRIPTION *(Add the following:)*

This work consists of the compaction of the asphalt mixtures utilizing intelligent compaction (IC) rollers within the limits of the work as described in the plans. Intelligent compaction is defined as a process that uses vibratory rollers equipped with a measurement and documentation system that automatically records various critical compaction parameters in real time during the compaction process. Intelligent compaction uses roller vibration measurements to assess the mechanistic properties of the compacted materials to ensure optimum compaction is achieved through continuous monitoring of the operations.

Intelligent compaction applies to all asphalt on the project with the exception of drives, tapered transitions associated with shoulders, ramps, acceleration, deceleration, climbing and turn lanes, and short isolated pavement areas requiring handwork.

411.03 EQUIPMENT

G. Compactor *(Add the following:)*

Supply sufficient numbers of rollers and other associated equipment necessary to complete the compaction requirements for the specific materials. Ensure that at least one IC roller is used. The required position for an IC roller is in the initial phase (breakdown) in the paving sequence. Use any additional IC rollers in the intermediate phase.

Provide the supplier, make, model, and unique identifier of the GPS system to be utilized. Sufficient training for the operator(s) shall be supplied by a representative of the manufacturer of the equipment.

(1) Breakdown Roller Global Positioning System (GPS) Requirements

Provide IC breakdown rollers equipped with GPS radio and receiver units to monitor the equipment locations and track the number of roller passes. GPS receivers shall utilize the Universal Transverse Mercator (UTM), or the Oklahoma State Plane coordinate system, and have a survey tolerance of not greater than 3.0 in [76.2 mm] in both the horizontal (x and y) directions. Once declared, utilize the same coordinate system for all rollers for the entire project.

Utilize GPS data in the following format:

Data	Format	Example
Time	Military local time zone	hhmmss.ss
GPS	Latitude/Longitude degrees/minutes, or decimal degrees	 ddmm.mmmmmmmm dd.dddddddd
Grid	Feet	0.25 ft

(2) Intelligent Compaction Measured Values (IC-MV)

Provide vibratory type IC breakdown rollers equipped with accelerometers to measure the interaction between rollers and compacted asphalt in order to evaluate the applied compaction effort. The output from the roller is designated as the Intelligent Compaction Measurement Value (IC-MV), which represents the stiffness of the materials based on the vibration of the roller drums and the resulting response from the underlying materials.

(3) Temperature Measurement

Provide IC breakdown rollers equipped with non-contact temperature sensors for measuring pavement surface temperatures.

(4) Integrated On-Board Documentation System

Provide IC breakdown rollers equipped with an on-board documentation system that is capable of displaying real-time color-coded maps of IC measurement values, including the stiffness response values, location of the roller, number of roller passes, pavement surface temperatures, roller speeds, vibration frequencies, and amplitudes of roller drums. Ensure that the display unit is capable of transferring the data by means of a USB port. Ensure the produced data files are compatible with the latest version of Veda IC data analysis software, available at www.intelligentcompaction.com.

H. Hand-Held Rovers

Provide a GPS system (including GPS receivers on equipment and handheld GPS receivers (i.e. Rovers)) that makes use of the same reference system that can be a ground-based base station or network-RTK (network-Real-Time Kinematic), to achieve RTK-GPS accuracy. Examples of combinations are:

- GPS receivers on equipment and hand-held GPS rovers referenced to the same on-ground base station.
- GPS receivers on equipment and hand-held GPS receivers referenced to the same network-RTK.

411.04 CONSTRUCTION METHODS

K. Compaction *(Add the following:)*

(4) Intelligent Compaction

(a) ***GPS Setup***

Prior to the start of production, the Contractor and representatives of the GPS and equipment manufacturer shall ensure that the equipment is set up and operating properly.

Conduct GPS setup daily during production operations to ensure consistency and accuracy of GPS measurements for all GPS devices prior to the compaction operation.

(b) ***Quality Control During Rolling***

In addition to any other QC responsibilities, the Contractor is responsible for the following:

- Daily GPS check testing for the equipment and rover(s).
- Establishing target number of passes using data from standard testing devices (i.e. nondestructive density gauges, roadway density cores, and roller(s)).
- Using hand-held GPS rovers to determine the GPS coordinates of the selected roadway density core locations.
- Monitoring the equipment location during paving operations, and the operation of the entire GPS system on the project site.
- Quality control testing to monitor the pavement temperature.
- Downloading and analysis of the data from the roller(s) daily.
- Daily Setting-up, taking down, and securing storage of GPS and equipment components daily.

(c) ***Materials Sampling and Testing***

Construct a test strip in accordance with Subsection 411.04.D of the Standard Specifications. Roll the test section at 100% coverage with optimal number of roller passes to achieve acceptable roadway density.

Ensure a minimum coverage of 90% of the mat for the total project meets or exceeds the optimal number of roller passes when analyzed using Veda software.

As a minimum, obtain the data from the equipment two times per day of asphalt compaction operations. Ensure the data is date and time stamped permitting external evaluation at a later time. The data may be requested at any time by the Engineer.

Provide access to the raw data and results from the analysis software to the Engineer within 24 hours of obtaining the data.

(d) ***Documentation***

Provide documentation of the manufacturer and model of the IC rollers used each day of paving. Note the relative positioning of the equipment in the paving operations.

Upon the completion of the first day's paving, at a minimum, provide the Engineer with the electronic data, including IC-MV, from the equipment and the data analysis software.

Export all data from the vendor's software on a daily basis. Following each work day or shift, operators shall make daily data files available to ODOT Materials & Research Division, and Residency personnel for review.

At the complection of the Contract, provide a summary of all equipment data, coverage area and uniformity, and color prints of all compaction data to the Department.

(e) ***Assistance and Training***

1) *Technical Assistance*

Coordinate for on-site technical assistance from the equipment representatives during the initial three days of production, and then as needed during the remaining operations. As a minimum, the equipment representative shall be present during the initial setup and verification testing of the equipment. The equipment representative shall also assist the Contractor with data management using the data analysis software including data input and processing.

2) *On-Site Training*

Coordinate for on-site training for Contractor and Department project personnel related to operation of the technology. Contractor's personnel shall include the paving superintendent, QC technicians (if applicable), and equipment operators. At a minimum, training topics are to include:

- Background information for the specific system(s) to be used
- Setup and checks for system(s), GPS receiver, base-station and hand held rovers
- Operation of the system(s) on the equipment (e.g. setup data collection, start/stop of data recording, and on-board display options)
- Transferring raw data from the equipment (e.g. via USB connections)
- Operation of vendor's software in order to open and view raw data files and export all-passes and proof data files in Veda-compatible format.
- Operation of Veda software in order to import the above exported all-passes and proof data files, inspect maps, input point test data, perform statistical analysis, and produce reports for project requirements.

411.05 METHOD OF MEASUREMENT *(Add the following:)*

Intelligent Compaction of Asphalt will be measured for payment on a Lump Sum basis.

411.06 BASIS OF PAYMENT *(Add the following:)*

The Department will pay for each pay item at the contract unit price per the specified pay unit as follows:

Pay Item:	**Pay Unit:**
INTELLIGENT COMPACTION OF ASPHALT	Lump Sum

The Lump Sum bid price constitutes full and complete compensation for all labor, materials, equipment and incidentals required to complete the work in a manner accepted by the Engineer.