

**STATE OF OHIO
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION 401
INTELLIGENT COMPACTION**

August 28, 2026

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401.01 Description. This work consists of using the Intelligent Compaction (IC) Method to continually monitor compaction during asphalt concrete paving operations.

401.02 Definitions. For this specification, these terms are defined as follows:

Gridded All Passes Data. Includes all measurement passes for a given grid.

Gridded Final Coverage Data. Data that summarizes the final (last) measurement pass recorded for a given grid (e.g. total pass count, last temperature). Grid sizes are typically at a mesh size of 1 foot (0.3 m) in the X and Y direction for post-processed data,

Instrumented Roller. A self-propelled roller integrated with a global position monitoring system and onboard documentation system that can display real-time color-coded maps of roller location, number of passes, roller speeds, and amplitude and vibration frequencies of the roller drum. Some systems are also equipped with drum vibration instrumentation, infrared temperature sensors, and automatic feedback control. The onboard documentation system on these rollers also displays real-time color-coded maps of stiffness response or pavement surface temperatures, or both.

Layer. The total thickness of each material type. It may be comprised of a single or multiple lifts.

Lift. A unit of material within a layer that is placed for compaction.

Measurement Pass. A roller pass, performed by an instrumented roller, where all required information is recorded in a data file.

Stationed Alignment. A stationed alignment matching the solid yellow inside line on a divided facility and the centerline on an undivided facility.

Tandem Rolling. The use of two or more instrumented rollers to complete one cumulative roller pass on a width of asphalt mat.

Veta. A standardized intelligent construction data management software that stores, maps, and analyzes geospatial data resulting from intelligent compaction, thermal profiling, spot test data, and other intelligent construction data sources. This software can perform standardized data

processing, analysis, and reporting to provide project summary results from various manufacturers of intelligent construction systems.

401.03 Equipment. Provide an IC system as follows:

A. IC System Supplier. Use an IC equipment supplier that can provide a qualified representative for on-site technical assistance during the initial setup, pre-construction verification, data management and processing, and as needed during the project to maintain equipment within specifications and requirements.

B. IC System Software. Provide the Engineer with access to the cloud storage and cloud computing before the start of compaction until 90 days after final acceptance of all work.

Use IC software and cloud computing and storage capable of collecting, mapping, and exporting gridded all passes and gridded final coverage data meeting the requirements of this specification and supporting the following features:

1. Filtering by instrumented roller, date and time stamp, and lot designation.
2. Creating boundaries.
3. Calculation of gridded final coverage data using filtered data (e.g. gridded final coverage for a given roller and lot; gridded final coverage within the entire project limits).
4. Retain the IC data and keep it available for download throughout the duration of the cloud storage requirement.

C. IC System Requirements. Use an IC system that functions independently from the paving crew during normal paving operations but requires an operator to initiate the start of data collection. After initializing the equipment, no operator attendance is required for continuous data collection.

Use instrumented rollers calibrated and installed according to manufacturer recommendations. Ensure the IC system meets the accuracy requirements of Table 401.03-1 and is instrumented with the following:

TABLE 401.03-1 IC SYSTEM ACCURACY

Parameter	Accuracy
GNSS	± 2 inches (50 mm) in the X and Y Direction
Rolling Speed	± 0.3 mph (0.5 kph)
Frequency	± 2 Hz
Amplitude	± 0.008 inches (0.2 mm)
Surface Temperature Readings	± 3.6°F (2°C)

1. Global Navigation Satellite System (GNSS) – Use a GNSS receiver with the ability to obtain positional corrections using the ODOT Real Time Network (RTN) or a Base-Rover real-time kinematic (RTK) system. Tie data to the most current version of the National Spatial Reference System (NSRS) through Ohio County Coordinate System (OCCS) Coordinates.

2. Cellular modem or Wi-Fi for transferring data to cloud storage.

3. Onboard Documentation System – Use an onboard documentation system with a minimum of the following capabilities:

a. Display (in real-time) color coded maps of line work (alignment file), roller drum location, number of roller passes, pavement surface temperature readings, and IC measurement value for systems with an accelerometer.

b. Displays and stores current value for roller speed, vibration frequency, vibration amplitude, GNSS coordinates, and pass count.

c. Ability to automatically transfer data to cloud storage. Ability to manually export data using a removable media device and the ability to store data locally when cell coverage is unavailable to be uploaded to the cloud later.

d. Allows the operator to define, label, and select the standardized name for each lot.

4. Accelerometer – Accelerometer data may be submitted but is not required to be collected and reported. If supplied, mount accelerometers in or about the drum, according to the manufacturer's recommendations, to measure the interactions between the rollers and compacted materials.

5. Temperature Sensor – Instrument rollers with one non-contact, temperature sensor, mounted on, or near, the front of the roller for measuring pavement surface temperatures. A second temperature sensor may be mounted on, or near, the rear.

IC systems from multiple manufacturers are permitted; however, use systems from the same manufacturer for tandem rolling.

D. IC Measurement Data. Ensure the IC system can export gridded all passes and gridded final coverage data in a file format compatible with Veta. Encrypt the data logged in the results files to prevent tampering or manipulation.

Include the information in Table 401.03-2 in the header of each data file or section. Include the fields in Table 401.03-3 with each data point.

TABLE 401.03-2 REQUIRED INFORMATION IN DATA HEADERS

Item No.	Description	Example Data included in Header
1	State Project Number, Highway and/or Section	IR 70

TABLE 401.03-3 REQUIRED FIELDS FOR EACH DATA BLOCK

Item No.	Data Field Name ^{[1] [2]}	Data Format Examples
1	Date Stamp (YYYYMMDD) ^[3]	20230701
2	Time Stamp (HHMMSS.S -military format) ^[3]	090504.0 (9 hr 5 min. 4.0 s.)
3	Roller Trade Name	Roller Model
4	Machine ID	Serial number, machine ID
5	Northing (Y) (ft) ^{[4] [5]}	153328.47
6	Easting (X) (ft) ^{[4] [5]}	524195.65
7	Height (Z) (ft) ^{[4] [5]}	909.85
8	GNSS Mode	RTK Fixed
9	Roller Pass Number (calculated from grid)	2

Item No.	Data Field Name ^[1] ^[2]	Data Format Examples
10	Roller Direction	Forward, Reverse (or an index)
11	Roller Speed	4.0
12	Vibration On	Yes, No, On, Off (or an index)
13	Frequency	38.4
14	Amplitude	0.6
15	Surface Temperature	120
16	IC Measurement Value (ICMV) ^[6]	20.0

^[1] Include measurement units in a header or as part of the field name.

^[2] Use a data mesh size of 18 inches (450 mm) or less in the X and Y direction for post-processed data.

^[3] Ensure the IC system's date/time stamp is reflective of the local time zone for both mapped and exported data.

^[4] Collect the coordinates, unless otherwise specified, in the most current version of the National Spatial Reference System (NSRS) through OCCS Coordinates.

^[5] Coordinates indicate the left and right edge of the roller drum or can be used to determine the left and right roller drum edge.

^[6] ICMV reporting is optional.

401.04 Intelligent Compaction Data Collection.

A. Stationed Alignment. If needed, the Department will provide a stationed alignment for loading into the onboard documentation system of each individual roller and into the cloud computing mapping software.

B. Lot Establishment. A lot is defined as all asphalt paving for a given day, lift, material type, centerline offsets, and direction of travel.

C. IC Measurement Passes. Complete measurement passes on **100 percent of each lift** of asphalt placed. IC measurement passes are not required on tapers, service interchange ramps, system ramps less than 2500 ft (760 m), cross-overs, driveways, roundabouts, non-continuous turn lanes, acceleration/deceleration lanes less than 2500 ft (760 m), and intersecting streets.

Turn data collection and recording off when not performing measurement passes. Provide the Engineer with immediate viewing of the measurement pass data on the instrumented roller's onboard documentation system upon request.

D. IC System Failure. System Failure occurs when the IC system does not collect or store data according to the requirements of this provision or the roller becomes inoperable. This includes loss of GNSS.

Immediately notify the Engineer when IC system failure occurs and immediately after resolution of the issues. Additionally, provide the Engineer with a written notification of the dates of IC system failure, along with a brief description detailing the IC system failure and the paving areas affected by this failure. Do not proceed with placement the next working day without a functioning IC system.

401.05 Submittals. Store the IC data internally until transfer of data. Transfer the IC data directly from the IC system to cloud storage within 15-minute intervals, or at least once per day when there is limited cellular coverage. Notify the Engineer when cellular coverage is limited or not available. Transfer the IC data directly to the Engineer at the end of daily paving when cellular coverage is not available.

401.06 Method of Measurement. The Department will measure Intelligent Compaction by the lump sum. Failure to provide daily IC measurement pass data for each roller will result in a deduction of \$1000 per lot.

401.07 Basis of Payment. Interruptions in the availability of Ohio RTN or satellite signals to operate this system will not result in adjustment to the “Basis of Payment” for any construction items or to Contract time.

The Department will pay for accepted work at the contract prices as follows:

Item	Unit	Description
690E98400	Lump Sum	Intelligent Compaction (IC)