

**TRAFFIC MONITORING SITE VEHICLE SENSOR - NON-WEIGHT APPLICATIONS.  
(REV 1-3-12) (FA 1-27-12) (1-13)**

PAGE 864. The following new Section is added after Section 715:

**SECTION 741  
TRAFFIC MONITORING SITE VEHICLE SENSOR  
(NON-WEIGHT APPLICATIONS)**

**741-1 Description.**

Install traffic monitoring site (TMS) vehicle sensors of the type and at the location shown on the Plans. Use vehicle sensors currently listed on the Department's Approved Products List (APL) and compatible with the electronics unit to which they will be connected.

**741-2 Type I Axle Sensor (In-Roadway).**

**741-2.1 General:** Ensure Type I axle sensors are installed in the roadway and secured using an adhesive bonding material listed on the APL.

Physical Characteristics, Type I Sensors	
Sensor Element Dimensions	6 feet to 8 feet in length (as specified in Plans), 3/16 inch to 3/8 inch in diameter (varies by manufacturer)
Sensor Element Material	Pressure sensing piezoelectric
Pavement Operating Temperature	0°F to +150°F
Output Signal	Minimum +200mV for passenger/pickup truck axle @ 70°F with less than 10% negative signal

**741-2.2 Installation Requirements:** Install sensors in accordance with the requirements of this Section and Design Standards, Index No. 17900. Use a chalkline or string and paint to layout the position of the sensor and lead-in cable slots. Ensure the saw cuts do not deviate more than 0.5 inches from the chalkline. The saw must have a single blade or ganged blades wide enough to cut the axle sensor slot at full width in a single pass. Cutting two slots and chipping out roadway material between them is not allowed. Ensure the slots for sensor lead-in cables are 3.5 inches deep and wide enough to allow unforced placement of the cable.

Install axle sensors in the right-hand wheel-path midway between the leading and trailing loops as detailed in Design Standards, Index 17900. Installation in the left-hand wheel-path is allowed at locations where no paved shoulder exist and sensor lead exit windows are installed at the right-hand edge of the roadway surface or in a lane which is to the left of and adjacent to an open lane of traffic.

Install the axel sensor such that the cable end is closest to the pull box to which the sensor lead cable will be routed. Install the end of the sensor mid-way into the edge line stripe or lane line stripe, as appropriate. Ensure that the axle sensor being installed has lead-in cables of sufficient length to reach the cabinet without splicing. Splicing axle sensor lead-in cable is not allowed.

Installation: Cut the saw slot the length of the sensor plus an additional 3 inches to 4 inches. Ensure the depth and width of the slot are installed as recommended by the sensor manufacturer, typically 0.75 inches wide by 1 inch deep. Use the clips or jigs provided by the manufacturer to ensure the sensor will be suspended at a uniform depth in the slot. Mix and apply the bonding agent ensuring the slot is completely full with no voids beneath the sensor. Route the sensor lead to the pull box and from there to the traffic monitoring site cabinet. Mark the sensor lead at the pull box and at termination in the cabinet using a permanent marker pen or labeler. Provide lane numbering information as specified in Design Standards, Index No. 17900.

**741-2.3 Test Requirements:** Perform the manufacturer’s recommended on-site pre-installation test to determine the sensor’s condition using an Inductive/Capacitance/Resistance meter. Install only those sensors that pass the pre-installation test. After installation, repeat the tests at the termination point in the cabinet. Use an oscilloscope to view and record typical waveforms and signal intensity measurements for the axles of passenger cars and large trucks. Remove and replace any sensor that fails the test at no additional charge to the Department.

**741-3 Type II, Wireless Vehicle Sensors (Off-Roadway).**

**741-3.1 General:** Install Type II wireless vehicle sensors on a pole or structure adjacent to the roadway as shown in the Plans.

Physical Characteristics of Type II Sensors	
Detection Zone	A minimum of 8 distinguishable lanes within a minimum 200 feet of detection zone
Enclosure	Weatherproof aluminum, stainless steel or polycarbonate housing
Dimensions	Typically up to 15” X 12” X 6”
Weight	Typically less than 10 lbs
Operating Temperature (Ambient)	0°F to 140°F
Operating Frequency	Wireless transmission in FCC approved band or unlicensed RF range
Communications	RS-232/RS-485 ports, supports minimum 19,200 baud rate
Data Interface	Compatible with the Department’s field storage devices (counters) and downloads data via contact closure board using a hardwired connection

**741-3.2 Installation Requirements:** Install the sensor on a pole oriented at the roadway such that it is perpendicular to the target lanes of traffic with room to perform horizontal and vertical aiming adjustments. Order the Type II sensor with sufficient cable length to reach the cabinet without splicing. Fasten the cable to the pole so wind does not move it, or route the cable within the pole cavity to the cabinet termination point. Provide slack in the cable at the connections to the sensor and in the cabinet to ensure the cable is stress-free. Include the appropriate mounting hardware, contact closure signal that corresponds to vehicle presence and the manufacturer’s recommended surge suppression as a part of the installation.

Using the manufacturer's instructions and software, set up the lane detection zones and verify that the sensor's orientation is perpendicular to the roadway. Configure the Type II sensor for vehicle volume unless otherwise specified in the Plans.

**741-3.3 Test Requirements:** Conduct a visual test to determine that all detection zones are being counted accurately. Connect a laptop computer to the electronics unit and observe traffic in every lane, verifying that each vehicle is displayed on-screen. A minimum of twenty vehicles should be observed for each lane of traffic with all vehicles counted. If any vehicles are not counted, reconfigure the Type II sensor and repeat the visual observation test until all lanes count correctly. If the sensor fails to provide accurate counts after three test attempts, it must be replaced with a new unit at no expense to the Department.

#### **741-4 Guaranty Provisions.**

**741-4.1 Contractor's Responsibility:** Secure all guaranties that are customarily issued by the equipment manufacturers for the specific equipment included in the Contract. Ensure that the form in which such guaranties are delivered includes the provision that they are subject to transfer to the Department, and is accompanied by proper validation of such fact. Transfer guaranties at final acceptance of the work (or equipment) by the Department.

**741-4.2 Terms:** Ensure that the manufacturers of the equipment stipulate the terms of guaranties when submitting a request to the Department for certification and for equipment submittal for construction projects. Include terms for a specified service performance with provisions for repair parts and labor, or for replacement. Ensure the provisions define the equipment "installation date" as the date for such guaranty to be in effect. For construction projects, the "installation date" is the first day of equipment "burn-in". For warehouse purchases, the "installation date" is the date of visual inspection approval, not to exceed ten days after delivery date.

**741-4.3 Conditions:** When guaranty is available, ensure that a written and signed guaranty accompanies the manufacturer's billing invoice. The Engineer will sign and retain the original and provide a copy to the manufacturer. If the Contractor does not comply with the terms of the guaranty, the Department may suspend the certification. Comply with additional terms and conditions as stated in purchasing agreements.

#### **741-5 Method of Measurement**

**741-5.1 General:** Measurement for payment will be in accordance with the following tasks.

**741-5.2 Furnish and Install:** The Contract unit price each for vehicle sensor, furnished and installed, includes the vehicle sensor, lead-in cables, bonding agent, all equipment, materials, and labor necessary for a complete and accepted installation.

**741-5.3 Furnish:** The Contract unit price each for vehicle sensor, furnished, includes the vehicle sensor and materials as specified in the Contract Documents, plus all shipping and handling costs involved in the delivery as specified in the Contract Documents.

**741-5.4 Install:** The Contract unit price each for vehicle sensor, installed, includes all lead-in cables, bonding agent, miscellaneous materials, labor, and equipment necessary for a complete and accepted installation. The Engineer will supply the vehicle sensor.

#### **741-6 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 741- 1- Traffic Monitoring Site Vehicle Sensor - Non-Weight Applications- each.