

**TRAFFIC MONITORING SITE VEHICLE SENSOR (CLASS II).**  
**(REV 6-16-99) (FA 7-20-99) (7-02)**

PAGE 755. The following new Section is added after Section 715:

**SECTION 741**  
**TRAFFIC MONITORING SITE VEHICLE SENSOR (CLASS II)**

**741-1 Description.**

Install Traffic Monitoring Site (TMS) Class II Vehicle Sensor of the type and at the location(s) shown on the plans.

**741-2 Materials.**

Use a Vehicle Sensor currently listed on the Department's Approved Products List (APL) and compatible with the electronic unit to which they will be connected meeting the following requirements:

	TYPE I		TYPE II
	Unencapsulated	Encapsulated	
Sensor Size	6 to 8 feet long Flat Element: 3/16 to 1/4 inch wide Round Element: 3/16 to 1/4 inch dia.	6 to 8 feet long by 1 1/2 by 1 1/2 inch	8 by 10 by 12 inches
Encapsulant	Not Encapsulated	Epoxy Binder within an aluminum channel	N/A
Sensing Element	Pressure sensing polymer in flat coax construction	Pressure sensing polymer cable	N/A
Operating Temp.	-40°F to 158°F	-40°F to 176°F	-35°F to 165°F
Output Signal	250 mV for 400 pound wheel load at 70°F Minimum	1 volt signal for average passenger car tire or axel Signal to noise ratio 100:1 or better	N/A
Polarization	Increase in pressure produces positive voltage	Increase in pressure produces positive voltage	N/A
Output Uniformity	± 20%	± 20%	N/A
Capacitance	7.2 nF for 6 foot long sensor with 100 foot cable	N/A	N/A
Temperature Sensitivity	2% per degree Fahrenheit	N/A	Auto-Compensating
Transmission	N/A	N/A	10.525 Ghz ± 25 MHz

	TYPE I		TYPE II
	Unencapsulated	Encapsulated	
Frequency			
Transmission Power	N/A	N/A	10 mW maximum
Coverage Area	N/A	N/A	Oval shaped detection area: 10 feet minimum 200 feet maximum Elevation Beam Width 50 degrees Azimuth Beam Width 15 degrees
Detection Zone	N/A	N/A	6 Zones minimum
Enclosure	N/A	N/A	NEMA 3R Aluminum or Stainless Steel
Power	N/A	N/A	9 to 36 vDC or 95 to 135 vAC

Ensure that the Vehicle Sensor is marked in accordance with Section 748 and the markings are visible after installation.

Use bonding agents listed on the APL and which are approved for use with the sensor being installed.

The approval process for equipment and/or material(s) used at a Traffic Monitoring Site is covered in Section 748.

### **741-3 Installation Requirements.**

**741-3.1 General:** Install the Vehicle Sensor in accordance with the manufacturer's recommended installation procedure, and the Contract Documents.

**741-3.2 Saw Cuts:** Use a chalk line or equivalent method to outline the perimeter of the sensor on the pavement and routes for lead-in cables. Do not allow the saw cut in the pavement to deviate more than 1 inch from the chalk line. Ensure that all saw cuts are free of any dust, dirt or other debris and completely dry prior to the installation of the loop wire, loop wire twisted pair lead or lead-in cable.

Make saw cuts sufficient in depth to ensure that the top conductor of the loop wire or lead-in cable is a minimum of 1 inch below the final surface of the roadway.

#### **741-3.3 Piezoelectric Axle Sensor (Type I):**

**741-3.3.1 General:** Install the sensor in the right wheelpath of the travel lane, with the lead-in cable orientated toward the pull box to which the lead-in cable will be pulled. Ensure that the end of the sensor element or channel is 6 inches from the right edge of the travel lane, unless otherwise specified in the Contract Documents. Ensure that all lead-in cable(s) are sufficient in length to extend to the traffic monitoring site cabinet without splicing.

**741-3.3.2 Encapsulated Sensor:** Install either a rigid or flexible channel encapsulated sensor flush with the traffic bearing surface of the roadway by sawing a slot into the pavement perpendicular to the flow of traffic, equal to the length of the sensor plus 4 inches by 2 1/4 inches wide by 2 inches deep. Suspend the sensor within the slot with jigs. Prepare and

apply bonding agent in accordance with the sensor manufacturer instructions, ensuring that there are no voids around the sensor and the bonding agent cures to bear traffic within four hours of application. Remove the jigs, after the bonding agent has cured. Route the sensor lead-in cable to the pull box and through the conduit to the traffic monitoring site cabinet. Mark the sensor lead-in cable(s) at the pull boxes and at the point of termination within the traffic monitoring site cabinet with an indelible marker numbering the lanes as specified in the Design Standards.

**741-3.3.3 Unencapsulated Sensor:** Install the unencapsulated sensor by sawing a slot into the pavement perpendicular to the flow of traffic, equal to the length of the sensor plus 4 by 3/4 inch wide by 3/4 inch deep. Suspend the sensor within the slot with jigs. Prepare and apply bonding agent in accordance with the sensor manufacturer instructions, ensuring that there are no voids around the sensor and the bonding agent cures to bear traffic within four hours of application. Remove the jigs after the bonding agent has cured. Route the sensor lead-in cable(s) to the pull box and through the conduit to the traffic monitoring site cabinet. Mark the sensor lead-in cable(s) at the pull boxes and at the point of termination within the traffic monitoring site cabinet with an indelible marker, numbering the lanes as specified in the Design Standards.

**741-3.4 Microwave Radar Vehicle Sensor (Type II):** Install the microwave radar sensor as specified in the Contract Documents. Use a NEMA 3R stainless steel or aluminum enclosure to house the sensor. Use stainless steel bands to mount the enclosure to a pole or stainless steel expansion bolts to mount the enclosure to a concrete structure. Mount the sensor 16 to 23 feet above the surface of the roadway, unless otherwise specified in the Contract Documents.

#### **741-4 Piezoelectric Axle Sensor Test Requirements.**

Perform the manufacturer's recommended on-site pre-installation test to determine the sensor's condition. Install only those sensors that pass the pre-installation test. Repeat the test, following installation, at the lead-in point of connection in the traffic monitoring site cabinet. Remove and replace any sensor which fails the test at no additional cost to the Department.

Record representative waveforms for a passenger car, single unit truck, and a tractor/semi-trailer combination vehicle, for each piezoelectric axle sensor. This requirement may be waived by the Engineer if one or more of these vehicles are not in the traffic stream. Place a copy of the final test results, including the date of installation, manufacturer's name, model number for each sensor, type of bonding agent used and recorded waveforms, in a waterproof package in the cabinet and furnish one copy to the Engineer.

#### **741-5 Guaranty Provisions.**

**741-5.1 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.

**741-5.2 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. Provisions shall 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.

**741-5.3 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.

**741-6 Method of Measurement.**

**741-6.1 General:** Measurement for payment will be in accordance with the following tasks.

**741-6.2 Furnish and Install:** The Contract unit price each for Vehicle Sensor (Class II), furnished and installed, includes the Vehicle Sensor (Class II), lead-in cable(s), bonding agent, all equipment, materials, and labor necessary for a complete and accepted installation.

**741-6.3 Furnish:** The Contract unit price each for Vehicle Sensor (Class II), furnished, includes the Vehicle Sensor (Class II) and materials as specified in the Contract Documents, plus all shipping and handling costs involved in the delivery as specified in the Contract Documents.

**741-6.4 Install:** The Contract unit price each for Vehicle Sensor (Class II), installed, includes all lead-in cable(s), bonding agent, miscellaneous materials, labor, and equipment necessary for a complete and accepted installation. The Engineer will supply the Vehicle Sensor (Class II).

**741-6.5 Modify:** The Contract unit price each for Vehicle Sensor (Class II), modified, as specified in the Contract Documents, includes all labor, equipment and miscellaneous materials necessary for a complete and accepted installation.

**741-7 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- 70- TMS Vehicle sensor (Class II) - each.