Special Specification 6413
Wireless Magnetometer Pods

1. DESCRIPTION

Furnish and install individual Magnetometer Pods, as detailed on the plans, that detects vehicles on a roadway that measure changes in the earth’s magnetic field and provide detector outputs to a traffic controller and other devices. This item defines the requirements for the pod that detects vehicles on a roadway using one or more battery powered wireless magnetometer pods and other system components that are used to transmit detection information to the controller cabinet interface modules compatible with the existing NEMA TS-2 V2.06b cabinet detector rack.

The installation is composed of in-pavement sensors for each lane and the materials to mount the detectors in the pavement.

All equipment must be on the Departments Qualified Products List (QPL).

1.1. Definitions.

1.1.1 In-pavement Sensor. Device placed in the roadway used to detect a change in the earth’s magnetic field when a vehicle passes over its measured area of influence. The in-pavement sensor houses 3-axis magnetometer used to sense the change in the earth’s magnetic field. The sensor acts as a data communications device to an access point to transmit contact closure when detection is achieved by the 3-axis magnetometer.

1.2. Functional Capabilities. Provide Magnetometer Pods capable of detecting a variety of vehicle types including bicycles, motorcycles, automobiles, large trucks, and light rail trains. Provide Magnetometer Pods that allow the user to select sensitivity levels needed to achieve contact closure to the assigned detector channel. Provide Magnetometer sensitivity level adjustments that allow for different levels of vehicle detection. Make sensitivity level settings of the magnetometer adjustable using Magnetometer Pod software via wireless communication.

Provide Magnetometer Pods that perform presence or passage detection as described in this specification.

Provide Magnetometer Pods that perform delay and extension timing as described in this specification.

Ensure equipment failure such as: the sensor, communications link, access point radio, repeater radio (if used), or interface module, result in constant vehicle call “fault state” on the affected detector channel to the traffic controller.

Provide a detection accuracy comparable to properly operating inductive loops. Detection accuracy includes the Magnetometer Pod ability to detect the presence of any vehicle within the sensor’s magnetic field and to communicate contact closure to the appropriate detector channel. If the Magnetometer Pod “false detects,” (system applies contact closure when a vehicle is not present in the sensor’s magnetic field), this will count against the accuracy measured during performance testing. Achieve a minimum of 95% detection accuracy for the Magnetometer Pod when measured in a 24 hr. period.

Furnish Magnetometer Pods that provide real time vehicle detection (within 150 milliseconds (ms) of vehicle arrival). Once the sensor achieves detection, ensure the traffic controller receives contact closure to the assigned detector channel within the 150 ms time frame.
2. **MATERIALS**

Provide only materials able to operate at temperatures from -40°F to +185°F and up to 95% humidity (non-condensing).

2.1. **In-Pavement Sensor Hardware.** Provide in-pavement sensors and epoxy. Provide in-pavement sensors consisting of a 3-axis magnetometer, a microprocessor, a wireless transmitter, and a battery. Provide in-pavement sensor components contained within a single housing.

Install in-pavement sensors per manufacturer recommended instructions.

Provide in-pavement sensors capable of presence detection as defined in this specification. Provide in-pavement sensors that, as a minimum, create a 6 ft. length x 6 ft. width accurate area of detection when used for presence detection at an intersection.

Provide in-pavement sensors capable of passage detection as defined in this specification. Provide in-pavement sensors that, as a minimum, create a 6 ft. length x 4 ft. width accurate area of detection when the sensors are set back from the intersection and used for passage detection on an arterial.

Provide in-pavement battery powered sensors that, at a minimum, use a 3-axis magnetometer in the design and operation of the unit. The sensor continuously monitors the earth’s magnetic field and establishes a baseline reference value for the X, Y, and Z axis. As a minimum, the refresh rate on the magnetometer's processor will be 128 Hz, providing a sampling rate of 8ms of the earth’s magnetic field. As a minimum, during periods of no detection the X, Y, and Z axis will refresh the baseline reference value every 8ms. The sensors must be able to detect a change in the magnetic field as referenced by the sensitivity setting selected by the user and the size of the vehicle passing over the detection zone.

The in-pavement sensor must operate on batteries without the need for underground power or communication cable connections to the unit. Provide an in-pavement sensor that has an average operating life span under battery power of a minimum of 10 yr.

2.2. **Interface Module.** Provide sensors that are assignable via the Magnetometer Pod software, to the available detector channels on the module.

2.3. **Software.** Provide in-pavement sensors that are assignable to radios or detector channels via existing system software.

2.4. **Installation and Training.** When required by plans or purchasing agency, the supplier or manufacturer of the Magnetometer Pod will supervise and assist in the installation and set-up of the equipment. Provide a factory certified representative from the manufacturer to be on-site during installation of the Magnetometer Pod.

Instruction personnel are required to be certified by the equipment manufacturer. The User’s Guide is not an adequate substitute for practical, classroom training, and formal certification by an approved agency.

Formal levels of factory authorized training are required for installers, contractors, and system operators. Training must be certified by the manufacturer.

The final locations of the equipment must be approved by the appointed inspector from the local municipal before installing any equipment.

Ensure access points are wired (EIA-485) to base station unless otherwise directed by the Department and the local municipal.

Do not drill holes into the traffic cabinet to mount any equipment. If an antenna is necessary at the cabinet, use appropriate ear holes and mounts.
2.5. **Warranty, Maintenance and Support.** Warranty the Magnetometer Pod to be free of defects in material and workmanship for a period of 5 yr. from date of shipment from the supplier's facility, with the exception of the 2 yr. repeater batteries. During the warranty period, the supplier will repair with new or refurbished materials, or replace at no charge, any product containing a warranty defect provided the product is returned Free On Board to the supplier's factory or authorized repair site. Products repaired or replaced under warranty by the supplier will be returned with transportation prepaid.

This warranty does not apply to products damaged by accident, improper operation, improper installation, abused, serviced by unauthorized personnel, or unauthorized modification. During the warranty period, ensure technical support is available from the supplier via telephone within 8 hr. of the time a call is made by a user, the support is to be provided by factory-authorized personnel or factory-authorized installers.

Provide ongoing software support by the supplier that includes updates of the Magnetometer Pod processor unit and software. Provide these updates free of charge during the warranty period. Ensure the update of the Wireless Magnetometer Vehicle Detection System software is tested and approved by the Department before installing.

Ensure the supplier maintains a program for technical support and software updates following expiration of the warranty period. Make this program available to the Department or agency responsible for maintenance in the form of a separate agreement for continuing support.

Ensure the supplier maintains an adequate inventory of parts to support maintenance and repair of the Magnetometer Pod.

3. **CONSTRUCTION**

Install the in-pavement sensors in concrete or asphalt pavement as shown on the plans. Do not install in-pavement sensors before or during road paving.

Install the in-pavement sensors per manufacturer instructions. Locate the core to avoid sources of magnetic noise such as underground power cables, overhead high-tension power cables, light rail or subway tracks, and power generation stations and sub-stations.

Correctly orient in-pavement sensors as clearly marked on the sensor. Apply enough epoxy to cover the bottom of the core hole, then place the sensor in the core hole and fully encapsulate it with the epoxy to the lip of the core.

4. **MEASUREMENT**

This Item will be measured by each magnetometer pod installed, made fully operational, and tested per intersection in accordance with this special specification or as directed.

5. **PAYMENT**

The work performed and materials furnished, installed, tested, and accepted, in accordance with this Item and measured as provided under “Measurement,” will be paid for at the unit price bid for “Magnetometer Pod” with the equipment as specified on the plans and quantities per intersection.

This price is full compensation for the materials, labor, tools, cabling, connectors, equipment, and incidentals. This price includes associated mounting hardware and associated field equipment required for a complete and fully functional wireless battery powered magnetometer detection system.