**REVISION OF SECTION 614**

**TRAFFIC SIGNAL VEHICLE DETECTOR (MICRO TYPE) (NON-INVASIVE)**

**Section 614 of the Standard Specifications is hereby revised for this project as follows:**

**In subsection 614.10(g) add the following:**

Each non-invasive micro loop shall have individual lead-in wiring to the controller cabinet. Lead-in wiring shall be continuous with no splices from controller cabinet to non-invasive conduit termination pull box.

Each single, double, triple, or quadruple non-invasive, magneto-inductive vehicle sensing assembly shall be connected to an inductive loop vehicle detector per CDOT Specifications.

Traffic data collection or traffic flow parameter measurements across diverse roadway geometry shall be optimized by either installing single, double, triple or quadruple non- invasive sensors.

The non-invasive sensor shall transduce changes in the ambient magnetic field to changes in its inductance.

An increase in the ambient magnetic field shall result in a decrease in the inductance of the non-invasive sensor.

The nominal magnitude of the vertical magnetic field over which the non-invasive sensor shall function to specified requirements shall be 200 millioersteds to 800 millioersteds

The non-invasive sensor shall detect reliably and consistently changes in the ambient magnetic field of seven millioersted or greater when the earth’s magnetic field is >200 millioersted [HDC =200mOe] and the peak-to-peak amplitude of the applied inductive current is 40mAmpp-p[IAC = 40mAmpp-p]. This requirement defines the sensitivity to be >2nanohenries/millioersted at HDC=200mOe and IAC = 40mAmpp-p.

The inductance change of the non-invasive sensor shall be directly proportional the changes in the earth’s magnetic field.

The probe inductance shall be between 50µH to 80µH.

The nominal operating frequency of the non-invasive sensor shall be between 20kHz and 60kHz.

The non-invasive sensor shall operate with drive currents of 2.5 mAmpp-p to 175 mAmpp-p.

The specified electrical and operating requirements shall be maintained over temperatures ranging from –29.9oF to 162.5oF.

The non-invasive sensor shall have an outer diameter of 0.8125 inches and a height of 2.25 inches.

The non-invasive sensor shall snap into a carrier.

The carrier shall hold and maintain the sensor position to +20o of vertical.

The non-invasive sensor shall be suitably sealed for use in 100% humidity environments in the conduit.

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**REVISION OF SECTION 614**

**TRAFFIC SIGNAL VEHICLE DETECTOR (MICRO TYPE) (NON-INVASIVE)**

The conduit shall be a three inch conduit consisting of Schedule 80 PVC or seamless polyethylene with an inner diameter of 2.9 inches and outer diameter of 3.5 inches

The conduit shall be installed at a nominal centerline depth of 21 inches from the road surface following crownline.

The depth of the centerline from the road surface shall be maintained between 18 and 24 inches over its entire length.

The centerline of the conduit shall not deviate horizontally more than required by the application.

Any deviation in conduit alignment shall be less than 0.25 inches per foot.

Non-invasive conduit shall terminate at a 24” x 36”x 18” pull box and extend three inches into the pull box. Pull boxes may need to be stacked in order to maintain flush finish with existing ground line.

The end of the conduit at the pull box shall have grade to permit drainage. Opposite end shall be sealed to prevent dirt and debris from entering conduit.

The carrier mechanism for holding and inserting the non-invasive sensor (carrier) shall allow for placement of either single, double, triple or quadruple non-invasive, magneto-inductive vehicle sensors in the three inch diameter conduit meeting the installation requirements.

The carrier shall allow probes to be placed at six inch spacing increments.

The carrier shall allow for horizontal placement of the non-invasive sensors to be within three inches with respect to the specified location referenced at the road surface.

The carrier and the non-invasive sensor components shall be readily assembled on-site without special tools.

The carrier shall hold up to twelve lead-in cables including the pull rope.

The carrier and interlinking mechanism shall have sufficient strength to allow insertion of up to twelve probe sets into a 100 foot long conduit meeting the installation requirements.

The carrier system shall have a locking mechanism to maintain the orientation of all non-invasive sensors within +20o of vertical.

The first carrier (end cap carrier) shall have a rope attached of sufficient strength to assist in the removal of the carriers from the conduit.

The conduit installer shall provide a log of the boring depth measured every two feet in boring distance.

The installer of the non-invasive sensor, home-run cable and detector shall verify that the installation meets requirements by measuring the inductance of the non-invasive sensor assembly with a properly designed, matched vehicle detector.

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**REVISION OF SECTION 614**

**TRAFFIC SIGNAL VEHICLE DETECTOR (MICRO TYPE) (NON-INVASIVE)**

The inductance shall be the sum of probe inductance, inductance of lead-in cable 16H per 100 feet) and home-run cable (23H per 100 feet) and shall be within +20percent of the calculated inductance.

The installer of the non-invasive sensor, home-run cable and detector shall verify that the installation meets requirements by measuring the DC resistance of the non-invasive sensor assembly with a properly calibrated ohm meter.

The measured DC resistance shall be the sum of 105 ohms per probe, 3.0 ohms per 100 feet of lead in wire and 2.0 ohms per 100 feet of home-run cable and shall be within +20 % of the calculated DC resistance.

The installer of the non-invasive sensor assembly, home-run cable and detector shall measure the change in inductance of the installed non-invasive sensor assembly using a properly designed, matched vehicle detector when a standard, midsize vehicle is driven directly over the sensor.

The measured change in inductance for a standard midsize vehicle shall be in the range of 120nH to 1200nH.

The installer of the Non-invasive Micro loop assembly, home-run cable and detector shall provide a log of the measured inductance, DC resistance and the change in inductance for each installed non-invasive sensor assembly.

**Subsection 614.13 shall include the following:**

Traffic Signal Vehicle Detector (Micro Type) (Non-Invasive) will be measured by the number of units installed operational and tested in accordance with this specification or as directed by the Engineer and shall include all necessary documentation and testing.

**Subsection 614.14 shall include the following:**

Pay Item Pay Unit

Traffic Signal Vehicle Detector (Micro Type) (Non-Invasive) Each