

MICHIGAN  
DEPARTMENT OF TRANSPORTATION  
  
SPECIAL PROVISION  
FOR  
**CELLULAR MODEM, TRAFFIC SIGNAL**

SIG:DJA

1 of 4

APPR:HLO:NJB:08-05-22  
FHWA:APPR:08-15-22

**a. Description.** This work consists of completing one or more of the following work types at locations shown on the plans.

1. Furnish and deliver an environmentally hardened cellular modem to MDOT and install associated antenna and cables.

2. Provide notice for MDOT to remove an existing cellular modem, then remove existing associated antenna and cables, store, and reinstall existing antenna and cables.

3. General.

A. Furnish and deliver all equipment and required components, including antennas necessary to provide full and complete functionality in all respects, without additional expense to the agency responsible for traffic signal maintenance.

B. All cellular data service will be provided by the MDOT statewide cellular data service provider agreement or the cellular data service for the local agency responsible for the project.

C. Ensure final equipment selection, procurement, and provisioning is coordinated with MDOT and the Michigan Department of Technology, Management, and Budget (DTMB) or the local agency responsible for the project.

D. Use identical and completely interchangeable equipment at each field location.

4. Functional and Performance Requirements:

A. Support Virtual Private Network (VPN) connections;

B. Support Dynamic Mobility Network Routing (DMNR) per Internet Engineering Task Force (IETF) Request for Comments (RFC) 5177;

C. Built in Global Navigation Satellite System (GNSS) module;

D. Minimum 2 ethernet ports;

E. Support firewall capabilities, such as, IP block/allow listings;

F. Provide an "always-on" connection, without dialing;

- G. Support local and remote management;
- H. Domain name addressable;
- I. Port Filtering;
- J. Generic Routing Encapsulation (GRE) Tunneling;
- K. IP Filtering;
- L. Media Access Control (MAC) Address Filtering; and
- M. Provide a broadband communications link between field cabinet location(s) and the head-end via the public cellular network.

**b. Materials.** Furnish equipment that meets the following requirements.

1. Full duplex transceiver.
2. Frequency Band and Cellular Network Interface.
  - A. Fourth generation (4G) Long Term Evolution (LTE) models:
    - (1) Tri-band support for LTE-Advanced Category 6;
    - (2) Backward compatible with Evolved High Speed Packet Access (HSPA+), High Speed Packet Access (HSPA), Enhanced Data-rates for GSM Evolution (EDGE), General Packet Radio Service (GPRS) or Evolution Data Only (EV-DO) (Rev. A), Code Division Multiple Access (CDMA) EV-DO (Rev. 0), CDMA 1x Radio Transmission Technology (RTT) based on the selected provider's network.
3. Ethernet Interfaces.
  - A. Support Transmission Control Protocol (TCP)/IP and User Datagram Protocol (UDP)/IP.
  - B. Registered Jacks (RJ)-45, IEEE 802.3 standard 100 Base-TX Ethernet ports for 4G modems.
  - C. Furnish network cables that are Electronic Industries Alliance (EIA)/Telecommunications Industry Association (TIA)-568-A compliant.
  - D. Furnish DB-9 integrated serial port that is EIA232 real port compatible and preconfigured for on-street primary controller applications.
4. Antenna.
  - A. Furnish omnidirectional external cabinet mounted antenna rated for outdoor usage. Include installation hardware and adapters per manufacturer recommendation.
  - B. 50 Ohm SubMiniature version A male connector.

C. Minimum dual element LTE antenna gain of 3 decibel relative to isotrope (dBi) and 5 dBi for active GNSS antenna

D. Operating frequencies of 694-960 and 1710-3700 Megahertz.

5. Management, Security and Diagnostic.

A. LED indicators for Ethernet, power, cellular link/activity and signal strength.

B. Support signals for Transmit Data (TXD), Receive Data (RXD), Request To Send (RTS), Clear To Send (CTS), Data Terminal Ready (DTR), Data Set Ready (DSR), Data Carrier Detect (DCD) and hardware and software flow control.

C. Provide compatibility with Hypertext Transfer Protocol (HTTP)/HTTP Secure (HTTPS), Dynamic Host Communications Protocol (DHCP), Simple Network Management Protocol (SNMP) v2 or v3, Simple Mail Transfer Protocol (SMTP), Secure Socket Layer (SSL), Secure Shell (SSH)-2.

D. Web-based Graphical User Interface (GUI).

E. Command Line Interface (CLI) access via SSH connection.

F. SNMP Management Information Base (MIB)-II and SNMP Traps.

6. Power. Ensure 24 Volt power supply is supplied with device.

7. Environment.

A. Operating Temperature for Cellular Modem, Power Supply, Antenna, and all connectors. -22 °F to 158 °F.

B. Storage Temperature for Cellular Modem, Power Supply, Antenna, and all connectors. -22 °F to 158 °F.

C. Relative humidity for Cellular Modem, Power Supply, Antenna, and all connectors. 5 percent to 95 percent non-condensing.

8. Mounting. Ensure all mounting hardware is supplied with device.

**c. Construction.**

1. General.

A. Furnish new cell modem to MDOT and provide a minimum of 7 work days' notice for MDOT to install new cell modem.

B. Install new cabinet mounted antenna, and associated cables and connectors in accordance with manufacturer specifications. Ensure the installation is waterproof.

C. Furnish MDOT a minimum of 7 work days' notice for MDOT to remove an existing

cell modem.

D. Remove existing antenna, mounting hardware and the entire length of cabling. The salvaged equipment is to be protected and stored inside a building, off the floor, and free from rodent/insect intrusion.

E. Reinstall existing antenna, and associated cables and connectors in accordance with manufacturer specifications. Ensure the installation is waterproof.

F. Furnish MDOT a minimum of 7 work days' notice for MDOT to install an existing cell modem.

2. Warranty. Furnish cellular modem with a standard manufacturer's warranty, transferable to MDOT. The cellular modem must carry a warranty (parts, software and labor) of 5 years from the date of shipment. Furnish warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to final written acceptance.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	Pay Unit
Cellular Modem, TS, 4 <sup>th</sup> G .....	Each
Cellular Modem, Salv .....	Each

1. Cellular Modem, TS, 4<sup>th</sup> G, includes furnishing and delivering cellular modem to MDOT, and installing new cabinet mounted antenna and associated cables and hardware.

2. Cellular Modem, Salv, includes removing, storing, and reinstalling an existing cell modem antenna.