ROAD WEATHER INFORMATION SYSTEM.
(REV 2-25-20)

The following new Section is inserted after Section 687:

SECTION 688
ROAD WEATHER INFORMATION SYSTEM

688-1 Description.

Furnish and install a road weather information system (RWIS) in accordance with the Contract Documents.

688-2 Materials.

Ensure that all materials furnished, assembled, fabricated, or installed are new products and approved by the Engineer. Provide a RWIS consisting of environmental sensor stations (ESS). Provide ESS including environmental sensors and remote processing units (RPU). Ensure that the RPU can collect, store, and process sensor data to describe current weather conditions.

Provide any ancillary equipment or incidental items required, including mounting hardware, power supplies, grounding, surge protection devices, and communication equipment, at each ESS location to make a complete and fully operational RWIS. Ensure that the system provides real-time, accurate, reliable data on all system parameters to the degree of precision defined in this specification.

688-2.1 Sensors: Provide a RWIS that can collect and store data from multiple ESS using various environmental sensors. Ensure the ESS includes sensors as shown in the plans. Sensors can include, but are not limited to, those necessary to collect, store, and transmit the following data:

1. Temperature
2. Relative humidity
3. Barometric pressure
4. Precipitation data that includes type and intensity
5. Visibility as affected by fog, smoke, or a combination thereof
6. Wind data, including direction and average speed

Ensure that all RWIS sensors and other field equipment are made of UV, heat, and corrosion resistant materials.

Provide ultrasonic anemometers and other environmental sensors that do not rely on moving parts, unless otherwise shown in the plans.

Environmental sensors must provide the following data to the listed degree of precision:

Atmospheric Data		
Temperature	±1° F between -40° F and 176° F; resolution of 0.1 degree	
Relative Humidity at 70° F	±5% between 10% and 100%	
Barometric Pressure	±0.02 inch of mercury (inHg) between 27.2 and 31.9 inHg; resolution of 0.005 inHg	
Precipitation	Type:	Light rain, rain and ice

	Intensity:	±20% between 0.02 to 7.5 inches per hour
Wind	Direction:	±3 degrees between 0 and 360 degrees
	Speed:	±3% between 0 and 120 mph
Visibility	±10% from 0.005 to 1 mile	

688-2.2 Remote Processing Unit:

The RPU must be able to store a minimum of 1000 data records. Each data record will include sensor readings of a user-defined time interval of 5 to 60 minutes.

The RPU must be able to issue an alarm if its power supply is low or if there has been a complete power loss and send a message when the unit returns to normal operation. The RPU must be able to issue an alarm using user configurable thresholds for various sensor parameters, including high wind speed alarms.

688-2.3 Communications: Use an RPU capable of transmitting all collected data to the transportation management center (TMC) over an Ethernet connection using the National Transportation Communications for ITS Protocol (NTCIP) or a data collection package (DCP) and satellite transmitter that comply with all applicable standards for NOAA and CS2 Certification for Geostationary Operational Environmental Satellite (GOES) transmission.

688-2.4 Cabinet: Cabinets provided with the RWIS must be listed on the APL or meet the applicable criteria of Section 676.

688-2.5 RWIS Software: Provide any software necessary for the RWIS system configuration and operation.

688-2.6 Mechanical Specifications: Ensure equipment is permanently marked with manufacturer name or trademark, part number, and serial number. Ensure that every conductive contact surface or pin is gold-plated or made of a noncorrosive, nonrusting, conductive metal. Do not use self-tapping screws on the exterior of the assembly. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

Ensure all assembly hardware, including nuts, bolts, external screws and locking washers less than 5/8 inch in diameter, are Type 304 or 316 stainless steel and meet the requirements of ASTM F593 and ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized and meet the requirements of ASTM A325.

688-2.7 Electrical Specifications: RWIS equipment must be capable of operation using 120 volts alternating current (V_{AC}) and 12 V_{DC}. Supply an appropriate voltage converter for devices that require operating voltages of less than 120 V_{AC}. In cases where the ESS are mounted on towers that are part of the Department's statewide microwave system, ensure that the devices can utilize the 48 V_{DC} power supply available at the site.

Ensure that solar- and battery-powered units operate continuously for 14 days without requiring battery recharging.

688-2.8 Environmental Specifications: Ensure that roadside electronics operate properly during and after being subjected to the environmental testing procedures described in NEMA TS 2, Sections 2.2.7, 2.2.8, and 2.2.9.

688-2.9 Support Structure: When the ESS requires a support structure, provide a tower or pole as shown in the plans. Use a single support structure for the ESS and any associated equipment, such as solar panels, cabinets, and atmospheric sensors.

688-3 Testing.

Develop and submit a testing procedure that includes an environmental sensor-to-RPU test, a remote-to-central communication test, and a systems operational test. Notify the Engineer a minimum of 10 calendar days before the start of any tests. Provide and submit evidence of the following for each RWIS field site:

1. Laboratory tests from manufacturer verifying proper initial sensor calibration.
2. Instrument alignment with true north.
3. Sensor calibration protocols and adjustment procedures.
4. Verification that the site is reporting proper field data.

Deliver a summary test report and a copy of all test results to the Engineer for approval. Include documentation of any discrepancies found during testing, along with descriptions of installation locations, successful test completion dates, and equipment serial numbers.

688-4 Installation.

Mount all atmospheric sensors per the manufacturer's recommendations. Install all wiring so that it is either internal to a pole or in conduit.

Place a concrete service slab as shown in Index 17841 in front of any ground mounted cabinets, unless otherwise shown in the plans. Construct the pad using concrete meeting the requirements of Section 347.

688-5 Warranty.

Ensure that the manufacturer will furnish replacements for any part or equipment found to be defective during the warranty period at no cost to the Department or the maintaining agency within 10 calendar days of notification. Ensure that the RWIS equipment and components have a manufacturer's warranty covering defects for a minimum of one year from the date of final acceptance by the Engineer in accordance with 5-11 and Section 608.

688-6 Method of Measurement.

The Contract unit price for each RWIS field location will include furnishing, placement, and testing of all materials and equipment, and for all tools, labor, equipment, hardware, operational software package(s) and firmware(s), supplies, support, personnel training, shop drawings, warranty documentation, and incidentals necessary to complete the work.

688-7 Basis of Payment.

Price and payment will be full compensation for furnishing all materials and completing all work as specified in this section or shown in the Plans.

Payment will be made under:

Item No. 920-688- Road Weather Information System - each.