

Special Specification 6395

Central Processing Unit for Queue Detection System



1. DESCRIPTION

The Queue Detection System (QDS) is a permanent, real-time, automated, hard-wired powered system that calculates and displays travel time through a corridor as shown on the plans. Provides surveillance of the roadway to the District Traffic Management Center (TMC). The goal of this system is to provide traffic condition information to motorists and alert them of stopped traffic conditions. This system must be in operation 24 hr. per day, 7 days per week.

This item consists of submittal and approval of a Central Processing Unit for Queue Detection System, meeting the deployment requirements in the plans, furnishing, installing, and operating a permanent, automated, hard-wired powered real-time QDS meeting the requirements. Assume responsibility for any damaged equipment due to crashes, vandalism, adverse weather, etc. that may occur prior to project acceptance.

Furnish and maintain this system for gathering traffic data and displaying real-time messages for the zone identified in the plan sheets. Coordinate any work with Customs and Border Protection operating in the area. Assume responsibility for all charges for communications required to support operation and reporting of the QDS for the duration of the project. The Department will assume charges for communications once the project is fully accepted by the State. Coordinate with the District TMC operations staff for District ITS element integration such as dynamic message signs, closed circuit television cameras, and Radar Vehicle Detector.

2. MATERIALS

2.1. **Central Processing Unit.** Provide a Central Processing Unit that has the functionality described below:

2.1.1. **General.** Provide a Graphical User Interface that is compliant with Windows standards. Communication between the Central Processing Unit and any device must be independent and non-reliant upon communications with any other DMS or sensor. Alerts to the Operator may be provided via SMS text messages, pagers, or e-mail. Alerts must be sent in the event of device failure or traffic delays over 15 min.

2.1.2. **Data Processing Software.** Provide Data Processing Software that has the following capabilities:

- to collect and store sensor data;
- to compare traffic data collected from sensors to user-defined thresholds and automatically update one or more DMS;
- to estimate travel times and automatically update one or more DMS consistent with user-defined thresholds;
- to display up to 20 predefined messages consistent with user-defined thresholds with Radar Vehicle Detector combination of triggers or on a scheduled basis; and
- to allow DMS message override from TMC operator.

Data Management. The Data Management must provide storage of speed, volume, occupancy, DMS message history, and travel times as well as appropriate sensor status for each day.

Integrate and adjust Radar Vehicle Detector detectors to ensure those provide accurate, real-time volume, average speed, and occupancy data.

Ensure the Radar Vehicle Detector transfers locally stored data to the Central Processing Unit in the field when communication is restored.

Central Processing Unit must be hardened to support 0° F to 140° F temperatures and must be accessible from the District TMC.

Central Processing Unit must be integrated to the TMC by using a business-class 3G/4G/LTE cellular modem.

Integrate each Color DMS, and a non-intrusive traffic sensors as shown on the plans.

Transportation Sensor System (TSS) Protocol Document (TSS-Protocol) is available through the "TSS Tools" link on the Department's website, URL: <http://www.txdot.gov/business/resources/information-technology/engineering-software.html>.

- 2.2. **Full Color Dynamic Message Signs.** Provide a Central Processing Unit that is compatible with Full Color Dynamic Message Signs in accordance with Item 6270, integrated with the other QDS devices.

Each device must be integrated through fiber optics to Central Processing Unit. This will communicate with other devices at upstream or downstream locations. Provide Department District staff the ability to override messages displayed on any DMS in the system from the TMC thru the Central Processing Unit. Protect this feature with a password on a website separate from the Department's public website.

- 2.3. **Non-Intrusive Traffic Sensors.** Provide a Central Processing Unit that is compatible with Radar Vehicle Detector provided by the State. The Radar Vehicle Detector must be installed as shown on the plans. Each device must be integrated through fiber optics to Central Processing Unit. This will communicate with other devices at upstream or downstream locations. Provide Department District staff the ability to monitor Radar Vehicle Detector data such as, speed, occupancy and classification from the TMC thru the Central Processing Unit. Protect this feature with a password on a website separate from the Department's public website.

3. CONSTRUCTION

- 3.1. **System Requirements.** Install the QDS on the project as shown in the plans. QDS must consist of the following as a minimum:
- integration of Color DMS as per item 6322;
 - Integration of Radar Vehicle Detector provided by the State;
 - Cellular modem provided by the State;
 - Installation of fiber optic cable as per item 6007;
 - Electrical Service Pole and electrical conductor installation as per Items 628 and 620; and
 - Central Processing Unit that fully operates the QDS in a stand-alone and fully automated way as well as provides remote access from the District TMC.
- 3.2. **Submittal.**
- 3.2.1. **General.** Submit to the Engineer for approval a written and illustrated QDS Submittal. Include in the QDS Submittal the items required in this specification. Do not start any construction activities that will affect traffic on the project until the QDS Submittal is approved by the Engineer.
- 3.2.2. **Content of the Submittal.** The QDS Submittal must include, at a minimum, the following items:
- Software documentation meeting the Central Processing Unit requirement of this specification.
 - Hardware documentation meeting the Central Processing Unit requirement of this specification.

3.2.3. **Approval of Submittal.** Obtain approval of the QDS Submittal by the Engineer before placing any QDS devices. Approval is conditional and will be predicated on satisfactory performance during construction. The Engineer reserves the right to require the Contractor to make changes in the QDS Submittal and operations, at no additional cost to the Department, including removal of personnel, as necessary, to obtain the quality specified. The Contractor must notify the Engineer in writing a minimum of seven calendar days before any proposed changes in the QDS Submittal. Proposed changes are subject to approval by the Engineer.

3.3. **Testing.** Once the QDS is installed, it must undergo a five-day operational test. The operational test must include a test of the system in operation to ensure that the QDS equipment (including the full color dynamic message signs, traffic sensors, Central Processing Unit and communication devices) is operating in a fully functional manner and in accordance with the QDS plan for a minimum duration of five calendar days. Provide for complete operations support from the vendor during the operational test, and provide verification that the reported drive time through the queue detection zone accurately reflects actual field conditions. If any equipment malfunctions occur for a combined period of 4 hr. or more during this operational test on any day, no credit will be given for that day, for the operational test period, and the five-day operational test will reset.

Maintain records of equipment stoppages and resumptions during the five-day operational test for submission to the Engineer. If in 10% or more of the time, similar malfunctions occur that affect the proper operation of the QDS, the Engineer may declare a system component defective and require replacement of the equipment at no additional cost to the Department. When a system component defect is declared, the five-day operational test must begin again after the defective equipment is replaced and the system is fully operational.

3.3.1. **Report.** Submit a report to the Engineer detailing the daily activity of the system during the operational test. The report must indicate the date and time of any activity necessary to maintain operation of the QDS during the operational test period. Each entry must include the following information:

- identity of the equipment on which work was performed;
- cause of equipment malfunction (if known);
- a description of the type of work performed; and
- time required to repair equipment malfunction.

Once the operational test report is received and approved by the Engineer, the QDS will be considered operational and the system will be accepted for use.

4. MEASUREMENT

QDS will be measured by the each.

5. PAYMENT

The work performed and materials furnished in accordance with the Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Central Processing Unit." This price is full compensation for furnishing, installing, operating, maintaining, testing, monitoring, and providing historical data including labor, tools, equipment, and incidentals required for proper operation of this installation.