Special Specification 6140
Work Zone Intelligent Transportation System

1. DESCRIPTION

The Work Zone Intelligent Transportation System (WZITS) is a portable, real-time, automated, solar powered system that calculates and displays travel time through work zones and provides video surveillance of the roadway to the Austin District CTECC. The goal of this system is to provide advance traffic condition information to motorists at key decision points due to construction activity. The information reported to the public will include an accurate drive time through the work zone. This system must be in operation 24 hr. per day, seven (7) days per week, during the construction period.

This item consists of submittal and approval of a Work Zone Intelligent Transportation System plan meeting the deployment requirements in the Plans, furnishing, installing, relocating, and operating a portable, automated, solar powered real-time work zone system ("Work Zone Intelligent Transportation System") meeting the requirements, and providing a system manager to maintain the system during the duration of the project. The contractor assumes responsibility for any damaged equipment due to crashes, vandalism, adverse weather, etc. that may occur during the system's deployment.

The Contractor will furnish and maintain this system for measuring and delivering real-time messages for the work zone. The contractor is responsible for coordinating any work in adjacent roadway construction projects. The contractor is responsible for all charges for communications required to support operation and reporting of the Work Zone system for the duration of the project. The contractor will be responsible to relocate the devices as directed by the Engineer. When the equipment is no longer required for this project, the contractor must remove it and retain ownership.

2. MATERIALS

2.1. **Changeable Message Signs.** The Work Zone Intelligent Transportation System must utilize approved portable changeable message signs (CMS) integrated into, and mounted on, each WZITS mobile platform with the other WZITS devices. Each CMS must be capable of displaying eight characters on each of three rows. Each CMS power supply must be properly sized to allow continuous operation for up to ten days during periods of darkness and inclement weather.

Each CMS must be integrated with a radio/modem, CCTV, and a traffic sensor or other equipment (e.g. controller) mounted on a common trailer and must all act as a single "device" for the purpose of communicating with similarly integrated "devices" and displaying real-time traffic condition information. Each device must be capable of communicating through radios/modems with other device(s) at upstream or downstream locations. TxDOT District staff must have the ability to override messages displayed on any CMS in the system. This feature must be password protected and on a website separate from TxDOT's public website.

2.2. **Portable Non-Intrusive Traffic Sensors.** The Smart Work Zone System traffic sensors must be side-fired microwave radar type whose accuracy is not degraded by inclement weather and visibility conditions including precipitation, fog, darkness, excessive dust and road debris. These sensors must be capable of acquiring traffic data from up to eight (8) lanes of traffic on a lane-by-lane basis. Each Traffic Sensor power supply must be properly sized to allow continuous operation for up to ten days during periods of darkness and inclement weather

2.3. **CCTV.** The Smart Work Zone System CCTVs must be MPEG4 pan tilt and zoom cameras located on each Smart Work Zone System mobile platform. They must be remotely controlled from CTECC and must provide

MJPEG images to CTECC for viewing. Each CCTV power supply must be properly sized to allow continuous operation for up to ten days during periods of darkness and inclement weather

2.4. **Central Computer.** The central computer must provide the functionality described below:

2.4.1. **General.** Provide a Graphical User Interface that is compliant with Windows standards. Communication between the central computer and any device must be independent and *non-reliant* upon communications with any other CMS or sensor. Alerts to TxDOT TMC or District staff and the Engineer may be provided via pagers and/or e-mail. Alerts must be sent in the event of device failure or traffic delays over 15 min.

2.4.2. **Data Processing Software.** The Data Processing Software must have 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 CMS's;
- to estimate travel times and automatically update one or more portable CMS's consistent with user-defined thresholds; and
- to display alternate route messages consistent with user-defined thresholds.

2.4.3. **Data Management.**

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

Ensure the radar detectors provide accurate, real-time volume, average speed and occupancy data.

Ensure the radar detectors provide user configurable settings for a collection interval from 20 sec. to 15 min. and polling intervals from 20 sec. to 1 hr.

Ensure the radar detector unit or accompanying field equipment provides a minimum of 3 hr. of local storage for detection interval settings of 20 sec. to 15 min. in local storage to reduce data loss during communications outages.

Ensure the radar detector transfers locally stored data to the CTECC's Transportation Sensor System (TSS) when communication is restored.

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.

3. CONSTRUCTION

3.1. **System Requirements.**

The Work Zone Intelligent Transportation System must be installed on the project as shown in the Plans. Each Work Zone Intelligent Transportation System mobile platform must consist of the following as a minimum:

- Portable changeable message sign;
- Portable non-intrusive traffic sensor;
- Pan/tilt/zoom MPEG 4 CCTV;
- Radio/Modem;
- Solar platform power supply and batteries for all devices on the platform; and
- The mobile platform must be capable of being leveled and secured to the ground to prevent theft and physical displacement due to winds during operation.

The Work Zone Intelligent Transportation System must include one (1) central computer.

3.2. **Smart Work Zone Submittal.**

3.2.1. **General.** The contractor must submit to the Engineer for approval a written and illustrated WZITS Submittal three (3) weeks prior to mobilization of any component of the WZITS System. The WZITS Submittal must include the items required in this specification. The Contractor will not be allowed to start any construction activities that will affect traffic on the project until the WZITS Submittal is approved by the Engineer.

3.2.2. **Content of the WZITS Submittal.** The WZITS Submittal must include, as a minimum, the following items:

- A shop drawing of each type of WZITS unit with equipment description including make and model.
- A drawing showing WZITS unit locations based on traffic control plan and approximate locations identified in the plans.
- A description of all proposed thresholds and proposed CMS messages to be implemented.
- The name and contact information of the WZITS System Manager.
- A detailed description of the proposed methods of communication between WZITS devices and WZITS Central Computer and between WZITS Central Computer and the Transportation Management Center (TMC) or District Office located at CTECC.
- Proposed corrective method procedures including response times and notification process.

3.2.3. **Approval of Submittal.** Approval of the WZITS Submittal by the Engineer is required prior to the placement of any WZITS 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 WZITS Submittal and operations, at no additional cost, including removal of personnel, as necessary, to obtain the quality specified. The Contractor must notify the Engineer in writing a minimum of seven (7) calendar days prior to any proposed changes in the WZITS Submittal. Proposed changes are subject to approval by the Engineer.

3.3. **System Manager.**

The contractor must employ a system manager for the WZITS. The system manager must be locally available to maintain system components, maintain the website data interface, move portable devices as necessary, and respond to emergency situations. The system manager must be responsible for coordinating the placement of devices in the project areas. It is the responsibility of the system manager to move system components that interfere with construction operations and relocate the components to another area. The system manager must supply a local phone number and/or a toll free number to the Engineer to contact the system manager or other system representative at any time. The system manager must not perform any other duties on the jobsite.

3.4. **Testing.**

Once the WZITS is installed, it must undergo a five (5) day operational test. The operational test must include a test of the system in operation during a lane closure to ensure that all WZITS equipment (including the changeable message signs, traffic sensors, central computer, communication devices, and website) is operating in a fully functional manner and in accordance with the Smart Work Zone Plan for a duration of at least five (5) calendar days. The contractor must provide for complete operations support from the vendor during the operational test, and the contractor must provide verification that the reported drive time through the work zone accurately reflects actual field conditions. If any equipment malfunctions occur for a combined period of four (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.

The contractor must maintain records of equipment stoppages and resumptions during the five-day operational test for submission to the Engineer. In the event that ten percent or more of the time similar malfunctions occur that affect the proper operation of the WZITS, the Engineer may declare a system component defective and require replacement of the equipment at no additional cost. When a system

component defect is declared, the five (5) day operational test must begin again after all defective equipment is replaced and the system is fully operational.

3.4.1. **Report.** The contractor must 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 WZITS 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 WZITS will be considered operational and the system will be accepted for use.

4. MEASUREMENT

Work Zone Intelligent Transportation System (WZITS) will be measured by one lump sum and will be divided into the following payment schedule:

- 35% will be paid when all of the WZITS equipment is delivered to the jobsite.
- 25% will be paid when the Engineer approves the Operational Test Report.
- 20% will be paid after 30 calendar days of full system operation.
- 20% will be paid after traffic is in its final position, the contractor's equipment has been removed from the project, and historical data has been provided to the Engineer.

4.1. **Deduction for Failed System.** A percentage of the lump sum will be deducted should the system malfunction for three (3) or more consecutive calendar days or any total of five (5) calendar days in any one calendar month after the approval of the operational test. This deduction will be based on a ratio of calendar days of unsuccessful operation to total calendar days of operation following the approval of the operational test. This deduction will not reduce the total system payment to less than 60% of the lump sum.

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 "Work Zone Intelligent Transportation System." This price is full compensation for furnishing, installing, relocating, operating, maintaining, testing, monitoring, providing a website, providing historical data, and removal of the Work Zone Intelligent Transportation System (WZITS), including all items required for proper operation of this installation.