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# Special Specification 6307

## Temporary Speed Monitoring System

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### 1. DESCRIPTION

Furnish, install, relocate, operate, maintain, and remove various components of an automated, portable, real time Temporary Speed Monitoring System as shown on the plans or as directed. The system to be Each System deployed is for one travel direction only.

Furnish a System capable of providing real time speed information to motorists. The notification to the motorist occurs with the use of display panels activated through real-time speed data collected by the system.

The System must operate continuously when deployed. This equipment must be a packaged System that operates as a stand-alone System meeting the specifications. Conditions might exist that require multiple deployments of the System at a given time. This will be shown on the plans. The Department reserves the right to terminate this Item at any time if it determines this System is not performing in accordance with this specification or the Contractor has not met the responsibilities identified in this specification.

Temporary Speed Monitoring Systems used on this project will remain the property of the Contractor.

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### 2. MATERIALS

Provide materials and software that complies with the requirements of this Special Specification and the details shown on the plans. The System must comply with manufacturer's specifications and recommendations, and National Transportation Communications for ITS Protocol (NTCIP) standards NTCIP 1203. The Contractor must maintain an adequate inventory of parts to support maintenance and repairs of the Speed Monitoring System within allowed down time limits.

Furnish, assemble, fabricate or install materials referenced under this Specification that are corrosion resistant, in good working condition and in strict accordance with the details shown on the plans or as directed.

Provide all equipment, supplies, materials, and labor to make the System operational. Assume all communication costs including cellular telephone service, FCC licensing, wireless data networks, satellite and internet subscription charges, solar power system support, and battery charging and maintenance. Additional to these requirements, the Contractor must assume all responsibilities for and all damaged equipment due to crashes, vandalism, adverse weather, etc. that may occur during the contract period.

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### 3. EQUIPMENT

Ensure the System is comprised of all items required to provide an operational system. Any equipment furnished under this specification must be in good working condition. The equipment furnished and installed under this section must include the following:

- Power,
- Non-invasive sensors capable of detecting vehicle speed,
- Display panels,
- Portable trailers,
- Controller unit, and
- Communication System.

- 3.1. **Power.**
- 3.1.1. **Batteries.** Provide unit equipped with heavy duty, deep cycle batteries which will power the system components 24 hr. a day for a minimum of 7 days during periods of darkness and inclement weather.
- 3.1.2. **Battery Regulator and Recharging System.** Provide a unit equipped with an internal controller that regulates the amount of current delivered to the batteries and prevents overcharging.
- 3.1.3. **Solar Panels.** Provide unit equipped with solar panels which generates enough power to enable the System to continually recharge the batteries.
- 3.2. **Speed Detection Sensors.** Provide non-invasive sensors that will detect speed in miles-per-hour (mph). Position the detection system so that it detects up to 8 approaching lanes and differentiates by direction. The System must use non-invasive sensors approved by the Engineer. Furnish units with an effective detection range that meets the areas specified on the plans with a reaction speed range of 5 mph to 99 mph. Sensors mounting options must be approved by the Engineer.
- 3.3. **Display Panel.** Provide display panels that contain LED technology which display oncoming vehicle speeds in miles per hour from 10 mph to 99 mph. Each panel must be capable of being controlled by the System Coordinator on the event of System malfunction.
- Provide display panels that consist of at a minimum 2 characters, each a minimum of 18 in. in height. Provide a sign message legibility distance of 600 ft. for nighttime conditions and 800 ft. for normal daylight conditions. Provide display panels with yellow legend on a black background. The display panel must be displayed under a static work zone speed limit sign comparing it to the drivers speed. Provide static speed limit signs in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) latest version.
- Provide display panels equipped with a photocell that automatically adjusts the display for day and night operation.
- Provide display panels equipped with an operator-set high speed cutoff feature.
- 3.4. **Portable Trailer.** Provide heavy duty portable trailers with trailer lights and delineated with retroreflective material. Other mounting options that produce cost savings or meet special conditions may be possible, but only with the approval of the Engineer.
- 3.5. **Controller Unit.** Provide a local/remote controller unit that controls the System. The controller unit must continuously monitor the sensors, and when the sensors sense a vehicle, the controller must activate the appropriate messages on the display panel. Archive all messages displayed and the associated speeds with time and date stamps.
- When the sensors do not detect a speed reading the default message must be a blank screen or as specified on the plans.
- The controller should restart automatically in case of power failure and must display must display a blank screen until the System can re-establish normal operation.
- Provide password protected login for local and remote access, and the ability to be remotely configured.
- The controller should have automated error detection/correction mechanisms.
- 3.6. **Environmental Requirements.**
- 3.6.1. **Meteorological Conditions.** Provide equipment that operates and meets all of the requirements of this specification under the following atmospheric conditions:
- Ambient Temperature: -40°F to 135°F (-40°C to 57°C),

- Relative Humidity: 5% to 90% non-condensing,
- Rain: 3 in. per hour rate,
- Snow: 5 in. per hour rate,
- Fog: 200 ft. visibility, and
- Wind Velocity: AASHTO 2013 LTS Design Spec, "Wind Velocity and Ice Zones."

The System operation and accuracy must not be appreciably degraded by inclement weather.

### 3.7. **System Communication Requirements.**

- 3.7.1. Communication Requirements. When shown on the plans, provide a point to point communications link between the Speed Monitoring System controller and the Display Panels, other means subject to approval of the Engineer.

The System must be capable of providing constant communication to and from the display panel, the controller, and the sensors. It must also support communications between the controller and the Traffic Management Center (TMC).

The Communication System must have a lag time of no more than 1 second from the sensor to the controller and the display panel. If the System is not able to operate within the 1 second lag time, the System must be considered inoperative. All other communications between the controller, the Traffic Management Center (TMC), the cloud, etc. may be accomplished by cellular modem, radio frequency or other means that provide reasonable performance as approved by the Engineer.

The Communication System must have an automatic error detection/correction mechanism that addresses anomalies in the detection data to insure the integrity of all traffic condition data and motorist information messages. Any required configuration of the Speed Monitoring Communication System must be performed automatically during System initialization.

If communication is lost for more than 10 consecutive minutes, the System must revert to a fail-safe condition.

Data to be integrated as shown on the plans.

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## 4. **CONSTRUCTION**

- 4.1. **Alignment.** Allow for directional adjustment and aiming after initial installation. Perform basic alignment of the detectors either manually or electronically. Perform this step on the sensors per the manufacturer's guidelines and recommendations.
- 4.2. **Installation.** Install Speed Monitoring System in accordance with the manufacturer's specifications to achieve specified accuracy and reliability. Install Speed Monitoring System so that proper operation of the equipment will commence within 15 seconds after restoration of power. Install all System components at the locations shown on the plans or as directed.
- Follow the Temporary Speed Monitoring System time frame and duration for Systems implementation as shown on the plans or as directed.
- Use established industry and utility safety practices to erect assemblies near overhead or underground utilities.
- 4.3. **Performance.** If the system displays the default blank message or unrealistic values for more than 24 hr., or 5 times while the system is deployed, the Engineer may declare a System defective and require replacement of the appropriate equipment at no additional cost. Failure may be determined by any method, including but

not limited to remote or direct observation, monitoring systems, and data received and collected by the Traffic Management Center (TMC).

- 4.3.1. **Report.** Provide a System capable of generating a daily report that documents equipment stoppages and resumptions, and message activations during the entire time the System is operational. Submit a report to the Department at a minimum every month or as scheduled on the plans detailing the following:
- 4.3.1.1. Daily report of the System during any time the System is not operational. The report must indicate the date, time, and location of any activity necessary to maintain operation of the Temporary Speed Monitoring System and record the time/date stamps for any events when the System failed. Each entry must include the following information:
- Identify the equipment on which work was performed,
  - Cause of equipment malfunction (if known),
  - Description of the type of work performed, and
  - Time required to repair equipment malfunction.
- 4.3.1.2. Speed distribution bins per hour of each day for the entire duration the System is operational. The report must indicate the date, time, and location of each distribution bin.
- 4.3.1.3. Frequency of total speed violations speeds above posted speed, per month for the entire duration the System is operational. The report must indicate the date, time and location of each violation. Date and times of alerts and warning activations must be system generated.
- 4.3.1.4. Calculated 85th percentile speeds per hour of each day for the entire duration the System is operational. The report must indicate the date, time, and location of each system reported.
- 4.3.2. **Consequences of Failed Performance.** Failure to satisfy the performance requirements is considered a defect. Upon any notification of failure of any duration, the Contractor is required to complete a repair within the maximum allowable 24 hr. The equipment is also subject to rejection by the Engineer. The rejected equipment may be offered again for retest provided all noncompliance has been corrected.
- If a failure pattern develops in similar units within the System, implement corrective measures, including modification or replacement of units, to all similar units within the System as directed. Perform the corrective measures without additional cost or time extension of the contract period within 24 hr. after the failure pattern is identified.
- 4.4. Experience Requirements.
- 4.4.1. **Contractor Experience Requirements.** Contractor or designated subcontractor must meet the following experience requirements:
- 4.4.1.1. **Completed Project.** Demonstrate experience from one successfully completed project where the personnel installed, tested and integrated various network equipment combined as a system to create an operational function. This may include such systems as high-water detection and warning systems, variable speed limit systems, wrong-way detection and warning systems, roadway weather detection and warning systems, travel time delay estimate system, queue detection system or similar applications of technology requiring specialized equipment, electrical, and networking.
- Submit the names, addresses and telephone numbers of the references that can be contacted to verify the experience requirements given above.
- 4.5. **Documentation Requirements.** Provide a compliance matrix documenting conformance to this specification

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## 5. SYSTEM COORDINATOR

The Contractor's Responsible Person (CRP) identified under Item 7, "Legal Relations and Responsibilities" must designate a System Coordinator who is responsible to oversee the placement of the devices and for testing and calibrating the equipment. The System Coordinator must be locally available to maintain system components, move portable devices as necessary, and respond to emergency situations. It is the responsibility of the System Coordinator to move system components that interfere with construction operations and relocate the components to another area. The Contractor's Responsible Person (CPR) must provide a local phone number or a toll free number to the Engineer to contact the System Coordinator for the maintenance of the system at any time. The System Coordinator must be accessible 7 days a week and 24 hours a day while the System is deployed, and must respond within 2 hr.

Submit a schedule of implementation for approval at the pre-construction meeting. The Temporary Speed Monitoring System must be continually monitored throughout all periods of deployment. The decision to deploy, relocate, or remove field equipment is made by the Department and accomplished by the System Coordinator.

Technical Support must be available for all periods of operation.

In the event, communication is lost between any field equipment; provide a means and staff to manually program a display message within 2 hr. of notification.

System Operator local control functions and remote management operations must be password protected per TxDOT Policy.

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## 6. MEASUREMENT

This Item will be measured by each directional Temporary Speed Monitoring System furnished, installed or relocated, or by the number of days furnished and installed. All Temporary Speed Monitoring System components must be set up on the work area and operational before the time can be considered measurable. When measurement by the day used is specified, a day will be measured for each Temporary Speed Monitoring System set up and fully operational on the worksite.

When this Item is measured by the day and more than one Temporary Speed Monitoring Systems will be needed on a project and operational at the same time, a multi-system bid item code must be used. The bid item code description will reflect the number of systems operating concurrently. The total number of days measured for that bid item includes all systems combined. For example, a particular project may require two systems to be deployed at different locations operating concurrently over a period of time. In this example, the total number of days measured for the individual bid item description code includes the sum of both systems combined

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## 7. PAYEMENT

- 7.1. The work performed and materials furnished in accordance with this Item and as provided under "Measurement" will be paid for at the unit bid price for "Temporary Speed Monitoring System" of the number of systems specified when measured by the day. The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for "Temporary Speed Monitoring System" when measured by each system. This price is full compensation for the use of all equipment, including labor to set-up, furnish, operate, relocate, adjust and remove equipment, replacement parts, maintenance, all related consumables, software, programming, on-site System Coordinator, and for

incidentals necessary to complete the work. This price must also include any costs associated with communications (ex. cellular fees), power and damage from vandalism, weather or traffic incidents.

- 7.2. **Deduction for Failed System.** Should the System malfunction for a period of 24 consecutive hours without the Contractor correcting the deficiency, the payment for the day will be deducted.