

**PROJECT SPECIAL PROVISION-
AUTOMATED PORTABLE REAL-TIME WORKZONE INFORMATION
SYSTEM ('SMARTZONE')**

Description:

This item shall consist of furnishing, installing, relocating, operating and maintaining an automated portable real-time workzone system ('SMARTZONE') meeting the requirements noted herein, and providing the maintenance of the system during the duration of the project. Included in the operational responsibilities is the assuming of all communication costs such as cellular telephone and internet subscription charges. In addition to these requirements, the 'SMARTZONE' Contractor shall assume all responsibility for any damaged equipment due to crashes, vandalism, adverse weather, etc. that may occur during the systems deployment.

The goal of this system is to monitor projects when there is a specific need for lane closures to perform the work activities. These lane closures have the potential to produce abnormally large traffic backups and these backups create opportunities for crashes outside the workzone.

The 'SMARTZONE' Contractor shall furnish this system for measuring and delivering condition-responsive messages for the workzone on I-95 located between Milepost 145 and 154 in Nash and Halifax Counties. (See attached Drawings)

The Department has designed a 'SMARTZONE' setup that requires simultaneous usage of equipment between the Prime Contractor and the 'SMARTZONE' Contractor. However, if a different set-up or variation of this set-up is preferred by the 'SMARTZONE' Contractor, the Department will allow this provided it provides the level of performance required within this Specification and doesn't create a roadside hazard due to the number of devices.

If the 'SMARTZONE' Contractor decides to utilize the Department's design, they will coordinate with the Prime Contractor on the location of and simultaneous usage of equipment. Coordination will be critical to ensure the integrity of the SMARTZONE system. The 'SMARTZONE' Contractor will be attaching speed sensor equipment to the Prime's flashing arrow panel and changeable message boards unless more appropriate system configuration is defined.

The decision to deploy or remove the 'SMARTZONE' equipment will be made by the Department. Once the decision is made to deploy the 'SMARTZONE' equipment, the Department will coordinate with the 'SMARTZONE' Contractor on the remaining duration of the system. The Department will guarantee the Contractor a minimum of 8 months total usage for this contract if the system performs satisfactorily with no major malfunctions.

Malfunctions may include but are not limited to the inability of the equipment to provide accurate-real time delay or travel time information, inability to withstand an interstate roadside environment, inability to withstand normal weather conditions, etc. **The Department reserves the right to terminate this contract at any time if it determines the 'SMARTZONE' is not performing in accordance with this specification. The maximum duration for this contract will be 12 months.**

The Department will compensate the Contractor for mobilizing the 'SMARTZONE' equipment to the project at the contract unit price for "mobilization" once the system is fully operational. Once the contract is awarded, the Department expects the 'SMARTZONE' system to be fully operational within 30 days.

A secondary mobilization may be realized if both directions of I-95 are under construction simultaneously. If this occurs, the 'SMARTZONE' Contractor will be compensated at the contract unit price for "Secondary Mobilization". If secondary mobilization is required, then additional equipment will be required to monitor both directions of I-95. The Department expects the additional equipment to be fully operational within 5 days of equipment installation.

The 'SMARTZONE' Contractor will not under ANY circumstances be compensated under mobilization or secondary mobilization when moving equipment from 1 direction of the interstate to the other.

Once this equipment has arrived, any relocation or repositioning along the project or removal of equipment from the project will be incidental to the contract unit price for monthly rental.

If the Department requests the Contractor to remove all equipment and to remobilize at a later date, that remobilization will be paid for at the contract unit price for "re-mobilization". This may become necessary if the Prime Contractor decides to cease work on the project for an extended period of time. However, at this time, it is the Department's position that this situation is not likely and therefore re-mobilization will not be necessary.

The Resident Engineers Office, will be the coordinating group in charge of monitoring the performance of this 'SMARTZONE' system.

Prebid Requirements

In order to bid on this contract, all vendors will be notified and required to attend a Pre-bid Conference at the Division Office in Wilson, North Carolina. All vendors will be required to bring proof of prior deployments as well as contact information (Names and Phone numbers) to this Pre-Bid conference. The references provided will be contacted by the Department and a determination will be made as to whether the vendors system meets the requirements and conditions of this specification.

After the pre-bid conference is held, the Department will determine who qualifies for bidding and will notify all “qualified” bidders. Under no circumstances will a bidder be allowed to bid without attending the Pre-bid conference.

System Requirements

The ‘SMARTZONE’ system shall be primarily installed on 1 direction of I-95 at the time. However, there will be times when the ‘SMARTZONE’ equipment will be utilized for both directions simultaneously. Because of this situation, the pay item will be paid for “per direction/per month”. Our estimate is the ‘SMARTZONE’ equipment will be utilized in 1 direction at the time for 75% of the project duration with simultaneous usage the remaining 25%.

The ‘SMARTZONE’ system shall consist of the following (as a minimum) for 1 direction of I-95:

- *4 portable changeable message signs remotely controlled via central computer base station. (2 for the mainline, 2 for the alternate routes).*
- *3 portable traffic sensors linked to central computer base station (Two (2) of these may be mounted to other’s equipment, i.e. Flashing Arrow Panels and Changeable Message Signs)*
- *1 central base station equipped with appropriate software and either wireless or dedicated phone line communications to “link” with the ‘SMARTZONE’ equipment*
- *1 portable lap-top computer equipped with software and ultra high speed modem for fast, reliable wireless field communications with message boards, sensors, and central base station computer.*
- *2 cameras (1 for each direction of I-95 or 2 in the same direction if work is only occurring in 1 direction of I-95) to provide live video feed of the workzone portable mounted video cameras capable monitoring traffic delay and traffic queueing.*

These cameras shall become activated when delay in the workzone is detected by the speed sensors. Otherwise, they are to remain "off" unless activation is requested by authorized personnel. This activation will be an "On Demand" feature the Department can use to verify traffic conditions and/or verify messages on the Changeable Message Boards as well as other incident management purposes.

This "On Demand" feature shall be accessible from the project website with by providing a password protected "link" for approved personnel.

The cameras shall be mounted on a portable trailers located near the lane closure (See attached drawings) and shall have PTZ capabilities.

- *The 'SMARTZONE' system shall be capable of providing current operational status (i.e. current traffic data and messages, communications system, signs and sensors) via the central base station computer and via the Internet to a dedicated web-site established for the purpose of monitoring the corridor and the 'SMARTZONE' equipment*
- *The web-site shall have the capability of providing a password protected "link" for approved personnel to have limited access to the operational characteristics of the system to manually override errant messages on the CMS's due to communication interruptions or other system failures.*
- *The web-site shall have the capability of providing a password protected "link" for approved personnel to have access to retrieve the volume and speed data the system is collecting.*
- *The website for the monitoring of the 'SMARTZONE' system shall be capable of verifying and validating the real-time messages on the Changeable Message Boards for password approved personnel.*
- *The 'SMARTZONE' system software shall be configured so that appropriate personnel are notified by cell phone and/or email once a malfunction has occurred in the system. Configure the software so that up to 5 approved Department personnel are notified by cell phone and up to 25 personnel are notified by email.*
- *The software shall be configured to assess any type of malfunction that has occurred. This assessment includes communication disruption between any device in the system configuration, changeable message board malfunctioning, speed sensor malfunction, etc.*

The exact locations of all devices shall be determined as part of an on-site communications analysis with project personnel.

Materials

All materials used shall meet the manufacturer's specifications and recommendations.

Construction Methods

The provisions of Article 1105-3 in the North Carolina Standard Specifications for Roads and Structures (2002) will be applicable to the work covered by this section.

In addition, the below requirements are to be met.

- The 'SMARTZONE' system shall utilize North Carolina approved portable Changeable Message Signs (CMS) to convey real-time traffic condition information to motorists.
- The 'SMARTZONE' system shall operate continuously (24 hours, 7 days a week) when deployed on the project. It shall be in the "data collection" mode when the queue sensors aren't activated.
- To support incident management, the 'SMARTZONE' system shall allow the Division 4 staff to manually override motorists information messages for a user-specified duration, after which automatic operation will resume with display of messages appropriate to the prevailing traffic conditions.
- Critical system operator control functions shall be password protected.
- The 'SMARTZONE' system shall be capable of providing current operational status (i.e. current traffic data and messages, communications system, signs and sensors) via the central base station computer and via the Internet to a web-browser equipped remote computer.
- The 'SMARTZONE' system shall be capable of acquiring traffic volume and speed data and selecting motorist information messages automatically without operator intervention after system initialization.
- Via the central base station and a remote computer, the 'SMARTZONE' system shall provide a full color map depicting the project area with locations of traffic sensors, CMS's and cameras.
- Using color-coding, the Map shall reflect the current traffic conditions at each traffic sensor and display the entire information message being shown by each CMS.

RTWS Traffic Data Acquisition

- **Each traffic queue sensor shall communicate with the computer base station to activate the appropriate CMS whenever the prevailing traffic speed slows to 55 miles per hour. Once activated, the preprogrammed messages shall be automatically displayed on the CMS as shown on the attached drawing.**

- **The ‘SMARTZONE’ system shall be capable of calculating and having “real time” delay information displayed on the portable CMS’s. This “real time” delay shall be calculated and displayed on the portable CMS’s to the nearest minute for delays up to 15 minutes after the initial 5 minute delay. For delays exceeding 15 minutes, the delay information displayed on the CMS’s shall be rounded to the nearest 5 minute increment.**
- **The “real time” delay information displayed on the CMS’s is to be updated every 3 minutes.**
- **The website delay information is to be updated simultaneously with the delay information displayed on the Changeable Message Signs**
- **To allow for motorist information messages of high specificity, the ‘SMARTZONE’ system shall acquire quantitative traffic data using an accurate speed measurement technique that includes the capability of detecting stopped traffic and counting traffic volume.**
- **The ‘SMARTZONE’ system traffic sensors shall be of a type whose accuracy is not degraded by inclement weather or degraded visibility conditions including precipitation, fog, darkness, excessive dust, and road debris.**
- **The ‘SMARTZONE’ system shall be capable of automatically prompting motorists of alternative route messaging once delay reaches 10 minutes. The alternate routes will be preselected by Division 4 personnel.**
- **Once delay is at 10 minutes, the Changeable Message Signs along the alternate routes are to be activated by the ‘SMARTZONE’ system.**
- **The ‘SMARTZONE’ system shall be capable of acquiring traffic data from up to four lanes of traffic in multiple directions.**
- **All traffic data acquired by the ‘SMARTZONE’ system shall be archived in log file with time and date stamps**

‘SMARTZONE’ Motorist Information Messages

- **The ‘SMARTZONE’ system shall be capable of providing speed, delay, length of traffic queue (to the nearest miles) and lane closure advisories to motorists.**
- **The ‘SMARTZONE’ shall be capable of displaying the advisory/informational messages as shown on the attached drawing, as well as separate, independent advisory messages associated with Incident Management needs along the I-95 corridor on each CMS. (See attached drawing)**

- Records of all motorist information messages displayed by the 'SMARTZONE' shall be recorded in log files with time and date stamps.
- The 'SMARTZONE' shall be capable of displaying separate, independent default messages, as well as separate, independent advisory messages associated with Incident Management needs along the I-95 corridor on each CMS.
- The 'SMARTZONE' default and advisory messages must be capable of being automatically selected based on traffic conditions at a single traffic sensor point or at multiple traffic sensor points in combination.
- System must have capacity to preset up to 10 different default or automatic advisory messages for each CMS, for a total capacity of at least 40 different default and automatic messages (10 for each of the 4 CMS's).
- Default and advisory message content shall be programmable from the central base station.
- For later use, the 'SMARTZONE' shall be capable of storing messages created by an authorized user in overriding any default or automatic advisory message.

System communications

- **Communication method between devices is at the discretion of the manufacturer. However, careful field evaluation should be made to determine the most compatible communication type for the project. Redundancies are to be built into the system to minimize communication interruptions and erroneous and/or inaccurate messaging being transmitted to the portable changeable message signs thereby misinforming the motoring public.**
- **The SMARTZONE's communications system shall incorporate an error detection/correction mechanism to insure the integrity of all traffic conditions data and motorist information messages.**
- Any required configuration of the SMARTZONE'S communications system shall be performed automatically during system initialization.

Changeable Message Signs

- **The location of portable changeable message signs and traffic sensors for the various construction phases will be as shown on the attached drawings. If utilizing the Department's equipment configuration, two (2) of the three (3) speed sensors will be mounted on changeable message signs and flashing arrow panels owned by others. (See attached Drawings)**

- The portable changeable message signs shall be on the North Carolina approved products list and have the following features
 - Remote sign operation via central computer base station
 - Messages to be displayed shall have the capability to be timed to changes at various times of the day and days of the week.
 - All CMS's shall have the capability to "center justify" the messages.

Any request to change the messages on the Changeable Message Signs has to be approved by the DOT.

System Performance

To ensure a prompt response to incidents involving the integrity of the 'SMARTZONE' devices and changeable message signs, the 'SMARTZONE' Contractor shall provide an "on-site" SMARTZONE specialist who is skilled in the operation of all the 'SMARTZONE' equipment and software for the duration of this project. This "on-site" specialist shall be equipped with sufficient resources within 2 hours of notification to make needed corrections of deficiencies. This "on-site" technical support shall be provided around the clock from midnight Sunday night until noon Friday. For weekends, technical support shall be provided by "on call" status and be accessible by pager and/or cell phone.

When ANY type of system or equipment failure occurs, the amount of downtime the system experiences will be documented by the Department. The Department will allow a 2 hour "grace" period, before any price reductions are assessed to get the individual device and/or system restored to full operation. After the 2 hour "grace" period, the pro-rated price reductions for that day will be initiated. If the system experiences a malfunction due to "third party" involvement, that will not constitute price reductions for the system.

The amount of downtime will be subtracted from the monthly payment on a pro-rated basis. The pro-rated basis will be calculated by determining the number of hours the system is down between 6AM and 8PM Monday thru Friday. A lane closure day will consist of 14 hours. (For example, if the system is down 6 hours, this represents a 43% reduction in price for that day). If downtime exceeds more than 8 hours in a lane closure day, then that day is subtracted from the monthly amount. The monthly amount bid by the Contractor will be divided by 20 (20 lane closure days per month) to yield a per day amount.

Equipment (i.e. CMS, speed sensors, cameras, etc.) malfunctions shall be corrected within 2 hours. All system deficiencies shall be corrected within 24 hours.

The Department reserves the right to terminate this contract at any time if it determines the ‘SMARTZONE’ system is not performing in accordance with this specification.

Method of Measurement

The quantity for the **MOBILIZATION** of the ‘SMARTZONE’ system to be paid for will be the ‘SMARTZONE’ system required and satisfactorily installed as described in the “Description” Section and shown on the attached drawing for a direction on I-95 as required by this Special Provision. “Mobilization” includes providing the ‘SMARTZONE’ equipment for a direction on North or Southbound I-95.

A secondary mobilization may be realized if both directions of I-95 are under construction simultaneously. If this occurs, the ‘SMARTZONE’ Contractor will be compensated at the contract unit price for “Secondary Mobilization”. The ‘SMARTZONE’ Contractor will not under no circumstances be compensated under mobilization or secondary mobilization when moving equipment from 1 direction of the interstate to the other.

Once this equipment has initially arrived, any relocation along the project or removal of this equipment from the project will be incidental to the contract unit price for monthly rental. If the Department requests the Contractor to remobilize at a later date, that remobilization will be paid for at the contract unit price for “re-mobilization.

The quantity for the **SECONDARY MOBILIZATION** of the ‘SMARTZONE’ system to be paid for will be the ‘SMARTZONE’ system required and satisfactorily installed as described in the “Description” Section and shown on the attached drawing for a direction on I-95 as required by this Special Provision.

The quantity for the ‘SMARTZONE’ system to be paid for will be the ‘SMARTZONE’ system required and satisfactorily installed as described in the “System Requirements” Section and shown on the attached drawing for a direction on I-95 during the life of the project as required by this Special Provision.

The quantity for the **On-Site ‘SMARTZONE’ Technician** to be paid for will be measured by providing a project dedicated, full-time service technician knowledgeable in all aspects of the SMARTZONE equipment and software as described in the “System Performance” Section.

The quantity for the **REMOBILIZATION** of the ‘SMARTZONE’ System to be paid for will be the ‘SMARTZONE’ system required and satisfactorily reinstalled as described in the “Description” Section and shown on the attached drawing and as required by this Special Provision. “Remobilization” includes providing ‘SMARTZONE’ equipment for a direction on I-95. Once this equipment arrives, any relocation along the project (as described previously) or removal of this equipment from the project will be incidental to the contract unit price for monthly rental.

Basis of Payment

The quantity for **MOBILIZATION** of the 'SMARTZONE' System, measured as stated above, will be paid for at the contract unit price lump sum for "Mobilization of "SMARTZONE" System (Lump Sum)

The quantity for **SECONDARY MOBILIZATION** of the 'SMARTZONE' System, measured as stated above, will be paid for at the contract unit price lump sum for "Secondary Mobilization of "SMARTZONE" System (Lump Sum)

The quantity for the '**SMARTZONE' SYSTEM** measured as stated above, will be paid for at the contract unit price per direction per month for the "SMARTZONE System" (per direction/per month)

The quantity for the **On-Site 'SMARTZONE' Technician**, measured as stated above, will be paid for at the contract unit price per month for "On-Site 'SMARTZONE' Technician (month)

The quantity for **REMOBILIZATION** of 'SMARTZONE' System, measured as stated above, will be paid for at the contract unit price per each for "Remobilization of 'SMARTZONE' System" (each)

Such price and payment will be full compensation for all work covered by this provision including but not limited to furnishing, installing, relocating, operating, maintaining, and removing the 'SMARTZONE' system at the discretion of the Department.

Payment will be made under:

Mobilization of 'SMARTZONE' System	Lump Sum
Secondary Mobilization of 'SMARTZONE' System.....	Lump Sum
'SMARTZONE' System.....	Per Direction/Month
On-Site SMARTZONE Technician.....	Per Month
Remobilization of 'SMARTZONE' System.....	Per Each