

Project Special Provision for Work Zone Signing- Fluorescent Orange sheeting

DESCRIPTION.

Furnish, install and maintain work zone signs with fluorescent orange sheeting Type VII (Seven) or higher. All work zone signing (stationary, barricade mounted and portable) along with detour signing must meet this requirement. See traffic control website.

In addition, temporarily cover and uncover, relocate, and remove work zone signs (stationary, barricade mounted and portable) in accordance with the plans and specifications. Use work zone signs (portable) only with portable work zone sign stands specifically designed for one another. Portable work zone signs may be roll-up or approved composite.

MATERIALS.

1. General:

Sign retroreflective sheeting requirements for Types VII (seven), VIII (eight) and IX (nine) are described in Section 1093 of the NCDOT 2002 *Standard Specifications for Roads and Structures*. Cover the entire sign face with reflective sheeting. Apply the reflective sheeting in a workmanlike manner so that there are no bubbles or wrinkles in the material.

a) Work Zone Signs (Stationary):

Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better. Construct sign backing of a rigid material such as aluminum or approved composite material. Signs and sign supports must meet or exceed NCHRP 350 requirements for Breakaway Devices.

b) Work Zone Signs (Barricade Mounted):

Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better. Sign and barricade assembly must meet or exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

c) Work Zone Signs (Portable):

Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better without adhesive backing for roll-up portable work zone signs. Signs and sign stand assemblies must meet or

exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better for aluminum or composite portable work zone signs. Signs and sign stand assemblies must meet or exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

d) Work Zone Signs (Detour):

Use Type VII (seven), VIII (eight) or IX (nine) (prismatic) fluorescent orange retroreflective sheeting or better for aluminum or approved composite detour work zone signs.

CONSTRUCTION METHODS.

The provision of Article 1110-3 of the NCDOT 2002 *Standard Specifications for Roads and Structures* will apply to this special provision.

MAINTENANCE

Provide continuous and expeditious maintenance of all work zone signing throughout the life of the contract.

Prior to construction, submit for approval, a proposed maintenance schedule and maintenance checklist for all traffic control devices.

The scheduled maintenance and device inspections must be performed. Maintenance activities include the repair or replacement of work zone signs which have damaged torn sheeting, bent or deformed sign backing, deformed sign supports, displaced by traffic or other means, or deteriorated beyond effectiveness. Specific maintenance responsibilities include but are not limited to: replacement due to loss of retroreflectivity, repair or defaced sheeting and legend, replacement of broken supports, repositioning of leaning signs, cleaning of dirty signs, replacement of stolen or vandalized signs, and replacement of displaced signs.

Project Special Provision for Polyurea Pavement Marking Material with Highly Retroreflective elements.

Section 1205-1 DESCRIPTION:

This special provision covers machine applied “Highly Retroreflective” Polyurea pavement marking material with reflective elements. All remaining Articles in Section 1205 shall be as described in the 2002 Standard Specification for Roads and Structures with the exceptions below.

Section 1205-2 Materials

(A) General

Replace Article (A) with the following:

Use Section 1087-Articles 1, 3, 5 & 6 (General, Color, recommend any remaining information necessary for the placement of “Highly Retroreflective” Polyurea pavement markings.

(B) Material Qualification

Replace Article (B) with the following:

Use only “Highly Retroreflective” polyurea pavement markings that have been pre-approved by the Traffic Control Section prior to application. Use retroreflecting elements according to the manufacturer’s recommendations in order to meet the retroreflectivity requirements as stated in Section 1205-3(G)(8) as measured by a LTL 2000, LTL-X or Department approved 30m mobile retroreflectometer.

Furnish a Type 3 Material Certification and Type 4 Material Certification in accordance with Article 106-3 as described in the NCDOT 2002 *Standard Specifications for Roads and Structures*.

For more information, contact the Traffic Control Section at 919 250-4151.

Section 1205-3 Construction Methods

Section 1205-3(B) (1) General for all Application Equipment: Add the following sentence after the last paragraph:

Do not use handliners or any other non-truck mounted pavement marking machine to install “Highly Retroreflective” polyurea pavement markings on long-line applications.

Add the following Section immediately following Section 1205-3(G)(8)

Section 1205-3 (G) (9) “Highly Retroreflective” Polyurea Application: Packaging for Shipment, and Storage Life) as described in the NCDOT 2002 *Standard Specifications for Roads and Structures*. The manufacturer may

Produce “Highly Retroreflective” Polyurea pavement marking lines which have a minimum dry thickness of 20 mils (0.50mm) when placed on concrete and asphalt pavements.

Using the Polyurea application equipment, apply the pavement marking materials simultaneously. Apply the Polyurea resin, mixed at the proper ratio according to the manufacturer recommendations, to the pavement surfaces within the proper application temperatures as determined by the material manufacturer. Inject reflective elements into the molten (liquid) Polyurea pavement markings.

Apply reflective elements according to manufacturer’s recommendation to immediately produce a highly reflective marking.. At the time of installation, provide in-place marking with the minimum reflectance values shown below, as obtained with a LTL 2000, LTL-X or Department approved 30m mobile retroreflectometer. Maintain the retroreflectance values shown below for a minimum of 30 days from the time of placement of marking material.

WHITE: 800 mcd/lux/m²
YELLOW: 500 mcd/lux/m²

Produce marking, which upon cooling, is uniformly reflectorized and has the ability to resist deformation caused by traffic throughout its entire length.

The manufacturer of the Polyurea pavement marking material shall certify the Contractor to place the material. Provide at least one member of each crew that completed this training. Furnish the Engineer written confirmation of this training from the material manufacturer prior to the beginning of work. The manufacturer’s technical representative shall be onsite during the entire installation of product.

Provide a manufacturer’s technical representative that is knowledgeable and familiar with the Contractors application equipment prior to the installation of the Polyurea pavement markings.

Section 1205-3(H)(1) Observation Period for “Highly Retroreflective” Polyurea Pavement Markings:

Replace the first paragraph with the following:

Thermoplastic, epoxy, and polyurea pavement markings are subject to a 180 day observation period.

Add the following just before the last paragraph:

Provide high visibility polyurea pavement marking materials that maintain minimum retroreflectance values throughout the observation period as follows:

WHITE: 700 mcd/lux/m²

YELLOW: 400 mcd/lux/m²

In addition to the 180 day observation period, provide high visibility polyurea pavement marking materials that meet the following minimum retroreflectance values after having been snowplowed:

WHITE: 375 mcd/lux/m²

YELLOW: 250 mcd/lux/m²

These measurements will be taken within 30 days prior to the end of the Observation Period. The reflectance values will be taken using a LTL 2000, LTL-X or Department approved 30m mobile retroreflectometer.

Section 1205-3(I) Removal of Pavement Markings:

Add the following just before the last paragraph:

Do not apply Polyurea pavement marking over existing pavement marking materials having less adherence than the Polyurea. Remove existing lines according to the manufacturer's recommendations.

Project Special Provision 'Smart Zone' Work Zone System

A. Description:

This item shall consist of furnishing, installing, relocating, operating and maintaining an automated, portable, real-time work zone system 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, satellite and Internet subscription charges. In addition to these requirements, the 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 deteriorating traffic conditions on and along I-95 in Wilson and Johnston Counties created by the work zone located between Milepost 107 and 116. Traffic conditions will deteriorate due to backups caused by high traffic volumes, work zone vehicle interference, weather, etc. This project will require a 'SMART ZONE' work zone system company to contract with the Contractor to supply the necessary equipment to monitor traffic conditions. The NCDOT prequalified 'SMART ZONE' work zone system companies are as follows:

- 1) IRD Inc.
- 2) HIS Inc.
- 3) United Rentals
- 4) Scientex Inc.
- 5) PDP Associates
- 6) ASTI

The 'SMART ZONE' company which is selected by the Contractor shall attend the Preconstruction Conference to be held at the Division Office in Wilson, NC. The date and time of the Preconstruction Conference will be determined by the Engineer.

In addition, this project will also require the 'SMART ZONE' work zone system to notify the Incident Management Center in Wilson and the Resident Engineer's office once the delay along I-95 exceeds 25 minutes. The contact Incident Management person in Wilson is Brian Purvis (bpurvis@dot.state.nc.us). His phone number is 919 296-3543. The contact person at the Resident Engineer's office in Selma is Mike McKeel (MMcKeel@dot.state.nc.us). His phone number is 919 934-5863.

B. 'SMART ZONE' work zone system Requirements

The 'SMART ZONE' work zone system shall consist of but, not limited to the following (as a minimum): (See Attached Drawings).

I-3605
Rev. 9/2/04

The exact locations of all devices shall be submitted to the Resident's Office and State Alternate Delivery Systems Engineer for Approval prior to installing the system. Plan should be submitted with the Staging Concept.

- 10 portable changeable message signs remotely controlled via central computer base station.
- 10 portable traffic sensors linked to central computer base station
- 8 temporary traffic video surveillance cameras. 4 along I-95 and 4 along the alternate routes
- 1 central base station equipped with appropriate software and either wireless or dedicated phone line communications to "link" with the 'SMART ZONE' work zone system
- 8 pagers to provide notification to designated personnel in the Selma Resident Engineer's Office (3), Contractors Office (2), SMART ZONE Contractor (1) and Transportation Management Center (2).
- **Provide a database of real-time data that is accessible to the DEPARTMENT by a secure connection for integration into the www.ncsmartlink.org traveler information website. The database should include, but is not limited to, messages being displayed on portable Changeable Message Signs (CMS), images from the temporary Closed Circuit Television Cameras (CCTV), average travel speed and lane occupancy from the portable detector stations.**
- **Provide a project specific, secure web site for the DEPARTMENT that allows for operation of the equipment included in the SMART WORK ZONE. This web site will provide tiered access that allows the user functions that include, but are not limited to, pan-tilt-zoom control of the portable CCTV, full messaging control of the portable CMS, and monitoring capabilities of the detection equipment.**
- The 'SMART ZONE' work zone 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 project web-site established for the purpose of monitoring the corridor and the 'SMART ZONE' work zone system equipment
- 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.

I-3605
Rev. 9/2/04

- The website for the monitoring of the 'SMART ZONE' work zone system shall be capable of verifying and validating the real-time messages on the Changeable Message Boards for password approved personnel.
- The 'SMART ZONE' work zone system software shall be configured so that appropriate personnel are notified by pager and email once a malfunction has occurred in the system.
- 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 'SMART ZONE' work zone system shall be capable of notifying the Resident Engineer's office and both the Contractor and SMART ZONE representative about any system malfunction.

C. Materials

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

D. 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 'SMART ZONE' work zone system shall utilize North Carolina approved portable Changeable Message Signs (CMS) to convey real-time traffic condition information to motorists.
- **The 'SMART ZONE' work zone 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.**
- The "real time" delay information displayed on the CMS's is to be updated every 30 seconds.
- To support incident management, the 'SMART ZONE' work zone system shall allow the Wilson Incident Management Center 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.

I-3605
Rev. 9/2/04

- The 'SMART ZONE' work zone system shall be capable of providing current operational status (i.e. current traffic data and messages, communications system, signs and sensors) via the dedicated project web-site.
- The 'SMART ZONE' work zone system shall be capable of acquiring traffic volume and speed data and selecting motorist information messages automatically without operator intervention after system initialization.
- The dedicated project web-site 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.
- **The web-site delay information is to be updated simultaneously with the delay information displayed on the Changeable Message Signs**

'SMART ZONE' 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 60 miles per hour. Once activated, the preprogrammed messages shall be automatically displayed on the CMS as shown on the attached drawings.
- Records of all motorist information messages displayed by the 'SMART ZONE' system shall be recorded in log files with time and date stamps. **This information shall be provided to the Department on disk at the completion of the project.**
- All traffic data acquired by the 'SMART ZONE' shall be archived in log file with time and date stamps. **At the completion of the project, the 'SMART ZONE' vendor shall provide the Department this logged information on disk.**
- To allow for motorist information messages of high specificity, the 'SMART ZONE' shall acquire quantitative traffic data using an accurate speed measurement technique that includes the capability of detecting stopped traffic and counting traffic volume.
- The 'SMART ZONE's 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 'SMART ZONE' shall be capable of acquiring traffic data from up to four lanes of traffic in multiple directions.

I-3605
Rev. 9/2/04

‘SMART ZONE’ Motorist Information Messages

- The ‘SMART ZONE’ shall be capable of providing speed, delay, length of traffic queue, and lane closure advisories to motorists. The primary system messaging will be providing the number of minutes of delay to the end of the workzone from each portable changeable message sign.
- The ‘SMART ZONE’ 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.
- 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 80 different default and automatic messages (10 for each of the 8 CMS’s).
- Default and advisory message content shall be programmable from the central base station.
- The ‘SMART ZONE’ system shall be capable of storing messages created by an authorized user in overriding any default or automatic advisory message.

System communications

- **Communications between central computer base station and any individual CMS and sensor shall be independent through the full range of deployed locations and SHALL NOT rely upon communications with any other CMS, sensor or camera.**
- The ‘SMART ZONE’ communication 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 ‘SMART ZONE’ communications system shall be performed automatically during system initialization.

Changeable Message Signs

- The approximate location of portable changeable message signs and traffic sensors for the various construction phases will be as shown on the attached drawings. However, all final locations will be verified by the Resident Engineer.
- **ALL DISPLAYED MESSAGES ARE TO BE CENTER JUSTIFIED. NO EXCEPTIONS.**

- **All Time Information displayed on the CMS is to be synchronized on each CMS so that accurate time is shown according to official Eastern Standard Time. In no case shall any displayed time differ more than 5 minutes from official E.S.T. Also, the time information is to be synchronized so that the time information is displayed the same on each CMS until a further update is executed.**
- **The primary system messaging will be providing the number of minutes of delay to the end of the workzone from each portable changeable message sign.**
- 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 and/or website
 - Messages to be displayed shall have the capability to be timed to changes at various times of the day and days of the week.
 - Any request to change the messages on the Changeable Message Signs has to be approved by NCDOT.

Temporary Closed Circuit Television Cameras (CCTV) for Video Surveillance

The Contractor shall provide eight (8) cameras (2 for each direction of I-95 and 4 along the alternate route to provide live video feed of the subject location. These cameras shall provide continuous streaming video imaging for the duration of the project. The Contractor will be responsible for providing the platform, power source and communications for these temporary cctv cameras.

The traffic video surveillance cameras shall be an "IP" based system with wireless communication media. The Contractor will be responsible for hosting the server for this "IP" based camera system.

The Contractor is to provide standard software that enables approved DOT users to access the cameras through the project web site. This software is to be configured such that a camera icon (with password protection) appears on the project web site. When initialized, this icon will provide a GUI or a "point and click" windows application that allows the user to view the images of the 8 cameras. Upon "clicking" of the individual camera, the computer screen is to show the video imaging as well as a "pop-up" type window that provides the user with full pan-tilt-zoom control of the camera.

A secure connection will be provided that allows sharing of the cctv images through the project web site and NCSMARTLINK.org.

I-3605
Rev. 9/2/04

Approved DOT personnel are to have unlimited durational access to the camera images. The public will have access to view the images through the NCSMARTLINK.org website. The system shall be constructed to accept 100 simultaneous hits without image degradation or system malfunction.

A 15 second maximum continuous connection for video stream is to be established for the public access. To conserve bandwidth, after 15 seconds, the streaming video accessed by an individual will stop and a snap shot will appear. The individual will have to reconnect the camera location for further viewing of the streaming video after the 15 second time frame expires.

As a minimum, the CCTV cameras shall provide an update rate of 10 frames/sec.

As long as the required site distance is achieved, the CCTV cameras may be temporarily mounted on poles or mounted on portable trailers and shall have PTZ (Pan/Tilt/Zoom) capabilities.

System Performance

To ensure a prompt response to incidents involving the integrity of the 'SMART ZONE' devices and changeable message signs, the 'SMART ZONE' Contractor will be required to make all necessary corrections to the essential components of the system within 24 hours of notification by the Department. If all corrections are made within this 24 period and the system is brought back on-line, no monetary penalty will occur. Essential components are the Portable Changeable Message Signs, Communications Equipment, and Speed and Volume Sensors, Computer hardware and software required to place the real time information on the signs. Non-essential components of this system are the dedicated project web-site and video cameras.

If the 24 hour timeframe expires and the essential components of the system are not fully restored to proper working order a \$500/day monetary penalty will be assessed from the time of initial notification until the system is brought back online.

If the essential components of the 'SMART ZONE' system are down for 10 total days or more in a month whether they are consecutive or cumulative, then the penalty will be \$1,000.00 per day for each day that exceeds the 10th day.

If the 24 hour timeframe expires and the non-essential components of the system are not fully restored to proper working order a \$250/day monetary penalty will be assessed from the time of initial notification until the system is brought back online.

If the non-essential elements of the 'SMART ZONE' system are down for 10 total days or more in a month whether they are consecutive or cumulative, then the penalty will be \$500.00 per day for each day the exceeds the 10th day.

The 'SMART ZONE' system is a required component of this project. Non-compliance of this specification will result in the above stated liquidated damages. If the Contractor chooses to remove the SMARTZONE company due to either non-compliance or non-performance with this specification, he may select another prequalified SMART ZONE company to provide the required services. However, the liquidated damages will continue from date and time of system malfunction until the day and time a replacement system is in place and fully operational.