

**TRAFFIC CONTROL SUPERVISOR:**

**Description**

Furnish a Traffic Control Supervisor for the project who is knowledgeable of Traffic Control Plan design, devices and application, and has full authority to ensure traffic is maintained in accordance with the plans and specifications.

**Construction Methods**

The Contractor shall identify a Traffic Control Supervisor for the project that has the following qualifications:

- (A) A minimum 24 months of On-the-Job Training in supervision and work zone set up and implementation.
- (B) Be certified by responsible party (contractor or DOT) to have the required experience and training and is qualified to perform the duties of this position. If certified by the Contractor, a notarized certification letter shall be furnished to the Engineer at the preconstruction meeting. The letter shall state the Traffic Control Supervisor is qualified, and state that the Traffic Control Supervisor has the authority to ensure traffic is maintained in accordance with the contract documents.

The Traffic Control Supervisor for the project shall be capable of performing the following:

- (1) Be available and on call at all times to make any necessary changes in the traffic control operations in a timely manner.
- (2) Coordinate and cooperate with traffic control supervisors of adjacent or overlapping construction projects to insure safe and adequate traffic control is maintained throughout the projects at all times including periods of construction inactivity.
- (3) Coordinate and cooperate with Traffic Management Center personnel in Wake County to ensure proper messages are displayed on the CMSs (Changeable Message Sign) and Dynamic Message Sign (DMS) that guide motorists to designated alternate detour routes.
- (4) Provide traffic control set up that ensures safe traffic operations throughout the construction area.
- (5) Provide traffic control set up that ensures workers' safety throughout the construction area.
- (6) Attend any scheduled meetings as required by the Engineer.

**Measurement and Payment**

There will be no direct payment for the Traffic Control Supervisor as this is considered incidental to the cost of providing traffic control devices to the project.

**THE INFORMATION INCLUDED IN THIS RWZ-1 IS TO BE USED FOR R-5164B.****TRAFFIC CONTROL:**

(10-21-08)

RWZ-1Revised

Maintain traffic in accordance with Divisions 10, 11 and 12 of the *Standard Specifications*, the latest revisions thereto and the following provisions:

Use a lane closure (refer to the *Roadway Standard Drawings* Nos. 1101.02, 1101.11, 1110.02, 1130.01 and details for the Advance Work Zone signing in contract) or a slow-moving operation as shown in details of this contract. Use a moving operation only if the minimum speed maintained at all times is 3 mph with no stops that narrow or close a lane of travel. If the moving operation is progressing slower than 3 mph at any time, install a lane closure. Maintain the existing traffic pattern at all times, except in the immediate work zone where lane closures are allowed as determined by the Engineer.

Refer to Attached Details and the *Roadway Standard Drawings* Nos. 1101.02, 1101.03, 1101.04, 1101.05, 1101.11, 1110.01, 1110.02, 1115.01, 1130.01, 1135.01, 1145.01, 1150.01, 1165.01, 1170.01 and 1180.01 when closing a lane of travel in a stationary work zone such as pavement patching resurfacing, or pavement marking removal. Properly ballasted cones may be used instead of drums for lane closures during daylight hours. However, drums are required for the upstream taper portion of lane closures in all applications. The stationary work zone shall be a maximum of 3 miles in length at any given time unless otherwise directed by the Engineer. A pilot vehicle operation may be used in conjunction with flaggers and the appropriate pilot vehicle warning signing as directed by the Engineer. During periods of construction inactivity, return the traffic pattern to the existing alignment and remove or cover any work zone signs. When covering work zone signs, use an opaque material that prevents reading of the sign at night by a driver using high beam headlights. Use material, which does not damage the sign sheeting. Replace any obliterated markings as required by other sections of the *Standard Specifications* and the Engineer.

When personnel and/or equipment are working on the shoulder adjacent to an undivided facility and within 5 feet of an open travel lane, close the nearest open travel lane using the *Roadway Standard Drawings* No. 1101.02 unless the work area is protected by barrier or guardrail. When personnel and/or equipment are working on the shoulder, adjacent to a divided facility and within 10 feet of an open travel lane, close the nearest open travel lane using the *Roadway Standard Drawings* No. 1101.02 unless the work area is protected by barrier or guardrail. When personnel and/or equipment are working within a lane of travel of an undivided or divided facility, close the lane according to the traffic control plans, *Roadway Standard Drawings* or as directed by the Engineer. Conduct the work so that all personnel and/or equipment remain within the closed travel lane. Do not work simultaneously, on both sides of an open travel way, within the same location, on a two-lane, two-way road. Do not perform work involving heavy equipment within 15 feet of the edge of travel way when work is being performed behind a lane closure on the opposite side of the travel way. Perform work only when weather and visibility conditions allow safe operations as directed by the Engineer.

Do not exceed a difference of 2 inches in elevation between open lanes of traffic for nominal lifts of 1.5 inches. Install advance warning UNEVEN LANES signs (W8-11 at 48" X 48") 500 feet in advance and a minimum of once every half mile throughout the uneven area.

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Backfill at a 6:1 slope up to the edge and elevation of existing pavement in areas adjacent to an open travel lane that has an edge of pavement drop-off as follows:

- (A) Drop-off that exceeds 2 inches on roadways with posted speed limits of 45 mph or greater
- (B) Drop-off that exceeds 3 inches on roadways with posted speed limit less than 45 mph.

Backfill the unacceptable drop-off with suitable compacted material, as approved by the Engineer, at no expense to the Department. This work is not considered part of shoulder reconstruction.

When utilizing a slow-moving operation for such items as pavement marking placement, pavement marker installation and pesticide spraying, the slow moving operation caravan shall consist, as a minimum, of the vehicles and devices shown on the Moving Operation Caravan Detail(s) herein. Traffic cones may be used when necessary to provide additional protection of wet pavement markings. Ballast all traffic cones so they will not be blown over by traffic.

**Submit in writing a full and complete plan for traffic control and, if needed, construction lighting** to the Engineer at the first pre-construction meeting for approval by the Engineer. Approved sequence can not be altered without written permission of the Engineer.

**Failure to comply with the following requirements will result in a suspension of all other operations:**

**Failure to comply with the following requirements will result in a suspension of all other operations:**

- 1. Before working on ANY MAP, the Contractor shall submit a written construction sequence to the Engineer at the first pre-construction meeting and the sequence must be approved before closing a lane of traffic. The construction sequence shall coordinate with the phasing in the R-2000AF Traffic Management Plan. The Contractor and Engineer will coordinate with the Traffic Management Unit at 919-250-4159 for additional traffic control guidance.**
- 2. Coordinate the installation of items on Summary of Quantity spreadsheet and resurfacing operations such that these operations are completed in the order as agreed upon with the Engineer at the first pre-construction meeting. Refer to the Typical and Details unless otherwise directed by the Engineer.**
- 3. Once the Contractor has started work at a location, the Contractor should prosecute the work in a continuous and uninterrupted manner from the time he begins the work until completion and final acceptance unless determined otherwise by the Engineer.**
- 4. Obtain written approval of the Engineer before working in more than one location or setting up additional lane closures.**
- 5. Mainline pavement shall not be left milled, unmarked or uneven at the end of a paving season.**
- 6. Contractor shall mill and pave lanes in an order such that water shall not accumulate. When performing the work at interchanges, the Contractor will be allowed to close its Off-Ramp and its corresponding same directional On-Ramp and detour traffic to the Exit as shown in the detour drawings. These detour drawings will be provided at the first pre-construction meeting by NCDOT Personnel. No ramp shall be closed more than nine (9) consecutive hours. The Contractor shall not be allowed to close more than one pair of On & Off Ramps at a time. The Contractor shall notify the Engineer 48 hours before closing the interchange. The Contractor shall provide the Traffic Control**

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**items, including signing, for these detours. Pay items required for these detours are included as part of the estimate.**

**7. Coordinate all detection loop (signal and counter) installation with the Engineer.**

Notify the Engineer 48 hours before milling or resurfacing will interfere with the existing Signal Loops. Loops may need to be placed in milled surface before resurfacing occurs. Coordinate all signal loop operations with the Engineer.

Notify the Engineer 15 consecutive calendar days before resurfacing a bridge or its approaches. Patch and make repairs to bridge surface and its approaches before resurfacing occurs. Coordinate all operations on the bridge and its approaches with the Engineer.

Notify the Engineer 48 hours before resurfacing the areas of existing pavement that require patching. Patch these areas before resurfacing occurs. Allow full depth asphalt patching to cool to the point of supporting traffic without displacement or rutting before reopening closed lane. Coordinate the resurfacing operations of the patched areas with the Engineer.

**During a resurfacing only operation, bring all newly resurfaced lanes to the same elevation by the end of each work day as directed by the Engineer.**

For partial or wheel track milling operations on two-way, two-lane facilities, mill and pave back by the end of each work day. For partial or wheel track milling operations on multi-lane facilities, **mill and pave back by the end of each work day as directed by the Engineer.**

The following option is acceptable during Resurfacing/milling operations on two-way, two-lane facilities when the entire roadway or entire lane is to be milled:

**Mill and pave back by the end of each work day as directed by the Engineer.**

The following option is available during Resurfacing/milling operations on multi-lane facilities when all lanes or a single lane in one direction are to be milled:

**Mill and pave back by the end of each work day as directed by the Engineer.**

Slope the pavement at the beginning and ending of the daily milling operation as directed by the Engineer. Sweep and remove all milled material from the roadway as soon as the daily milling operation is completed. Continue milling operations until the particular section of roadway being milled is complete. Remove any existing pavement adjacent to the milled area, that has been damaged, and replace with patch material as directed by the Engineer.

Maintain vehicular access in accordance with Section 1101-13 of the *Standard Specifications* using suitable backfill material approved by the Engineer.

Operate equipment and conduct operations in the same direction as the flow of traffic. Do not cross medians with equipment, except at properly designated interchanges.

Review and record the existing pavement markings and markers prior to milling and resurfacing. **Use the record of existing pavement markings and markers in accordance with the *Roadway Standard Drawings* to re-establish the proposed pavement markings and**

**markers. The Contractor shall submit a pavement marking plan to the Engineer for approval 7 calendar days before any pavement markings are placed.**

Provide appropriate lighting in accordance with Section 1413 of the *Standard Specifications*. Remove existing pavement markers in preparation for paving. Repair any pavement damage due to existing pavement marker removal prior to the end of the work day. Dispose of existing pavement markers as directed by the Engineer. No direct payment will be made for this work, as it will be incidental to the paving operation.

**Payment will be made for the traffic control items that have been included in the contract.**

### **WORK ZONE SIGNING:**

(10-21-08)

RWZ-3Revised

#### **Description**

Install and maintain signing in accordance with Divisions 11 and 12 of the *Standard Specifications*, the *Roadway Standard Drawings* and the latest revisions thereto, and the following provisions:

Furnish, install, maintain, and remove advance warning work zone signs and any required lane closure signing.

Furnish, install, and maintain general work zone warning signs for resurfacing and/or milling such as ROUGH ROAD (W8-8 at 48" X 48") (for milling only), UNEVEN LANES (W8-11 at 48" X 48"), LOW SHOULDER (W8-9 at 48" X 48"), LOW / SOFT SHOULDER (DOT No. 16-79860 at 48" X 48"), UNMARKED PAVEMENT AHEAD (DOT No. 116087130 at 48" X 48") and DO NOT PASS (R4-1 at 24" X 30"). When construction is completed in any given area of the project, relocate signs to the next work site, as directed by the Engineer. Remove these signs at the completion of the project.

All work zone signs may be portable.

#### **Construction Methods**

##### **(A) General**

Install all warning work zone signs before beginning work on a particular map. If signs are installed three days prior to the beginning of work on a particular map, cover the signs until the work begins. Install each work zone warning sign separately and not on the same post(s) / stand(s) with any other sign except where an advisory speed plate or directional arrow is used.

**(B) Advance Warning Work Zone Signs**

Install advance warning work zone signs (see attached Details and the *Roadway Standard Drawings* Nos. 1101.02 and 1110.01 and advance signing details) prior to beginning of work and remove upon final completion of the project. If there is a period of construction inactivity longer than two weeks, remove or cover advance warning work zone signs. Uncover advance warning work zone signs no more than 3 days before work resumes. All other operations could be suspended upon failure to comply with the above requirements. Such suspended operations would not be resumed until the above requirements are fulfilled.

**(C) Lane Closure Work Zone Signs**

Install any required lane closure signing needed during the life of the project in accordance with the *Roadway Standard Drawings* Nos. 1101.02, 1101.11 and 1110.02.

**(D) General Work Zone Warning Signs**

Install general work zone warning signs for resurfacing and/or milling such as ROUGH ROAD (W8-8 at 48" X 48") (for milling only), UNEVEN LANES (W8-11 at 48" X 48"), LOW SHOULDER (W8-9 at 48" X 48") and LOW / SOFT SHOULDER (W8-9B at 48" X 48") at 1 mile intervals starting at a minimum of 500 feet in advance of the condition for both directions of travel (undivided roadways only) and at any other points determined by the Engineer.

Install the LOW SHOULDER (W8-9 at 48" X 48") or LOW / SOFT SHOULDER (DOT No. 16-79860 at 48" X 48") signs prior to any resurfacing in an area where shoulder construction will be performed.

Install general work zone warning signs such as UNMARKED PAVEMENT AHEAD (DOT No. 116087130 at 48" X 48") and DO NOT PASS (R4-1 at 24" X 30") alternately at 1/2 mile intervals starting at a minimum of 500 feet in advance of the condition for both directions of travel (undivided roadways only) and at any other points determined by the Engineer. Install signs prior to the obliteration of any pavement markings.

**Measurement and Payment**

**Payment will be made for the work zone signing items that have been included in the contract.**

**TIME LIMITATION FOR PAVEMENT MARKINGS AND  
MARKERS ON NEWLY RESURFACED AREAS:**

12-18-07)

RWZ-4

**Markings: Two-Lane, Two-Way Facilities**

For all two-lane, two-way facilities, place all edge lines and other symbols within 30 calendar days after they have been obliterated by the resurfacing operation.

**Markings: All Facilities**

The pavement markings on a specific map are subject to a 180-day observation period that begins with the satisfactory completion of all pavement markings required on a specific map and shall meet all requirements as specified in Subarticle 1205-3(H) Observation Period of the *Standard Specifications*.

Any portion of stop bars that are obliterated at intersections of a multilane roadway and all its approaches shall be replaced by the end of each work day prior to opening the lane to traffic. Any portion of stop bars that are obliterated at 2-lane 2-way roadway intersections shall be replaced by the end of 5<sup>th</sup> calendar day.

Prior to opening the lane(s) to traffic, all pavement markings that are obliterated by milling should be replaced as specified in Subarticle 1205-3(D) Time Limitations for Replacement of the *Standard Specifications* or as stated herein.

Final pavement marking applications of paint shall be placed in 2 applications of 15 mils wet each. Each application of paint pavement marking lines will be measured and paid for as the actual number of linear feet of pavement marking lines that have been satisfactorily placed and accepted by the Engineer.

**Markers: All Facilities**

Install permanent pavement markers within 60 calendar days after completing the resurfacing on each map.

**ROADWAY STANDARD DRAWINGS FOR PAVEMENT MARKINGS AND MARKERS:**

(7-18-06)

RWZ-5Revised

Use the following in conjunction with the *Standard Specifications*:

- Standard Pavement Markings**      *Roadway Standard Drawings:*  
1205.01, 1205.02, 1205.03, 1205.04, 1205.05, 1205.06,  
1205.07, 1205.08, 1205.09, 1205.10, 1205.11, 1205.12
  
- Raised Pavement Markers**      *Roadway Standard Drawings:*  
1205.12, 1250.01, 1251.01
  
- Snowplowable Pavement Markers**      *Roadway Standard Drawings:*  
1250.01, 1253.01
  
- Milled Rumble Strips**      *Roadway Standard Drawings:*  
665.01

Date: 10-07-2009

**Law Enforcement:**

2-19-09

SPI

**Description**

Furnish Law Enforcement Officers and marked Law Enforcement vehicles to direct traffic in accordance with the contract.

**Construction Methods**

Use uniformed Law Enforcement Officers and marked Law Enforcement vehicles equipped with blue lights mounted on top of the vehicle, and Law Enforcement vehicle emblems to direct or control traffic as required by the plans or by the Engineer.

**Measurement and Payment**

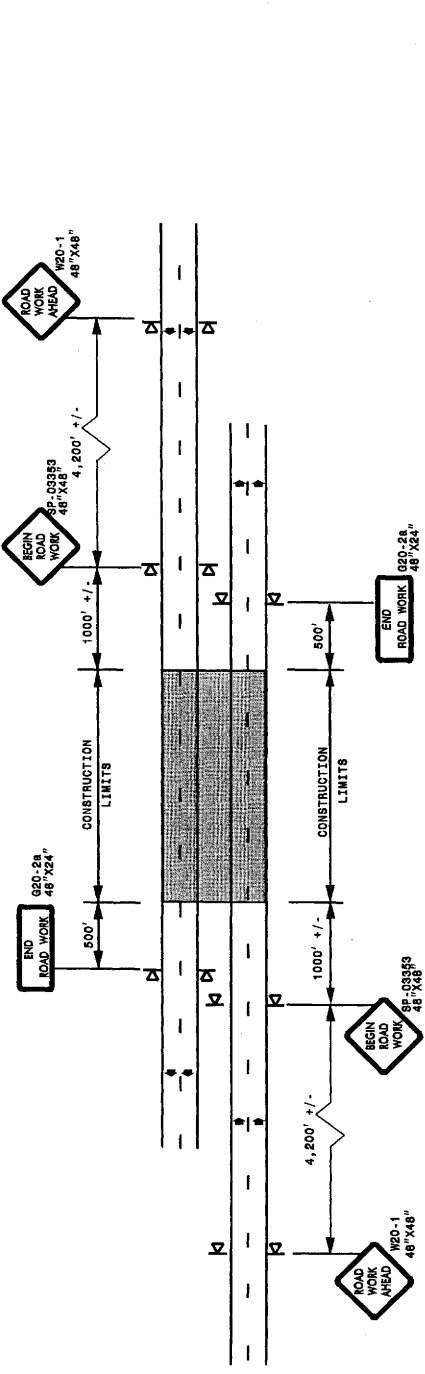
Law Enforcement will be measured and paid for in the actual number of hours that each Law Enforcement Officer is provided during the life of the project as approved by the Engineer. There will be no direct payment for marked Law Enforcement vehicles as they are considered incidental to the pay item.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Law Enforcement	Hour

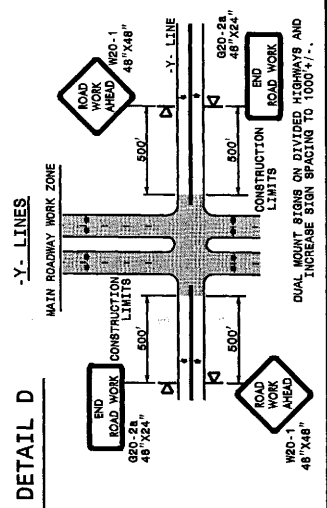


ADVANCE WORK ZONE WARNING SIGNING FOR FREEWAYS (4 LANES OR GREATER)



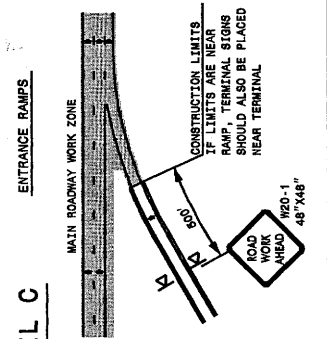
DETAIL A

ROADWAYS INTERSECTING ALONG FREEWAY WORK ZONE (Y-LINES)

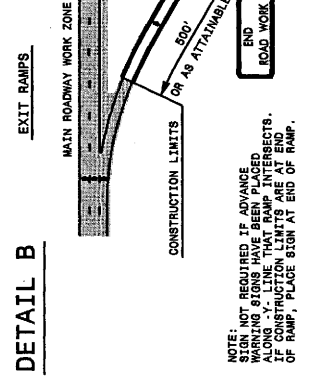


DETAIL D

DETAIL C



DETAIL B



621  
 DETAIL DRAWING  
 FOR FREEWAYS  
 WORK ZONE WARNING SIGNS  
 (SHORT-DURATION LANE CLOSURES)

GENERAL NOTES

- USE FLUORESCENT ORANGE SHEETING (TYPE VII OR HIGHER) ON ALL ADVANCE WORK ZONE SIGNS.
- DO NOT INSTALL ADVANCE WARNING SIGNS MORE THAN 3 DAYS PRIOR TO BEGINNING OF WORK.
- ALL SIGN SPACING DIMENSIONS ARE APPROXIMATE, FIELD ADJUST AS NECESSARY OR AS DIRECTED.
- USE PORTABLE WORK ZONE SIGNS ONLY WITH PORTABLE WORK ZONE SIGN STANDS SPECIFICALLY DESIGNED FOR ONE ANOTHER. PORTABLE WORK ZONE SIGNS MAY BE ROLL UP OR APPROVED COMPOSITE.
- PROVIDE PORTABLE WORK ZONE SIGN STANDS, PORTABLE SIGNS AND SIGN SHEETING WHICH ARE LISTED ON THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION'S APPROVED PRODUCT LIST OR ACCEPTED AS TRAFFIC QUALIFIED BY THE TRAFFIC CONTROL UNIT.
- \*\* TWO-WAY UNDIVIDED ADVANCE WARNING SIGN CONFIGURATION MAY BE USED ON MULTI-LANE FACILITIES WHERE CONDITIONS LIMIT THE USE OF DUAL MOUNTED SIGNS AS DETERMINED BY THE ENGINEER.

**LEGEND**

□ PORTABLE SIGN

◀ DIRECTION OF TRAFFIC FLOW

APPROVED: \_\_\_\_\_ DATE: \_\_\_\_\_

SEAL

DETAIL DRAWING FOR FREEWAYS WORK ZONE WARNING SIGNS

REVISIONS	DATE	BY	APP. BY
7-98	10/01		
10-98	08/04		
01/01	11/04		

### GENERAL NOTES

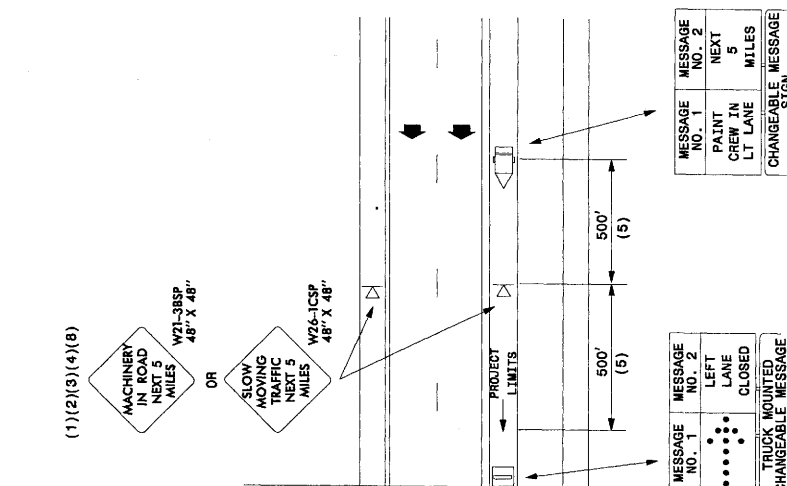
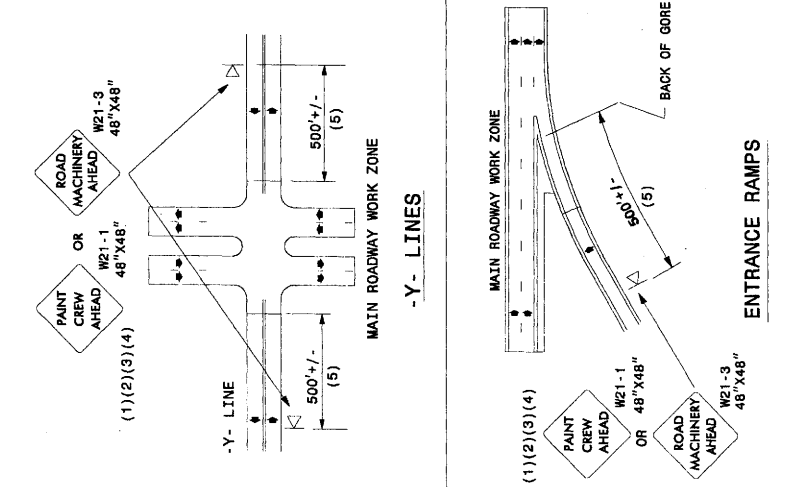
- (1) THE FOLLOWING OPTIONS MAY BE USED FOR ADVANCE WARNING SIGNS:
  - A. TRUCK MOUNTED SIGNS
  - B. TRUCK MOUNTED CHANGEABLE MESSAGE SIGN (CMS)
  - C. GROUND MOUNTED ADVANCE WARNING SIGNS (MUST CIRCLE TO PICK UP SIGNS)
  - D. GROUND MOUNTED CHANGEABLE MESSAGE SIGN (CMS) (MUST USE CIRCLE TO PICK UP SIGNS)
- (2) ALL ADVANCE WARNING SIGNS MUST BE 48" X 48" WITH FLUORESCENT ORANGE TYPE VII, VIII OR IX SHEETING. IF SPACE LIMITATIONS ON SHOULDER PROHIBIT A 48" X 48" SIGN, A SMALLER SIGN CAN BE USED WITH APPROVAL FROM ENGINEER.
- (3) SIGNS ON VEHICLES SHOULD BE MOUNTED A MINIMUM OF ONE (1) FOOT FROM THE GROUND AND SHOULD NOT BLOCK THE MOTORIST'S SIGHT OF THE FLASHING ARROW PANEL AND/OR LIGHTBAR.
- (4) GROUND MOUNTED ADVANCED WARNING SIGNS SHOULD BE MOUNTED A MINIMUM OF FIVE (5) FEET FROM THE GROUND TO BOTTOM OF SIGN.
- (5) SIGN SPACING SHOULD BE ADJUSTED FOR HORIZONTAL AND VERTICAL CURVES, ETC. TO IMPROVE SIGHT DISTANCES.

- (6) ADDITIONAL VEHICLES SHOULD BE USED IN WORK CARAVAN TO FACILITATE DRYING OF PAVEMENT MARKING MATERIAL (TMJA'S ARE OPTIONAL ON THESE ADDITIONAL VEHICLES). HOWEVER, THE FIRST VEHICLE MOTORISTS SEE IN THE TRAVEL LANE SHALL HAVE A TMJA.
- (7) ADJUST DISTANCE AS NEEDED TO PREVENT MOTORISTS FROM ENTERING SPACE BETWEEN THE APPLICATION AND PROTECTION VEHICLE. DISTANCE CAN BE LENGTHENED TO ACCOMMODATE SIGHT DISTANCE NEEDS. NOT EXCEED FIVE (5) MILES IN LENGTH.
- (8) ROUND UP MILEAGE TO NEXT WHOLE MILE. WORK ZONE SHOULD NOT EXCEED FIVE (5) MILES IN LENGTH.
- (9) RADIO COMMUNICATION BETWEEN VEHICLES IS REQUIRED.
- (10) USE OF A LIGHT BAR ON ALL VEHICLES IS PREFERRED, BUT A ROTATING BEACON MAY BE USED INSTEAD.
- (11) IF WORK IS PERFORMED AT NIGHT, THE WORK AREA MUST BE ILLUMINATED WITH MACHINE AND/OR TOWER LIGHTS AS APPROVED BY THE ENGINEER.
- (12) ALL TRAFFIC CONTROL DEVICES WILL BE CONSIDERED INCIDENTAL TO THE PAY ITEMS FOR PAVEMENT MARKING AND MARKERS.
- (13) INFORMATIONAL SIGNS SHOULD BE ACTIVITY SPECIFIC. IF PAINT CREW IN ROAD, SIGNS MAY BE RECTANGULAR OR DIAMOND SHAPE. SIGN SIZE SHOULD BE BASED ON THE MOTORIST ABILITY TO RECOGNIZE SIGN WHEN TRAVELING FIVE (5) MILES ABOVE POSTED SPEED LIMIT.

### LEGEND

- PORTABLE SIGN. SIGNS MUST BE NCHRP-350 AND NCDOT APPROVED.
- DIRECTION OF TRAFFIC FLOW
- APPLICATION VEHICLE WITH LIGHT BAR
- PROTECTION VEHICLE WITH TRUCK MOUNTED IMPACT ATTENUATOR (TMJA) AND LIGHT BAR (SEE ROADWAY STANDARD NO. 1165.01). TMJA MUST BE NCHRP-350 TEST LEVEL 3 (60-MPH) APPROVED.
- ADVANCE WARNING VEHICLE WITH TRUCK MOUNTED CHANGEABLE MESSAGE SIGN (CMS) AND LIGHT BAR. MESSAGE SIGN LETTER HEIGHT SHOULD BE A MINIMUM OF 10 INCHES.
- FLASHING ARROW PANEL, TYPE "B" (60"X30" MIN.), APPROPRIATE DIRECTION INDICATED
- CHANGEABLE MESSAGE SIGN

MAY USE "WET PAINT STAY OFF LINE" OR "WET PAINT AHEAD" OR SIMILAR INFORMATIONAL MESSAGE AND MAY ALSO USE ARROWS TO POINT TO WET LINES, ETC.

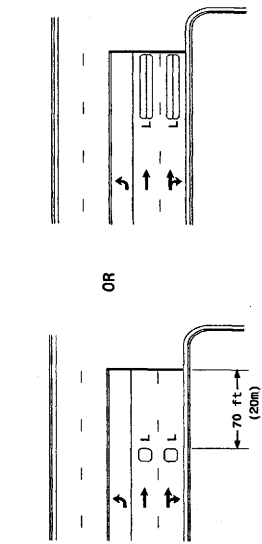


MESSAGE NO. 1	PAINT CREW IN LT LANE	MESSAGE NO. 2	NEXT 5 MILES
MESSAGE NO. 1	LEFT LANE CLOSED	MESSAGE NO. 2	TRUCK MOUNTED CHANGEABLE MESSAGE SIGN

# MOVING OPERATION CARAVAN

(OPERATIONS TRAVELING 3 MPH OR FASTER)  
PLACING PAVEMENT MARKING OR MARKERS ON INTERSTATE ROADWAYS

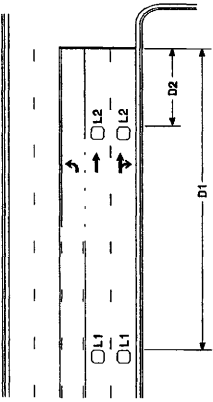
**Low Speed Detection**  
 [ ≤ 35 mph (56 km/hr) ]



L = 6ft X 6ft (1.8m X 1.8m)  
 Wired in series

L = 6ft X 40ft (1.8m X 12.0m)  
 Quadrupole loop, wired separately

**High Speed Detection**  
 [ > 40 mph (64 km/hr) ]



**"Stretch" Operation**

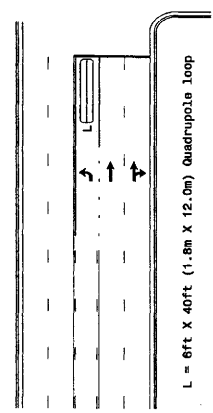
Speed Limit mph (km/hr)	D1 ft (m)	D2 ft (m)
40 (64)	250 (75)	80 (25)
45 (72)	300 (90)	80 (27)
50 (80)	355 (110)	100 (30)
55 (88)	420 (130)	110 (35)

L = 6ft X 6ft (1.8m X 1.8m)  
 Wired in series for TS1  
 Controllers  
 Wired separately for TS2,  
 170, and 2070L Controllers

**Volume Density Operation**

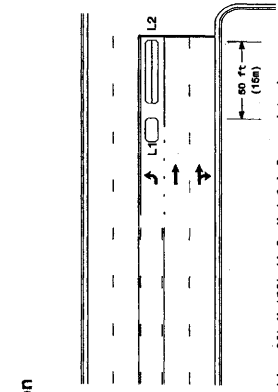
Speed Limit mph (km/hr)	D ft (m)
40 (64)	250 (75)
45 (72)	300 (90)
50 (80)	355 (110)
55 (88)	420 (130)

**Left Turn Lane Detection**



L = 6ft X 40ft (1.8m X 12.0m) Quadrupole loop

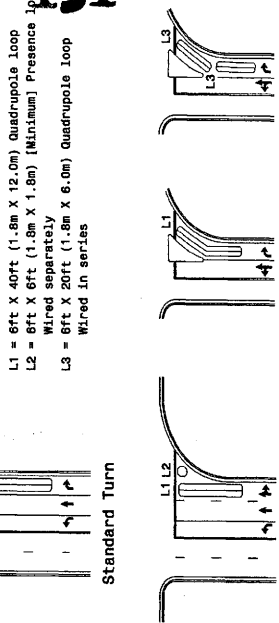
Presence Loop Detection



L1 = 6ft X 15ft (1.8m X 4.6m) Queue detector  
 L2 = 6ft X 40ft (1.8m X 12.0m) Quadrupole loop

Queue Loop Detection

**Right Turn Lane Detection**



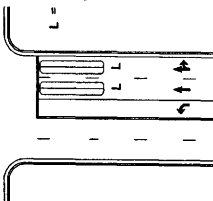
L1 = 6ft X 40ft (1.8m X 12.0m) Quadrupole loop  
 L2 = 6ft X 6ft (1.8m X 1.8m) [Minimum] Presence loop  
 Wired separately  
 L3 = 6ft X 20ft (1.8m X 6.0m) Quadrupole loop  
 Wired in series

Standard Turn

Wide Radius Turn

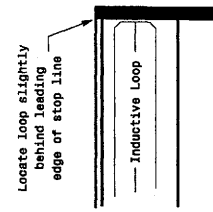
Channelized Turn

**Side Street Detection**



L = 6ft X 40ft (1.8m X 12.0m)  
 Quadrupole loop  
 Wired to separate  
 detectors/channels

**Presence Loop Placement at Stop Lines**



Locate loop slightly  
 behind leading  
 edge of stop line

Note:  
 Loop may be located in advance  
 of stop line when stop line is  
 greater than 15' (4.5m) from edge  
 of intersecting roadway; or, when  
 loop detects a permissive or  
 protected/permissive left turn.

**Recommended Number of Turns**

Quadrupole loops: Use 2-4-2 turns  
 6' X 15' (1.8m X 4.6m) Loops:  
 Lead-in < 150' (45 m), use 2 turns  
 Lead-in > 150' (45 m), use 3 turns

Single 6' X 6' (1.8m X 1.8m)  
 Loop (wired separately):

Length of Lead-in (ft. (m))	Number of Turns
< 250 (75)	3
250-375 (75-115)	4
375-525 (115-160)	5
> 525 (160)	6

**Typical Loop Locations**

SEALED  
 NORTH CAROLINA  
 STATE ENGINEERING BOARD  
 REGISTERED PROFESSIONAL ENGINEER  
 DATE: 06/16/09  
 SCALE: N/A  
 DRAWN BY: [Signature]  
 CHECKED BY: [Signature]  
 PROJECT NO.: [Blank]  
 SHEET NO.: [Blank]

**LAW ENFORCEMENT:**

2-19-09

SPI

**Description**

Furnish Law Enforcement Officers and marked Law Enforcement vehicles to direct traffic in accordance with the contract.

**Construction Methods**

Use uniformed Law Enforcement Officers and marked Law Enforcement vehicles equipped with blue lights mounted on top of the vehicle, and Law Enforcement vehicle emblems to direct or control traffic as required by the plans or by the Engineer.

**Measurement and Payment**

Law Enforcement will be measured and paid for in the actual number of hours that each Law Enforcement Officer is provided during the life of the project as approved by the Engineer. There will be no direct payment for marked Law Enforcement vehicles as they are considered incidental to the pay item.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Law Enforcement	Hour

**WATER FILLED BARRIER:**

3-20-07

SPI

**Description**

Furnish, install, secure, maintain, remove, and reset Water Filled Barrier in accordance with the contract.

**Materials**

(A) General

Provide Water Filled Barrier that meets the requirements of NCHRP 350 Test Level II for work zones that have a posted speed limit of 45 mph or less. Provide Water Filled Barrier that acts as its own free standing, non-redirective end treatment. Use environmentally safe anti-freezing agent in the water per manufacturer specifications and recover agent when the barrier is drained. Do not drain Water Filled Barrier into or across an existing travel lane. Provide barrier units that are capable of being lifted and moved when filled if draining is not possible. Dispose of water and agent properly.

(B) Material Qualifications

Use Water Filled Barrier that is on the Approved Products List or is Traffic-qualified by the Work Zone Traffic Control Unit. For more information on the Traffic-qualification process, contact the Work Zone Traffic Control Unit at Century Center Building B, 1020 Birch Ridge Dr., Raleigh, NC, 27610 (919) 250-4159, or see the approved product list on NCDOT web site at: [www.ncdot.org/~wztc](http://www.ncdot.org/~wztc)

(C) Historical Performance

Historical performance of the Water Filled Barrier will be used in determining future use of the material by the Department, regardless if the Water Filled Barrier has been traffic-qualified. Poor past or poor current performance of Water Filled Barrier at any site, whether or not related to a specific contract may be grounds for non-acceptance of a product on any project under contract.

**Construction Methods**

Place and install Water Filled Barrier units as shown in the plans and per manufacturer specifications on roadways with posted speed limits of 45 mph or less.

Furnish delineators for Water Filled Barrier that meet the requirements of Section 1088-2 and Section 1170-3 (E) of the *Standard Specifications*.

**Measurement and Payment**

*Water Filled Barrier* will be measured in accordance with Section 1170-4 of the *Standard Specifications* and paid for in linear feet.

*Resetting Water Filled Barrier* will be measured in accordance with Section 1170-4 of the *Standard Specifications* and paid for in linear feet.

There will be no direct payment for barrier delineators as they are considered incidental to these pay items.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Water Filled Barrier	Linear Foot
Reset Water Filled Barrier	Linear Foot