

**TRAFFIC CONTROL:**

(02-20-07)

RWZ-1 Revised

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.

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 a sequence of operation for all maps 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. **Provide the Engineer a schedule of work so as to allow State Forces a minimum of two weeks notice of resurfacing.**

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 within 72 hours.

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, the lane being milled may be left closed and paved back within 72 hours.

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

- (A) Mill a single lane and pave back by the end of each work day.
- (B) Mill the entire width of roadway and pave back within 72 hours.

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

- (A) Mill the entire width of pavement for all lanes to be milled in any given direction daily and pave back within 72 hours.
- (B) Mill a single lane and pave back by the end of each work day.
- (C) Mill a single lane, leave a lane closure in and pave back within 72 hours.

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 resurfacing. Use the record of existing pavement markings and markers in conjunction with the *Roadway Standard Drawings* to re-establish the proposed pavement markings and markers unless otherwise directed by the Engineer. **In order to assure compliance with this provision, the Contractor shall submit a pavement marking plan to the Engineer seven (7) calendar days before any pavement has been placed.**

Provide appropriate lighting in accordance with Section 1413 of the *Standard Specifications* when electing to perform paving at night at no expense to the Department.

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.

No direct payment will be made for the signing and traffic control items including Truck Mounted Impact Attenuators (TMIA - see Section 1165 of the *Standard Specifications* and the *Roadway Standard Drawings*). This work will be considered incidental to the various other bid items in the contract.

**WORK ZONE SIGNING:**

(1-16-07)

RWZ-3

**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**

No direct payment will be made for Work Zone Signing as such work will be considered incidental to the various other bid items in the contract.

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

(9-19-06)

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*.

Replace any portion of stop bars at signalized intersections by the end of each workday's operation on a multilane roadway if lane is opened to traffic and by the end of 5<sup>th</sup> calendar day on a 2-lane 2-way roadway if they have been obliterated by the resurfacing operation.

**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-5

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

Date: 12-27-2006

**LARGE BEADS IN PAINT PAVEMENT MARKING**

This work shall be in accordance with *Section 1205 Pavement Marking General Requirements* of the *Standard Specifications* except as follows:

Glass Beads:

**(A) Composition**

The silica content of the glass beads must be at least 60 percent.

Manufacture the **Large** gradation beads from a composition designed to be highly resistant to traffic wear and to the effects of weathering.

Manufacture the **Regular** gradation beads from 100% recycled non-pigmented glass from a composition designed to be highly resistant to traffic wear and to the effects of weathering.

The appropriate glass bead coatings such as Moisture-proof and Adherence shall be applied by the bead manufacturer for proper bead embedment depth. All gradation tests shall be performed after the coatings have been applied.

This requirement will not apply for tape.

**(B) Physical Characteristics**

The glass beads must be colorless, transparent and free from milkiness, excessive air bubbles, skins and foreign objects.

The glass beads must have a minimum refractive index of 1.50 when tested by liquid immersion method (See ASTM D-1214) at 77°F (25°C), be spherical in shape, be essentially free of sharp angular particles, and particles showing surface scarring and scratching.

**(C) Gradation**

Use glass beads in all pavement marking material with a minimum of 80% true spheres when tested according to ASTM D-1155. Test large beads for Aspect Ratio, which shall be 1.2:1 or less.

Use Large Drop-On Glass Beads in Paint which meet the following gradation requirements:

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<u>U.S. STANDARD SIEVE SIZE</u>	<u>% PASSING</u>	<u>% RETAINED</u>
SIEVE #8	100	0
SIEVE #10	95-100	0-5
SIEVE #12	80-95	5-20
SIEVE #14	10-40	40-80
SIEVE #16	0-5	10-40
SIEVE #18	0-2	0-5
PAN	0	0-2

The large glass beads shall be capable of flowing freely through dispensing equipment in any weather suitable for marking the pavement.

**(D) Glass Bead Application:**

Drop-On: Method where glass beads are dispensed by a pressurized mechanical feed or high pressure means onto the pavement marking as it is applied to the pavement. Drop-On bead dispensing for symbols and characters may be accomplished by gravitational methods such as hand scattering.

Drop on glass beads in two applications with the **large** gradation beads in the *first* application and the **regular** gradation beads in the *second* application. Apply in equal amounts by weight.

**(E) Paint Application:**

Final pavement marking applications of paint shall be placed in two applications of 15 mils (0.38 mm) wet each. Apply the second application of paint upon sufficient drying time of the first. Each 15 mil application of paint shall consist of drop-on beads applied at a rate to immediately obtain the minimum retroreflective values.

**(F) Method of Measurement and Basis of Payment:**

Method of Measurement and Basis of Payment will be in accordance with *Section 1205 Pavement Marking General Requirements* of the *Standard Specifications*.

Date: 12-27-2006



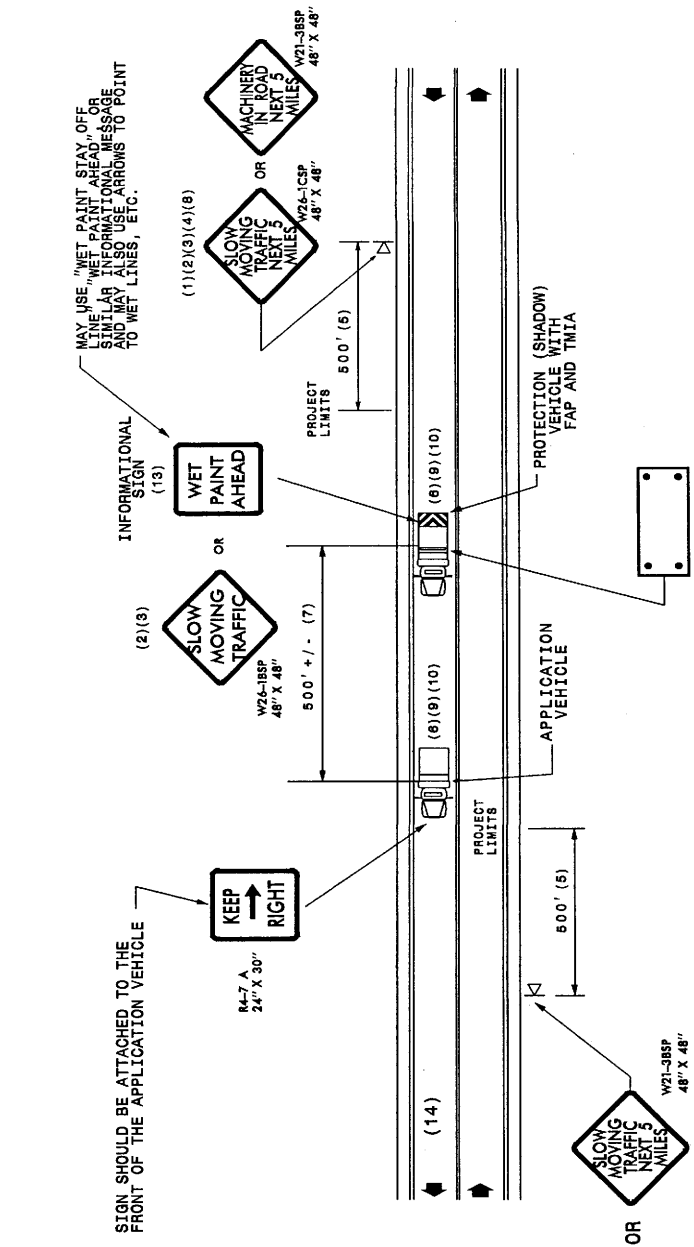
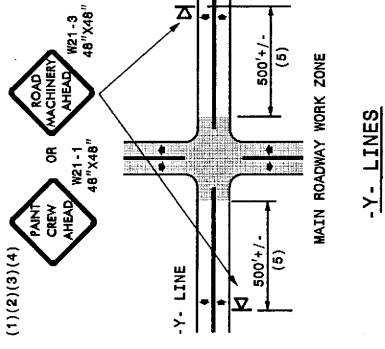
**LEGEND**

- PORTABLE SIGN. SIGNS MUST BE NCHRP-350 AND NCOOT APPROVED.
- DIRECTION OF TRAFFIC FLOW
- APPLICATION VEHICLE WITH LIGHT BAR
- PROTECTION VEHICLE WITH TRUCK MOUNTED IMPACT ATTENUATOR (TMIA) AND LIGHT BAR (SEE ROADWAY STANDARD NO. 1185.01). TMIA MUST BE NCHRP-350 TEST LEVEL 3 (60-MPH) APPROVED.
- FLASHING ARROW PANEL, TYPE "B" (60"x30" MIN.), "CAUTION MODE"

**GENERAL NOTES**

- (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.
- (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, I.E. "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.
- (14) IF A LEAD VEHICLE IS ADDED TO OPERATION, IT SHOULD HAVE THE SAME ADVANCE WARNING SIGNS AS THE APPLICATION VEHICLE SHOWN BELOW.









- (1) THE FOLLOWING OPTIONS MAY BE USED FOR ADVANCE WARNING SIGNS:
  - A. TRUCK MOUNTED CHANGEABLE MESSAGE SIGN (CMS)
  - B. TRUCK MOUNTED SIGN
  - 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 ONE (1) FOOT 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 (TMIA'S ARE OPTIONAL ON THESE ADDITIONAL VEHICLES). HOWEVER, THE FIRST VEHICLE MOTORISTS SEE IN THE TRAVEL LANE SHALL HAVE A TMIA.



**MOVING OPERATION CARAVAN**  
 (OPERATIONS TRAVELING 3 MPH OR FASTER)  
 PLACING PAVEMENT MARKING OR MARKERS  
 ON TWO-LANE TWO-WAY ROADWAYS

**DRAWING NUMBER 6**  
 IMPLEMENTATION DATE: 07/01/97  
 REVISED: 11/03/04

**LEGEND**

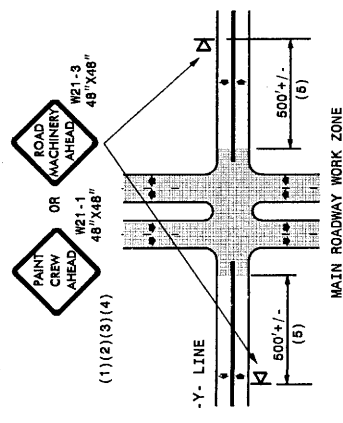
-  PORTABLE SIGN. SIGNS MUST BE NCHRP-350 AND NCDOT APPROVED.
-  TRUCK MOUNTED SIGN. STONS MUST BE NCHRP-350 AND NCDOT APPROVED.
-  DIRECTION OF TRAFFIC FLOW
-  APPLICATION VEHICLE WITH LIGHT BAR
-  PROTECTION VEHICLE WITH TRUCK MOUNTED IMPACT ATTENUATOR (TMIA) AND LIGHT BAR (SEE ROADWAY STANDARD NO. 1165.01). TMIA 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

**GENERAL NOTES**

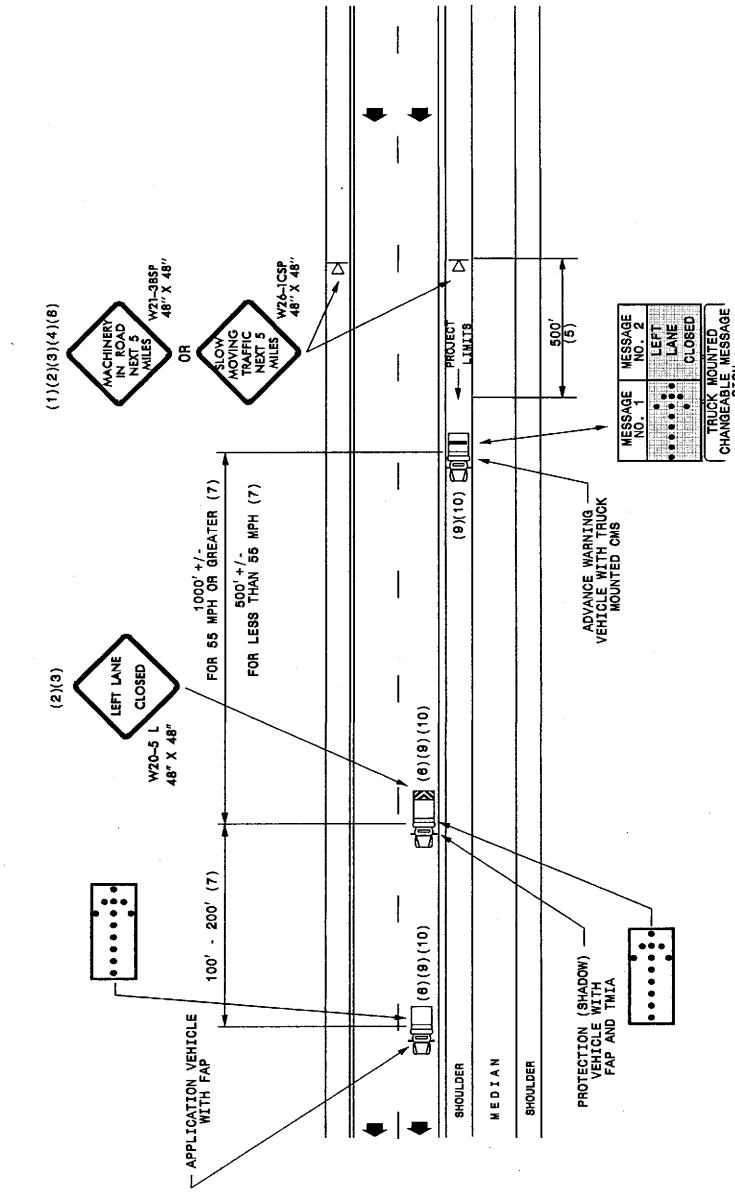
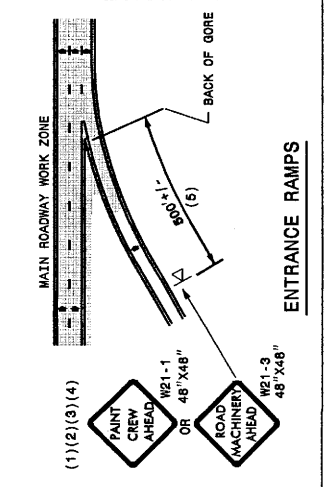
- (6) ADDITIONAL VEHICLES SHOULD BE USED IN WORK CARAVAN TO FACILITATE DRYING OF PAVEMENT MARKING MATERIAL. (TMIA'S ARE OPTIONAL ON THESE ADDITIONAL VEHICLES) HOWEVER, THE FIRST VEHICLE MOTORISTS SEE IN THE TRAVEL LANE SHALL HAVE A TMIA.
- (7) ADJUST DISTANCE AS NEEDED TO PREVENT MOTORISTS FROM ENTERING SPACE BETWEEN THE APPLICATION AND PROTECTION VEHICLE. DISTANCE CAN BE LENGTHENED TO ACCOMMODATE SIGHT DISTANCE NEEDS.
- (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.

**GENERAL NOTES**

- (1) THE FOLLOWING OPTIONS MAY BE USED FOR ADVANCE WARNING SIGNS:
  - A. TRUCK MOUNTED CHANGEABLE MESSAGE SIGN (CMS)
  - B. TRUCK MOUNTED ADVANCE WARNING 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 OFF 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.



**-Y- LINES**



MESSAGE NO. 1	MESSAGE NO. 2
LEFT LANE CLOSED	LEFT LANE CLOSED
TRUCK MOUNTED MESSAGE SIGN	TRUCK MOUNTED MESSAGE SIGN

**MOVING OPERATION CARAVAN**  
 (OPERATIONS TRAVELING 3 MPH OR FASTER)  
 PLACING PAVEMENT MARKING OR MARKERS  
 ON NON-INTERSTATE MULTILANE DIVIDED ROADWAYS

**DRAWING NUMBER 7**  
 IMPLEMENTATION DATE: 07/01/97  
 REVISED: 11/03/04