

TIP #:R-3427
Date:8-17-2004
Revised Date:

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PROJECT SPECIAL PROVISION
POLYUREA PAVEMENT MARKING MATERIAL
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, Packaging for Shipment, and Storage Life) as described in the 2002 Standard Specifications for Roads and Structures. The manufacturer may 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 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:

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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:

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

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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.

Measurement and Payment:

Measurement and payment shall be in accordance with Section 1205 of the North Carolina Standard Specifications for Roads and Structures.

SECTION 1089 TRAFFIC CONTROL

12-21-04

The 2002 Standard Specifications will be revised as follows:

Article 1089-1 WORK ZONE SIGNS.

Replace the first paragraph under Article 1089-1 (A) General with the following:

Rigid sign retroreflective sheeting requirements for Types VII, VIII and IX (prismatic) fluorescent are described in Tables 1089-A, 1089-B and 1089-C. Cover the entire sign face of the sign substrate with NCDOT approved Type VII, VIII or IX (prismatic) fluorescent orange reflective sheeting. Apply the reflective sheeting in a workmanlike manner so that there are no bubbles or wrinkles in the material.

Roll-up sign retroreflective requirements are described in Table 1089-D.

Replace Article 1089-1 (A, 1) the paragraph under Work Zones Signs (Stationary) with the following:

Use Type VII, VIII or IX (prismatic) fluorescent orange retroreflective sheeting that meets the following reflective requirements in Tables 1089-A, 1089-B or 1089-C respectively. Use approved composite or aluminum for sign backing. Signs and sign supports must meet or exceed NCHRP 350 requirements for Breakaway Devices.

Table 1089-A Minimum Coefficient of Retroreflection R_A for TYPE VII Fluorescent Orange Sheeting (Candelas per lux per square meter)		
Observation Angle	Entrance Angle	
	-4°	30°
0.1°	300	170
0.2°	230	130
0.5°	72	41

Table 1089-B Minimum Coefficient of Retroreflection R_A for TYPE VIII Fluorescent Orange Sheeting (Candelas per lux per square meter)		
Observation Angle	Entrance Angle	
	-4°	30°
0.1°	300	135
0.2°	210	95
0.5°	75	35

Table 1089-C Minimum Coefficient of Retroreflection R_A for TYPE IX Fluorescent Orange Sheeting (Candelas per lux per square meter)		
Observation Angle	Entrance Angle	
	-4°	30°
0.1°	200	110
0.2°	115	65
0.5°	72	41
1.0°	24	14

Replace Article 1089-1 (A, 2) Work Zones Signs (Barricade Mounted) with the following:

Use approved composite or roll-up signs for barricade mounted sign substrates. Approved composite barricade mounted warning signs (black on orange) must be Type VII, VIII or IX sheeting which meet the retroreflective requirements of Table 1089-A, 1089-B or 1089-C. Roll-up mounted barricade warning signs (black on orange) must meet the retroreflective requirements in Table 1089-D. Sign and barricade assembly must meet or exceed the requirements of NCHRP 350 for Work Zone Category II Devices.

Replace Article 1089-1 (A, 3) Work Zones Signs (Portable) with the following:

Use approved composite or roll-up sign substrates on portable sign stands.

Composite - Use Type VII, VIII or IX (prismatic) fluorescent orange retroreflective sheeting that meets the following reflective requirements in Tables 1089-A, 1089-B or 1089-C. Signs and sign supports must meet or exceed NCHRP 350 requirements for Breakaway Devices.

Roll-up Signs - Use fluorescent orange retroreflective roll-up signs that meet the following reflective requirements:

Table 1089-D
Minimum Coefficient of Retroreflection R_A for Fluorescent Orange Roll-Up Signs
(Candelas per lux per square meter)

Observation Angle	Entrance Angle	
	-4°	30°
0.1°	300	120
0.2°	200	80
0.5°	90	34

Use roll up signs that have a minimum 3/16" x 1 1/4" horizontal rib and 38" x 1 1/4" vertical rib and has been crash test to meet NCHRP 350 requirements and Traffic Control qualified by the Work Zone Traffic Control Unit.

Add Article "(D) Warranty" to 1089-1 WORK ZONE SIGNS:

(D) Warranty

Warranty requirements for rigid sign retroreflective sheeting Types VII, VIII and IX are described in Section 1093-9 (F) and Tables 1089 A, B and C.

Roll-up fluorescent orange retroreflective signs will maintain 80% of its retroreflectivity (Table 1089-D) for years 1 – 2 and 50% for year 3.

Rigid and Rollup Fluorescent orange signs will maintain a Fluorescence Luminance Factor (Y_f)* of 13% for three (3) years.

*Fluorescence Testing Method is described in ASTM E2301 Test Methods for Fluorescent Retro reflective Sheeting.

Rigid and Roll up fluorescent orange signs shall maintain a total Luminance Factor (Y) of 25 for three (3) years and conform to the requirements of Table 1089-E when measured in accordance with ASTM D4956.

Table 1089-E
Fluorescent Orange colorimetric requirements

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Fluorescent Orange	0.583	0.416	0.535	0.400	0.595	0.351	0.645	0.355

SECTION 1110 WORK ZONE SIGNS

12-21-04

The 2002 Standard Specifications will be revised as follows:

DESCRIPTION.

Page 11-5, Article 1110-1 DESCRIPTION.

Replace the second paragraph with the following:

Furnish, install, maintain and relocate portable work zone signs and portable work zone sign stands in accordance with the plans and specifications. When portable work zone signs and portable work zone sign stands are not in use for periods longer than 30 minutes, collapse sign stand and reinstall once work begins.

Replace the last sentence in the third paragraph with the following:

Use work zone signs (portable) only with portable work zone sign stands specifically designed for one another. Work Zone Signs (portable) may be roll up or approved composite.

MATERIALS.

Page 11-5, Sub-Article 1110-2 Part (A) General:

Replace Sub-Article 1110-2 Part (A) General and substitute the following:

General:

Refer to Division 10:

- Work Zone Signs.....Article 1089-1
- Work Zone Sign Supports.....Article 1089-2
- Barricade Mounted Signs.....Article 1089-3

MATERIAL QUALIFICATIONS:

Page 11-5, Sub-Article 1110-2 Part (B) Material Qualifications.

Delete the first sentence in the first paragraph and replace with the following:

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.

Delete “Traffic Control Section” in the second sentence of the first paragraph and insert “Traffic Control Unit”.

CONSTRUCTION METHODS.

Page 11-6, Article 1110-3 CONSTRUCTION METHODS.

Replace the sentence of Sub-Article 1110-3 (B) Work Zone Signs (Barricade Mounted) with the following:

Mount approved composite or roll-up signs to barricade rails so that the signs do not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails. Signs are to be mounted a minimum of 1’ from the ground to the bottom of the sign.

Replace Sub-Article 1110-3 (C, 2) Work Zone Signs (Portable) with the following:

Install portable work zone signs to carry roll-up or approved composite at a minimum height of 1’ from the bottom of the sign to the ground on two lane-two way roadways.

Install portable work zone signs to carry roll-up or approved composite at a minimum height of 5’ from the bottom of the sign to the ground on multi-lane roadways.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

All work will be in accordance with Section 1110 of the Standard Specification and Method of Measurement and Basis of Payment will be in accordance with Section 1110-5 and 1110-6 of the Standard Specifications.