

**Section 1086**

1 that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum  
2 thermal sprayed alloy and suitable for tidal water applications.

3 Steel sheet piles detailed for temporary applications shall be hot rolled and meet ASTM A328.

4 **SECTION 1086**  
5 **PAVEMENT MARKERS**

6 **1086-1 TEMPORARY RAISED PAVEMENT MARKERS**

7 **(A) General**

8 Use raised pavement markers evaluated by NTPEP.

9 Use raised pavement markers of the prismatic reflector type, or better as approved. The  
10 markers shall be constructed either of an injection molded plastic body and base or  
11 consist of a plastic shell filled with a mixture of inert thermosetting compound and filler  
12 material. Either construction type shall contain one or more integrated prismatic  
13 reflective lenses to provide the required color designation.

14 The minimum reflective area of the lens face is 2.0 sq.in.

15 The color of the reflective pavement marker housing shall match the pavement marking  
16 color, which it supplements.

17 All raised pavement marker reflective lenses shall be in close conformance with the  
18 Federal Standard No. 595 colors as listed below when viewed at night.

Crystal: Color No. 17886 (White)  
Yellow: Color No. 13538  
Red: Color No. 11302

19 **(B) Adhesives**

20 (1) Epoxy

21 The epoxy shall meet Section 1081-4.

22 Review 1081-4(B) for description of epoxy types suitable for markers to be  
23 installed. Use an epoxy adhesive type that is appropriate for the pavement and  
24 ambient temperature per the manufacture's recommendations. It is recommended  
25 that the ambient temperature during application of Types II and IV epoxy shall be at  
26 least 50°F and preferably higher than 60°F. These adhesives harden relatively  
27 slowly at 50°F, but the hardening rate rapidly accelerates as temperature increases.

28 (2) Hot Bitumen

29 The hot bitumen shall meet Article 1081-3.

30 (3) Pressure Sensitive

31 As supplied by the manufacturer.

32 **(C) Material Certification**

33 Furnish a Type 2 material certification in accordance with Article 106-3 for all raised  
34 pavement markers before use.

35 **1086-2 PERMANENT RAISED PAVEMENT MARKERS**

36 **(A) General**

37 Use raised pavement markers evaluated by NTPEP. The markers shall be constructed  
38 either of an injection molded plastic body and base or consist of a plastic shell filled with  
39 a mixture of inert thermosetting compound and filler material. Either construction type  
40 shall contain one or more integrated prismatic reflective lenses to provide the required

1 color designation. Raised pavement markers (permanent) shall be of the glass or plastic  
 2 face lens type and meet Subarticle 1086-1(A). Plastic lenses shall have an abrasion  
 3 resistant coating.

4 (1) Potted Markers

5 Potted marker shells shall be made of molded methyl methacrylate conforming to  
 6 Federal Specification L P 380C, Type I, Class 3. Filling material shall be an inert  
 7 thermosetting compound selected for strength, resilience, and adhesion adequate to  
 8 meet physical requirements of the *Standard Specifications*. Sand or other inert  
 9 granulars shall be embedded in the surface of the inert thermosetting compound and  
 10 filler material before its curing to provide a surface, which will readily bond to the  
 11 adhesive.

12 (2) Injection-molded Markers

13 Injection-molded markers shall consist of polymer materials selected for strength and  
 14 resilience adequate to meet the physical requirements of the *Standard Specifications*.  
 15 The bottom surface of the marker shall contain grooves or nonsmooth structure  
 16 designed to increase bonding with the adhesive.

17 **(B) Optical Requirements**

18 All optical performance for permanent raised pavement markers shall conform to  
 19 ASTM D4280.

20 **(C) Physical Properties**

21 All physical properties for permanent raised pavement markers shall conform to  
 22 ASTM D4280.

23 **(D) Hot Bitumen Adhesives**

24 Use hot bitumen adhesive for mounting the pavement markers to asphalt concrete  
 25 roadways. The hot bitumen adhesive shall meet the requirements of Article 1081-3.  
 26 Other adhesives such as epoxy or cold bituminous adhesive pads are not acceptable on  
 27 asphalt concrete roadways for permanent applications.

28 **(E) Epoxy Adhesives**

29 Use epoxy adhesive for mounting the pavement markers to concrete roadways. The  
 30 epoxy adhesive shall comply with Section 1081-4. Other adhesives such as hot and cold  
 31 bituminous or adhesive pads are not acceptable on concrete roadways for permanent  
 32 applications.

33 **(F) Material Certification**

34 Furnish a Type 2 material certification in accordance with Article 106-3 for all raised  
 35 pavement markers before use.

36 **1086-3 SNOWPLOWABLE PAVEMENT MARKERS**

37 **(A) General**

38 Use snowplowable pavement markers evaluated by NTPEP. The snowplowable  
 39 pavement marker shall consist of a cast iron housing with one or more glass or plastic  
 40 face lens type reflective lenses to provide the required color designation. Shape the  
 41 casting to deflect a snowplow blade upward in both directions without being damaged.  
 42 Incorporate into the casting two parallel keels and a connecting web designed to fit into  
 43 slots cut into the road surface. Plastic lens faces shall use an abrasion resistant coating.

44 Use recycled snowplowable pavement markers that meet all the requirements of  
 45 new snowplowable pavement markers except Subarticle 1086-3(B)(1). Recycled  
 46 snowplowable pavement markers with minimal variation in dimensions are acceptable

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1           only when the reflector fits in the casting of the recycled snowplowable pavement marker  
2           as originally designed.

### 3   **(B) Castings**

#### 4       (1) Dimensions

5           The dimension, slope and minimum area of reflecting surface shall conform to  
6           dimensions as shown in the plans. The minimum area of each reflecting surface  
7           shall be 1.44 sq.in.

#### 8       (2) Materials

9           Use nodular iron in accordance with ASTM A536.

#### 10      (3) Surface

11          The surface of the keel and web shall be free of scale, dirt, rust, oil, grease or any  
12          other contaminant which might reduce its bond to the epoxy adhesive.

#### 13      (4) Identification

14          Mark the casting with the manufacturer's name and model number of marker.

### 15   **(C) Reflectors**

#### 16      (1) General

17          Laminate the reflector to an elastomeric pad and attach with adhesive to the casting.  
18          The thickness of the elastomeric pad shall be 0.04 inch.

#### 19      (2) Reflector Type

20          (a) One-direction, one color (crystal)

21          (b) Bidirectional, one color (yellow and yellow)

22          (c) Bidirectional, two colors (red and crystal)

23          (d) Bidirectional, two colors (red and yellow)

24          All pavement marker reflective lenses shall be in close conformance with the Federal  
25          Standard No. 595 colors as listed below when viewed during night situations.

Crystal: Color No. 17886 (White)

Yellow: Color No. 13538

Red: Color No. 11302

#### 26      (3) Reflector Optical Requirements

##### 27          (a) Definitions

28                Define "horizontal entrance angle" as the angle in the horizontal plane between  
29                the direction of incident light and the normal to the leading edge of the marker.

30                Define "observation angle" as the angle, at the reflector, between observer's line  
31                of sight and the direction of the light incident on the reflector.

1 Define “specific intensity (S.I.)” as candlepower of the returned light at the  
 2 chosen observation and entrance angles for each footcandle of illumination at  
 3 the reflector.

$$\mathbf{S.I.} = \mathbf{RL} \times (\mathbf{D} \times \mathbf{D}) \times \mathbf{IL}$$

Where:

**S.I.** = Specific Intensity

**RL** = Reflected Light

**IL** = Incident Light

**D** = Test Distance

4 (b) Optical Performance

5 Test the reflector for specific intensity as described below:

6 Form a 1 inch diameter flat pad using #3 coarse steel wool per Federal  
 7 Specification FF-W-1825. Place the steel wool pad on the reflector lens. Apply  
 8 a load of 50 lbs. and rub the entire lens surface 100 times. Do not abrade the red  
 9 lens of the Type 3 and Type 4 bi-directional units.

10 Locate the reflector to be tested with the center of the reflecting face at  
 11 a distance of 5 feet from a uniformly bright light source having an effective  
 12 diameter of 0.2 inch.

13 The photocell must be an angular ring 0.37 inch I.D. x 0.47 inch O.D. Shield it  
 14 to eliminate stray light. The distance from light source center to the center of  
 15 the photoactive area shall be 0.2 inch. If a test distance of other than 5 feet is  
 16 used, modify the source and receiver in the same proportion as the test distance.

17 After abrading the lens surface using the above steel wool abrasion procedure,  
 18 the specific intensity of each crystal reflecting surface at 0.2 degrees observation  
 19 angle must not be less than the following when the incident light is parallel to  
 20 the base of the reflector.

<b>TABLE 1086-1</b>		
<b>MINIMUM SPECIFIC INTENSITY</b>		
<b>(candle/footcandle/unit marker)</b>		
<b>Color</b>	<b>Horizontal Entrance Angle</b>	
	<b>0 Degrees</b>	<b>20 Degrees</b>
Crystal	3.00	1.20
Yellow	1.80	0.72
Red	0.75	0.30

21 **(D) Properties**

22 All optical and physical properties for snowplowable pavement markers shall conform to  
 23 ASTM D4383.

24 **(E) Epoxy Adhesive**

25 The epoxy adhesive shall meet the requirements of Section 1081-4. Mix the epoxy  
 26 adhesive rapidly by a two component type automatic metering, mixing and extrusion  
 27 apparatus.

28 **(F) Material Certification**

29 Furnish a Type 2 material certification in accordance with Article 106-3 for all raised  
 30 snowplowable markers before use.