

## PORTABLE SIGN STANDS AND ROLL-UP SIGNS (MGS-04-02C)

**1.0 DESCRIPTION.** This specification covers the system of the Portable Sign Stands, Roll-up Signs, and Flags.

**2.0 PORTABLE SIGN STAND GENERAL.** Portable sign stands shall consist of a sign support system capable of displaying a 48-inch by 48-inch, diamond-shaped, roll-up sign at a minimum mounting height of twelve inches, five feet, or seven feet above the ground, as required.

**2.1 PORTABLE SIGN STAND DESIGN.** Portable sign stands shall consist of the following major components: a base assembly, legs, and a vertical mast. Stands shall conform to the weights and dimensions specified below and shall be capable of remaining upright and entirely free standing, exclusive of any ballast, with a sign attached in wind and traffic speeds of 50 and 70 mph, respectively.

SIGN MOUNT. HEIGHT	MAX WT.	MAX. DIMEN. LENGTH (STORED) (Inches)	MAX. DIMEN. BASE (STORED) (Sq. Inches)
12"	25 lbs.	30	64
5'	40 lbs.	72	100
7'	45 lbs.	84	144

**2.2 PORTABLE SIGN STAND BASE ASSEMBLY.** The base assembly shall consist of a fatigue-resistant, wind-relieving mechanism in the form of a steel spring coil or coils mounted to a flanged hub. The wind-relieving mechanism shall be designed to accommodate vertical mast deflections caused by the wind and traffic speeds noted previously while maintaining sign performance. The hub shall accommodate attachment of the legs and shall be designed to provide a minimum of three locking positions for each leg. One of these positions shall be used to facilitate storage of the stand. The other positions shall be located to accommodate deployment of the stand on moderately uneven terrain.

**2.3 PORTABLE SIGN STAND LEGS.** The portable sign stand shall be equipped with four two-piece, telescoping legs attached to the flanges of the base assembly hub. The inner and outer telescopic sections shall be of sufficient cross-section and thickness to withstand conditions normally experienced in the field. The inner telescopic section should fit loosely enough inside the outer telescopic section to extend or retract easily; but, tightly enough to prevent expansion or distortion of the ends of telescopic sections. Each leg shall positively lock into the retracted and extended positions by means of a spring-loaded, push-button mechanism. Each leg shall incorporate a leg-locking pin with a lever-actuated, spring-loaded release device easily operated by foot or gloved hand to deploy and knockdown the stand. As an option on twelve-inch, five-foot and seven-foot mounting height stands, the legs may be constructed as one non-telescoping piece. Each leg shall be equipped with an anti-skid device securely affixed to the end of the inner telescopic section to prevent the stand from "walking" or skidding along the pavement when deployed.

**2.4 PORTABLE SIGN STAND VERTICAL MAST.** The vertical mast shall be securely fastened to the top of the base assembly. The vertical mast shall be fabricated as a single piece with a universal sign holder attached and shall extend no higher than necessary to secure the sign at the desired mounting height. As an option on twelve-inch, five-foot and seven-foot mounting height stands, the vertical mast may be constructed of telescoping sections, similar in design to that specified in Sec 3.2, with a universal sign holder attached and may extend as high as the top of the sign when deployed at the desired mounting height. In either case, the holder shall provide positive capture of the sign bracing while not damaging it.

**2.5 PORTABLE SIGN STAND MATERIALS.** All portable sign stand components and hardware shall be constructed of aluminum, stainless steel, or steel. All corrosive steel parts shall be coated with a corrosion-resistant coating such as corrosion-resistant paint, powder coating or zinc plating.

**3.0 ROLL-UP SIGNS AND OVERLAYS.**








**3.1 SUBSTRATES.** Sign and overlay blanks shall consist of microprismatic, retroreflective sheeting, in colors specified, sealed to a heavy-duty coated fabric or vinyl material of like or neutral color. Sheeting shall be UV stabilized to meet weathering requirements of ASTM G 23 or G 26, shall have a minimum coefficient of retroreflection specified below when measured in accordance with ASTM E 810, and shall meet the applicable color specification below. Heat resistance and impact resistance of the sheeting shall be in accordance with the latest version of ASTM D 4956.



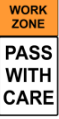

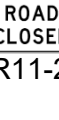
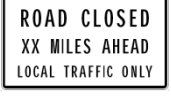
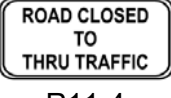

Minimum Coefficient of Retroreflection ( $R_A$ ) at 90 Degree Rotation Angle (cd/fc/ft <sup>2</sup> )					
Observation Angle (degree)	Entrance Angle (degree)	Color			
		Fluorescent Pink	Fluorescent Orange	White	Yellow
0.2	-4	135	200	250	170
0.2	+30	60	100	95	64
0.5	-4	60	80	200	136
0.5	+30	25	30	60	40









Color Specification Limits (daytime)									
Color	1		2		3		4		Min. Luminance Factor (Y%)
	x	Y	x	y	x	y	x	y	
Fluorescent Pink	.590	.350	.644	.290	.497	.209	.400	.335	25
Fluorescent Orange	.562	.348	.506	.404	.570	.429	.645	.355	14
White	.303	.300	.368	.366	.340	.393	.274	.329	30
Yellow	.498	.412	.557	.442	.479	.520	.438	.472	24











The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with CIE Standard Illuminant D65.




















**3.1.2 DESIGN AND LAYOUT.** Signs and overlays shall be of the color and size specified below. Sign and overlay borders, legends (size and copy), and symbols, as applicable, shall conform to the latest editions of the *Manual on Uniform Traffic Control Devices* and the *Standard Highway Signs* book and shall be silk-screened onto the face of the sign. Ink used in production of the signs and overlays shall conform to industry color standards and shall be compatible with the sheeting and shall not crack, peel, split, or delaminate from the sheeting for the useful life of the sign. For ease of sign identification when stored, the legend, or worded description for symbol signs, shall be printed near the bottom corner of the sign, between the border and the edge of each sign, or on a tag securely affixed to the bottom corner of the sign.

















<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
1	 E5-1	36"x48" Rectangle Black on Fl Orange	n/a	n/a	n/a
2	 E5-2	48"x36" Rectangle Black on Fl Orange	n/a	n/a	n/a
3	 E5-2a	48"x36" Rectangle Black on Fl Orange	n/a	n/a	n/a
4	 G20-4	36"x18" Rectangle Black on Fl Orange	n/a	n/a	n/a
5	 R1-1	36" Octagon Red on White	n/a	n/a	n/a
6	 R1-2	48" Triangle Red on White	n/a	n/a	n/a
7	 R2-1	36"x48" Rectangle Black on White	4	5	15"x17" (approx.) Black on White
			6	7	15"x17" (approx.) Black on White
			0	n/a	15"x17" (approx.) Black on White

<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
8	 R2-1(WZ)	36"x72" Rectangle (36"x24" Black on Orange & 36"x48" Black on White)	4	5	15"x17" (approx.) Black on White
			3	6	15"x17" (approx.) Black on White
9	 R4-1	36"x72" Rectangle (36"x24" Black on Orange & 36"x48" Black on White)	n/a	n/a	n/a
10	 R4-2	36"x72" Rectangle (36"x24" Black on Orange & 36"x48" Black on White)	n/a	n/a	n/a
11	 R10-6	36"x48" Rectangle Black on White	n/a	n/a	n/a
12	 R11-2	48"x30" Rectangle Black on White	n/a	n/a	n/a
13	 R11-3a	60"x30" Rectangle Black on White	1	6	3"x5" (approx.) Black on White
			2	7	
			3	8	
			4	9	
			5	0	
14	 R11-4	60"x30" Rectangle Black on White	n/a	n/a	n/a
15	 W1-4L	48" Diamond Black on FI Orange	n/a	n/a	n/a










<u>Line Number</u>	<u>Sign</u>	<u>Size and Color</u>	<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>		<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
16	 W1-4R	48" Diamond Black on Fl Orange	n/a	n/a	n/a
17	 W3-1	48" Diamond Black on Fl Orange w/ Red on White symbol	n/a	n/a	n/a
18	 W3-2	48" Diamond Black on Fl Orange w/ Red on White symbol	n/a	n/a	n/a
19	 W3-3	48" Diamond Black, Red, Yellow, and Green on Fl Orange	n/a	n/a	n/a
20	 W3-4	48" Diamond Black on Fl Orange	n/a	n/a	n/a
21	 W3-4(IM)	48" Diamond Black on Fl Pink	n/a	n/a	n/a
22	 W3-5	48" Diamond Black on Fl Orange w/ Black on White symbol	4	5	9"x11" (approx.) Black on White
			0	6	9"x11" (approx.) Black on White
23	 W4-1R	48" Diamond Black on Fl Orange	n/a	n/a	n/a









<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
24	 W5-1	48" Diamond Black on FI Orange	RAMP	BRIDGE	27"x10" (approx.) Black on FI Orange
25	 W8-1	48" Diamond Black on FI Orange	n/a	n/a	n/a
26	 W8-2	48" Diamond Black on FI Orange	n/a	n/a	n/a
27	 W8-7	36" Diamond Black on FI Orange	n/a	n/a	n/a
28	 W8-12	48" Diamond Black on FI Orange	n/a	n/a	n/a
29	 W20-1	48" Diamond Black on FI Orange	RAMP	BRIDGE	27"x10" (approx.) Black on FI Orange
30	 W20-2	48" Diamond Black on FI Orange	n/a	n/a	n/a
31	 W20-2(IM)	48" Diamond Black on FI Pink	n/a	n/a	n/a
32	 W20-3	48" Diamond Black on FI Orange	RAMP	BRIDGE	27"x10" (approx.) Black on FI Orange
			500 FT.	1000 FT.	29"x9" (approx.) Black on FI Orange
33	 W20-4	48" Diamond Black on FI Orange	n/a	n/a	n/a

<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
34	 W20-5	48" Diamond Black on FI Orange			40"x8" (approx.) Black on FI Orange
35	 W20-5(IM)	48" Diamond Black on FI Pink			40"x8" (approx.) Black on FI Pink
36	 W20-5a	48" Diamond Black on FI Orange	  	  	20"x8" (approx.) Black on FI Orange
37	 W20-7	48" Diamond Black on FI Orange	n/a	n/a	n/a
38	 W21-2	36" Diamond Black on FI Orange	n/a	n/a	n/a
39	 W21-6	48" Diamond Black on FI Orange	n/a	n/a	n/a
40	 MoDOT	60"x48" Rectangle (60"x12" Black on Orange & 60"x36" Black on White)		n/a	56"x12" (approx.) Black on White
41	 MoDOT	48"x36" Rectangle (48"x12" Black on Orange & 48"x24" Black on White)	n/a	n/a	n/a
42	 MoDOT	48" Diamond Black on FI Orange		n/a	24"x12" (approx.) Black on FI Orange

<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
43	 MoDOT	48" Diamond Black on FI Pink		n/a	24"x12" (approx.) Black on FI Pink
44	 MoDOT	36" Diamond Black on FI Orange	n/a	n/a	n/a
45	 W8-15	48" Diamond Black on FI Orange	n/a	n/a	n/a
46	 MoDOT	48" Diamond Black on FI Orange	n/a	n/a	n/a
47	 W8-24	48" Diamond Black on FI Orange	n/a	n/a	n/a
48	 MoDOT	48" Diamond Black on FI Orange	n/a	n/a	n/a
49	 MoDOT	42"x30" Rectangle Black on FI Orange	n/a	n/a	n/a
50	 MoDOT	48" Diamond Black on FI Orange			28"x10" (approx.) Black on FI Orange
					
51	 MoDOT	48" Diamond Black on FI Orange			28"x10" (approx.) Black on FI Orange



<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
52	 MoDOT(IM)	48" Diamond Black on Fl Pink	LEFT	CENTER	28"x10" (approx.) Black on Fl Pink
53	 MoDOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a
54	 MoDOT(IM)	48" Diamond Black on Fl Pink	n/a	n/a	n/a
55	 MoDOT(IM)	48" Diamond Black on Fl Pink	n/a	n/a	n/a
56	 MoDOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a
57	 MoDOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a
58	 MoDOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a
59	 MoDOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a
60	 MoDOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a

<u>Line Number</u>	<u>Sign</u>		<u>Overlay<sup>1</sup></u>		
	<u>Layout</u>	<u>Size and Color</u>	<u>Side a</u>	<u>Side b</u>	<u>Size<sup>2</sup> and Color</u>
61	 MoDOT (LE)	48" Diamond Black on Fl Orange	n/a	n/a	n/a
62	 MoDOT (LE)	48" Diamond Black on Fl Orange	n/a	n/a	n/a
63	 R3-1	36"x36" Red on White	n/a	n/a	n/a
64	 R3-2	36"x36" Red on White	n/a	n/a	n/a
65	 W1-4R	48" Diamond Black on Fl Orange	n/a	n/a	n/a
66	 W1-4L	48" Diamond Black on Fl Orange	n/a	n/a	n/a
67	 W6-3	48" Diamond Black on Fl Orange	n/a	n/a	n/a
68	 MODOT	48" Diamond Black on Fl Orange	n/a	n/a	n/a

- (1) Overlay packages are supplied as part of the associated sign.
- (2) Overlay size is approximate. The manufacturer shall ensure actual size provides enough area for the specified overlay legend or symbol, accommodates a buffer space for the overlay attachments, and completely covers the appropriate sign legend or symbol while not obscuring any sign border or relevant legend or symbol.

Note: The signs with the designated notes of (IM) and (LE) are recommended use for incident management and law enforcement, respectively.

**3.1.3 OVERLAY ATTACHMENTS.** For signs with overlays, a minimum 3/4-inch wide hook-and-loop material of color similar to the sign and overlay substrates they are placed on shall be used to display the overlay on the sign. The hook portion shall be placed along the length of the top and bottom of those sides opposite the sheeted sides of the overlay. The loop portion shall be placed on the face of the sign in the same dimensions used for the hook portion on the overlay and located on the sign face to display the overlay in its intended position. Each portion shall be securely affixed to the sign and overlay with a weather-resistant stitching material.

**3.1.4 BRACING POCKETS.** To facilitate attachment of the sign bracing to the sign, a pocket shall be provided on the back of the sign at each horizontal, vertical, and diagonal rib terminus, except those short horizontal ribs added for use with universal sign holders as described in Sec 2.2.2. Each pocket shall be positioned to ensure the sign remains taught and maintains its intended shape when the rib is engaged in the pocket and shall be securely attached to the sign with at least two appropriate-sized, semi-hollow, truss-head, zinc-plated steel rivets with washers. Fabric and sliding pockets, as well as plastic pockets with one of the two rivets exposed at the top of the pocket, are not acceptable.

**3.1.5 ANTI-KITING DEVICE.** A strap consisting of 1-inch wide hook-and-loop material securely affixed back-to-back shall be permanently attached near the center of the back of the sign to allow the user to prevent the sign from billowing away from the sign bracing. The manufacturer may submit alternative designs for department consideration.

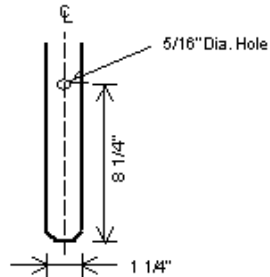
**3.1.6 STORAGE DEVICE.** A strap consisting of 1-inch wide hook-and-loop material securely affixed back-to-back shall be permanently attached to the sign to allow the user to store the roll-up sign easily. The manufacturer may submit alternative designs for department consideration.

## **3.2 ROLL-UP SIGN BRACING.**

**3.2.1 SUPPORT RIBS.** Sign bracing shall be constructed of UV stabilized, bloom- and splinter-resistant, fiberglass ribs conforming to the thickness and width dimensions specified below. Lengths shall be sufficient to ensure the sign remains taught and maintains its intended shape when the rib is engaged in the pocket. Rib ends shall be shaped or otherwise treated to prevent splintering, sharp edges, and damage to the sign face.

	Thickness	Width
Horizontal Ribs	3/16"	1-1/4"
Diagonal Ribs	1/4"	1-1/4"
Vertical Ribs	5/16"	1-1/4"

**3.2.2 CONFIGURATION AND DESIGN.** Diamond-shaped signs shall have one full vertical and one full horizontal rib. All other signs shall have a bracing configuration designed to present the intended sign shape and shall include a horizontally-centered, full vertical and a horizontal rib. The horizontal rib may extend the width of the sign or be designed for use with universal sign holders. All vertical ribs shall have one 5/16-inch diameter hole drilled as shown below.



**3.2.3 RIB CONNECTIONS.** All ribs shall be fastened together, typically at the intersection of the midpoint of their length and width, with a bolt or rivet combination designed for ease of roll-up sign storage and to minimize damage to the sign material. Bolt combinations shall consist of a zinc-plated steel 1/4-inch slotted-, phillips-, or hex-head bolt, washers, and an all-metal, self-locking nut. Rivet combinations shall consist of a 1/4-inch diameter, semi-hollow, truss-head, zinc-plated steel rivet and washers. Blind or hollow type rivets are not acceptable. Washers shall consist of a zinc-plated 1/4-inch I.D. x 1-inch O.D. x 1/16-inch flat washer located between the fastener pieces and the ribs and between each of the ribs and, if applicable, a zinc-plated 1/4-inch split-ring, lock washer located under the head of the rivet.

**3.2.4 SUPPORT STRAP.** A strap shall be permanently attached to the upper and lower portions of the vertical rib to allow the user to secure the roll-up sign to a sign support. One end of each strap shall consist of a 1-1/4 inch long (approx.) x 1-inch wide strap with a plastic or metal D-ring secured to the end. The other end of each strap shall consist of a 7-inch long (approx.) x 1-inch wide strap of hook-and-loop material arranged so the strap adheres to itself when fed through the D-ring. The manufacturer may submit alternative designs for department consideration.

**4.0 FLAG SYSTEM.** Flag systems, when specified, shall consist of a flag bracket and two flag assemblies and constructed as a single attached unit. Each flag assembly shall consist of an 18"x18" orange, vinyl flag securely attached on one side to a fiberglass blank. The blank shall be securely attached to the flag bracket with the flag "hanging" from the rod, be of sufficient cross-section to display the flag in wind speeds up to 50 mph, and be of sufficient length to hold the flags approximately six inches from the sign. The flag bracket shall be attached to the flag assemblies as a single system. The flag bracket shall display the flags at approximately 90 degrees from each other and be easily installed and removed from the upper portion of the vertical rib. All hardware needed to attach the single flag system to the vertical rib shall be included in the bid. The overall design of the flag system shall fold down to enable the storage of the entire system with the sign without removing the system from the sign or moving the bracket.

**5.0 PORTABLE SIGN STAND SAMPLES.** Upon request, the low bidder shall submit a portable sign stand type to be used in the production of the portable sign stands. Samples will be inspected by the department for conformance to this specification and will be considered in the determination of contract award.

**5.1 ROLL-UP SIGN SAMPLES.** Upon request, the low bidder shall submit a diamond-shaped and rectangular-shaped roll-up sign, complete with overlays, bracing, and flag system, meeting this specification and a 12"x12" sample of each substrate type to be used in the production of the roll-up signs. Samples will be inspected by the department for conformance to this specification and will be considered in the determination of contract award.

**6.0 CERTIFICATION.** The manufacturer shall provide written certification the portable sign stand model complies with the requirements of NCHRP 350 or MASH, Test Level 3. The manufacturer awarded the contract shall provide certification with each shipment of roll-up signs that the roll-up signs supplied conform to the accepted samples.

**7.0 ACCEPTANCE.** Acceptance of portable sign stands and roll-up signs will be by certification and any tests deemed necessary by the department to ensure the sign stands and signs are in accordance with this specification.