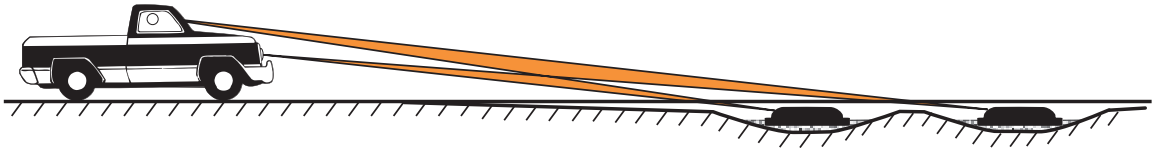
MARKER ONE
PAVEMENT REFLECTORS

THE SAFER APPROACH...



TO PLOWABLE MARKERS

Marker One **provides a significant advance in snowplowable marker safety, reflectivity, and durability. The R-100 marker system uses two traditional State-approved reflectors bonded into tough plastic housings and installed in very shallow grooves.**

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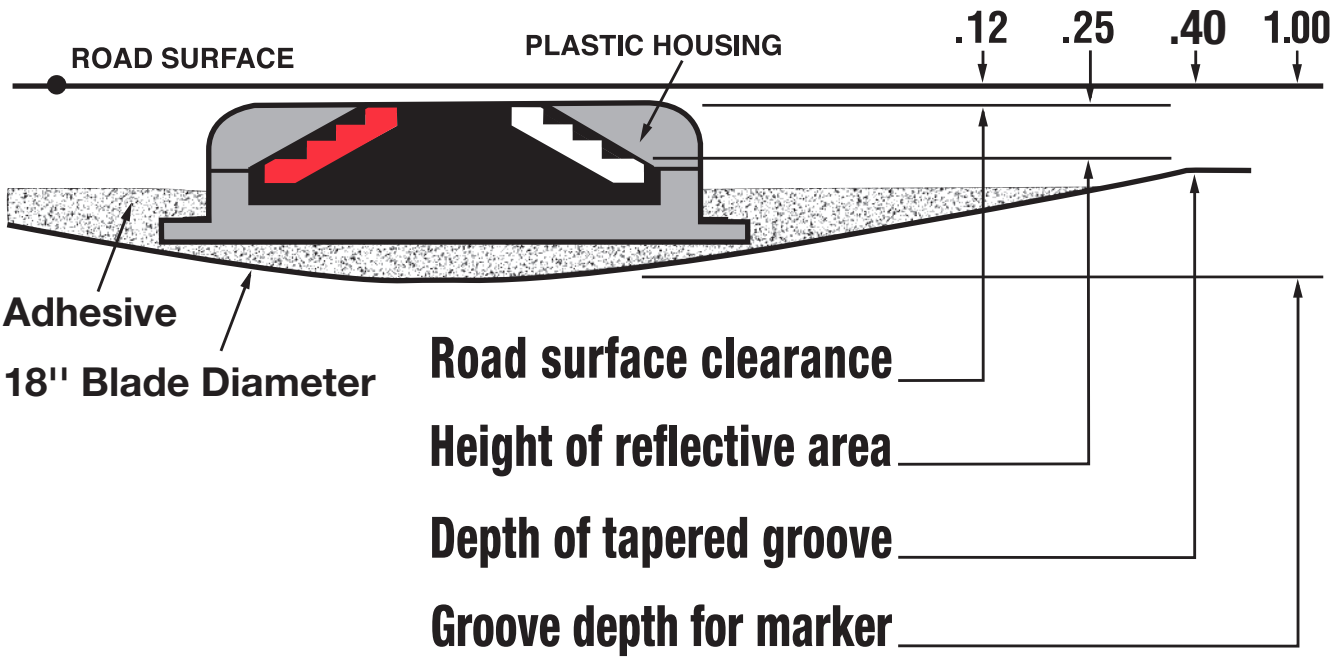
R-100 Marker

R-100 Adhesive Installation

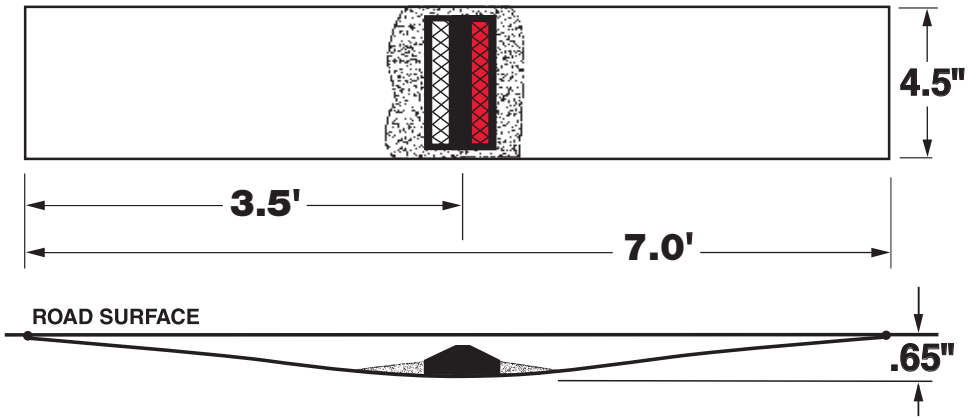
...AND HERE'S HOW



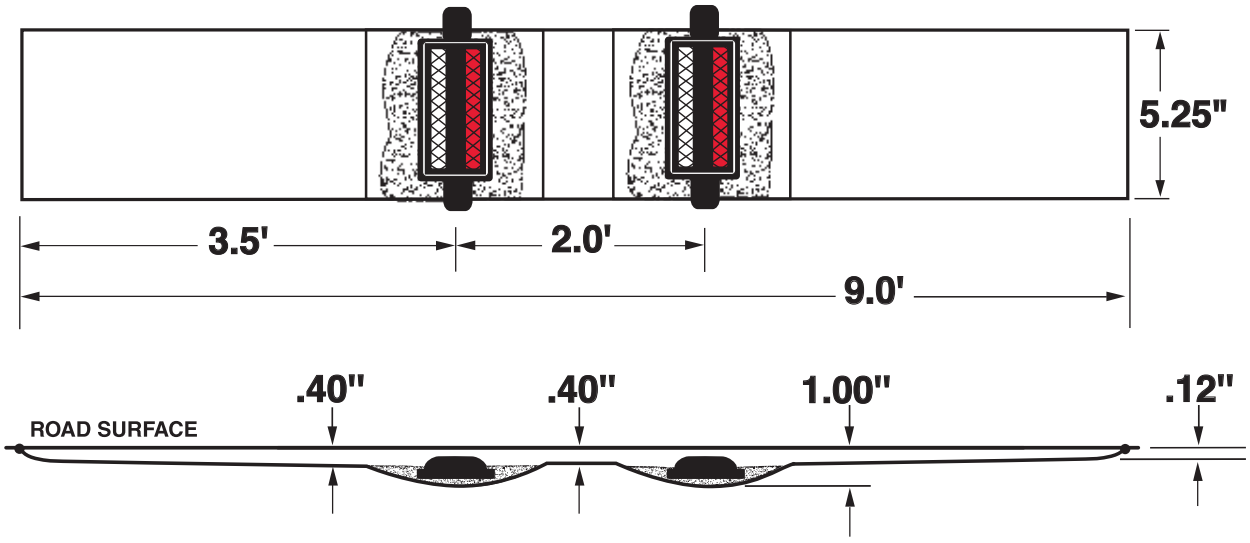
The above groove depth dimensions are important in defining reflective results. However, the groove length and two reflectors in the groove most notably affect the intensity of reflected light as vehicles approach markers.

RECESS SPECIFICATIONS

TRADITIONAL Recessed Marker



MARKER ONE Recessed Marker



REFLECTIVITY OF R-100 MARKERS

REFLECTIVE INTENSITY IS MEASURED BY THE HEIGHT (IN.) OF REFLECTIVE AREA OBSERVED BY A MOTORIST APPROACHING THE REFLECTORS ON CLEAR DRY PAVEMENT (1)

DISTANCE FROM HEADLIGHTS TO REFLECTOR (FT.)	DISTANCE FROM BEGINNING OF GROOVE TO REFLECTOR (FT.)		
	RAISED MARKERS (2) (NO GROOVE)	TRADITIONAL 3.5	MARKER ONE 3.5/5.5
	1 Reflector	*1 Reflector*	*2 Reflectors*
600	.20	.03	.03 + .07 = .10
500	.20	.06	.06 + .09 = .15
400	.20	.10	.10 + .15 = .25
300	.20	.17	.17 + .18 = .35
200	.20	.25	.25 + .25 = .50

(1) Max. Ht. of Reflective Area (1 Reflector)= .25 in.
(2) Benchmark Reflective Height of Low Profile Design

Specifications for R-100 Housing and Reflector

MATERIAL:	Polycarbonate Plastic
WEIGHT:	Housing 2.00 oz. Reflector 2.00 oz.
HOUSING SIZE:	5.00'' x 3.00'' x .70'' high
SPECIFIC INTENSITY cd/fc OF REFLECTIVITY AT 0.2° OBSERVATION ANGLE	
WHITE:	3.0 at 0° entrance angle 1.2 at 20° entrance angle
YELLOW:	60% of white values
RED:	25% of white values

R-100 Marker Advantages

- Recessed lightweight all-plastic markers are inherently safe and reduce liability.
- Recommended tandem (2) reflectors in a groove improve roadway visibility, especially in fog.
- Shallow grooves clean out quickly, don't hinder the steering of cars or motorcycles, and are less influenced by traffic wear.
- "Recessed snowplowable markers last on average 12 months longer than raised snowplowable markers…" *NCHRP–Report 518, ¶2.1.2.1*

R-100 Housing Advantages

- Reflector clearance below the road surface is held constant by positioning tabs on the housing or reflector
- Provides a durable rust-free surface to install, retain, and replace reflectors
- Stops asphalt from creeping over reflector sides in hot weather
- Accepts any brand of 2" x 4" replacement reflectors

NTPEP Testing

- R-100 markers performed well on the 2005 test deck on US 70 near Columbus, Ohio. Test results are available. www.ntpep.org/pages/rpmreports.aspx *Select NTPEP Reports 5008.1 or 5008.2*

R-100 Discussion and Recommendations

Marker One **recommends replacement of raised markers and traditional recessed markers with R-100 high reflectivity reflectors as shown on page 4. Tandem reflectors feature exceptional performance without a substantial price increase.**

Installation guidelines follow:

- **Groove depth dimensions are on page 3.**
- **Groove width specification is 5.25 inches.**
- **Groove length is typically 9 feet. Long grooves enable headlight rays to reach recessed markers at greater vehicle distance from markers, and they enhance water drainage.**
- **Most one-way applications require markers be installed in two-way grooves for effective wet-night reflectivity. Only on uphill lanes of divided highways where water drains back toward approaching vehicles can markers be installed in shorter grooves. Check this installation option with Resident Engineer.** *(See Appendix for illustrations)*

Comparison of Snowplowable Pavement Markings

Marking System	Wet-Night Reflectivity[1]	Road Hazard[2]
Raised Pavement Markers	10	Yes
Marker One Recessed Markers	8	No
Traditional Recessed Markers	6	No
Permanent Reflective Tapes	4	No
Reflective Paints / Thermoplastics	2	No

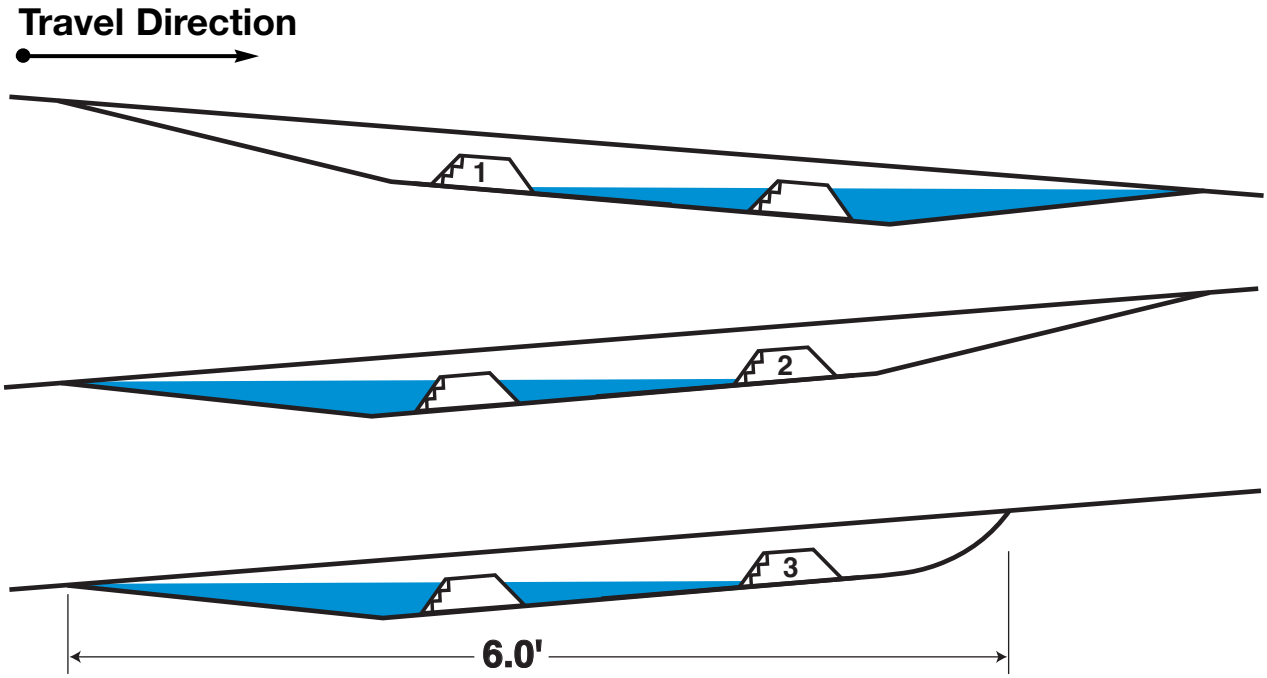
[1] 6 Year Pavement History - Rated 1 (Low) thru 10 (High), 10 being the benchmark rating for raised pavement markers

[2] When dislodged from their installation location by snowplows and traffic

Conclusion

Six years of road testing in Illinois, Kentucky, Missouri, Ohio, and West Virginia show the R-100 Markers are wet-night reflective, non-hazardous, and durable. With all test results and comparisons analyzed it is clear the R-100 Marker System is the best choice for snowplowable markers.

APPENDIX



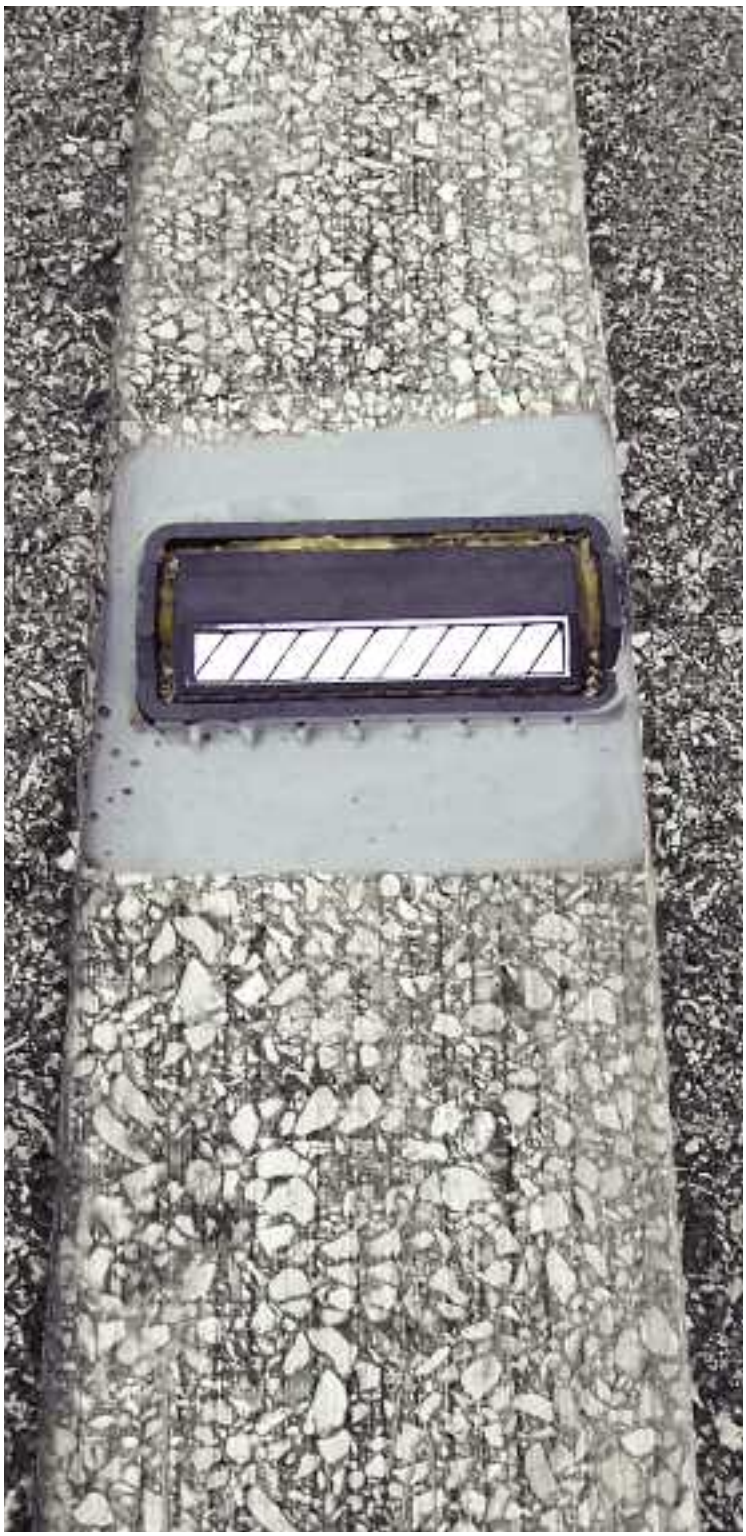
Uphill 1-way Option

Since water in grooves hinders wet-night reflectivity it is important to install markers as shown on pages 3 and 4. The markers shown above (1, 2, 3) are reflective in wet weather because water drains from the downhill end of their grooves. Wet-night experience on roads with angle of inclination greater than 3 degrees indicates grooves drain sufficiently to yield excellent reflectivity.

RAISED PAVEMENT MARKERS

replace with...

...RECESSED R-100 MARKERS



for **Safety**

R-100 INSTALLATION EQUIPMENT

R-100 Installation Instructions

1. **Reflector/Housing assembly**

   Use Liquid Nails #LN-933 "MARBLE & granite adhesive." Apply a 5/16" diameter by 3 1/2" long bead in the housing. By hand, press reflector into adhesive, then place this assembly into an arbor press to complete assembly. A small amount of adhesive should be visible around the reflector. A 10 fl. oz. tube of adhesive makes about 75 markers. This adhesive is stocked (or special order) by Home Depot.

2. **Marker installation in roadway**

   Pavement Grooves:

   Cut installation grooves using diamond blades on saws that accurately control groove dimensions. Installation cut specifications should follow requirements of the contract plans involved.

   Adhesive:

   Use (Approved Products List) snowplowable epoxy adhesive such as Poly-Carb Mark-29 or Epoplex MA50. Before adhesive is applied grooves should be clean and dry. The epoxy should cover the housing base projections by 1/16" to 1/8" in height.

   NOTE: In spring or fall installations where ambient temperature is below 50°F and the epoxy is heated to improve flow and mixing, the grooves should also be heated to avoid moisture development at the roadway/epoxy interface. Contact ***Marker One*** concerning "dew-point" considerations for low temperature installations.