**1. ITEM SPECIFICATIONS**

Unless otherwise specified in this ITB, reference to a specific manufacturer or a specific product or model in the bid specifications does not restrict bidders to that manufacturer, product or model. This method is used to indicate the functional requirements (e.g., type, design, characteristics, quality) of the article desired. Bids may be considered on other manufacturer’s products or other models determined by the Purchasing Division to be the functional equivalent of the product or model referenced.

**1.1 SCOPE**

This specification covers flexible white or colored, wide angle retro reflective micro prismatic sheeting, and related processing materials designed to enhance nighttime visibility of traffic control signs and objects. The sheeting shall consist of:

* prismatic lens elements with a distinctive interlocking diamond seal pattern and datum orientation marks visible from the face of a smooth surface; and
* a pre-coated adhesive protected by an easily removable liner

The sheeting shall be part of a family of matched component products required for the manufacture and imaging of permanent traffic control signs.

**1.1.2 DIGITAL PRINTING**

Reflective Sheeting shall be compatible and warranted with Nevada Department of Transportation (NDOT) Sign Shop HP 700 Series Latex Digital Printer to the performance criteria stated in Section 1.15.

**1.2 PREQUALIFICATION AND PERFORMANCE HISTORY**

Materials (sheeting, process colors, overlay films) shall be considered for use only when, in the opinion of the Nevada Department of Transportation, sufficient evidence exists to ensure that the materials and services offered can reliably conform to this specification. The sheeting manufacturer shall provide evidence of performance and suitability for use in accordance with Nevada Department of Transportation Qualified Products Procedures.

1.2.1 Prequalification

All prospective bidders are hereby notified that the material (sheeting, process colors, overlay films) proposed for submission or for use in production of finished traffic control devices shall be a material of manufacture and product code or designation shown on the list of approved manufacturers of materials covered by this specification maintained by the Nevada Department of Transportation.

Prospective bidders or suppliers who wish to establish a performance history and prequalification for materials (sheeting, process colors, overlay films) governed by this specification should contact Ryan Clark (775) 834-8322 or by email at [RClark@dot.nv.gov](mailto:RClark@dot.nv.gov) for instructions on samples and information required for testing.

***Information regarding the Department of Transportation’s policy for product evaluations can be found at*** [***http://www.nevadadot.com/About\_NDOT/NDOT\_Divisions/Planning/Research/Research.aspx***](http://www.nevadadot.com/About_NDOT/NDOT_Divisions/Planning/Research/Research.aspx)***Material shall be furnished at no charge to the State of Nevada.  In the event NDOT is unable to complete testing and evaluation process before bid opening date, product will be considered for acceptance on future bids if accepted.***

1.2.2 Performance History

The sheeting manufacturer shall provide test data showing that representative combined production materials (sheeting, process inks, overlay films) of the type to be supplied have met the requirements for 36 months.

This data shall be gathered by the Nevada Department of Transportation’s own testing facility in accordance with ASTM D 4956 or an independent agency, such as AASHTO’s National Transportation Product Evaluation Program (NTPEP).

The data submitted shall cover the retro reflective sheeting and process colors and/or overlay films manufactured by the sheeting manufacturer in standard traffic colors. The process colors and overlay films shall be tested with the sheeting to which they are intended to be applied. The data collection shall have been completed no more than 5 years prior to the offer.

The materials may also be considered for qualification if, in the opinion of the engineer, sheeting material of the type to be supplied has been used successfully in other substantial signing programs that are in similar climatic conditions for at least 5 years.

To be considered an equal alternate to an existing, qualified product, a candidate product must be used and weathered along-side the control or benchmark material to eliminate any bias in the exposure procedures.

**1.3 CLASSIFICATION AND CONFORMANCE**

The sheeting shall conform to ASTM D 4956 as modified by this specification.

**1.4 SHEETINGS AND COLORS STANDARDS**

1.4.1Process Colors

The manufacturer of the sheeting shall manufacture and offer process colors in standard traffic colors, clears and thinners recommended for the sheeting to meet the performance requirements of this specification at no cost. The sheeting manufacturer shall further be responsible for technical assistance in the use of these colors in accordance with Section 1.2.

The process colors shall be a single line of traffic colors which:

* may be applied before and after sheeting is applied to a substrate;
* require no component premixing;
* will air dry for packing in 3 hours or less and requires no clear coating

The sheeting manufacturer shall, upon request, provide custom color match formulas from the color series.

1.4.2Overlay Films

The sheeting manufacturer shall also manufacture colored acrylic imaging films and clear protective overlays, which are compatible with the sheeting(s), and when used in accordance with the sheeting manufacturer’s instructions, shall not lessen the warranty term as described in Table IVA Warranty Life.

1.4.3 Test Panels and Test Conditions

Unless otherwise specified herein, sheeting shall be applied to test panels in accordance with ASTM D 4956, Section 7.2 and test conditions shall conform to ASTM D 4956 Section 7.1.

**1.5 REQUIREMENTS**

1.5.1 Color Requirements

Color shall be as specified and shall conform to the Daytime and Nightime Color Specification Limits of ASTM D 4956. Daytime Luminance factors shall conform to ASTM D 4956-11, Table 2.

1.5.1.1 Ordinary Colors

Conformance to standard chromaticity (x, y) and luminance factor (Y%) requirements shall be determined by instrumental method in accordance with ASTM E 1164 on sheeting applied to smooth aluminum test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2o standard observer.

1.5.1.2 Fluorescent Colors

Conformance to standard chromaticity (x,y) and luminance factor (Y%) requirements shall be determined by instrumental method in accordance with ASTM E 991 on sheeting applied to smooth aluminum test panels cut from Alloy 6061-T6 or 5052-H38. The values shall be determined on a HunterLab ColorFlex 45/0 spectrophotometer. Computations shall be done for CIE Illuminant D65 and the 2o standard observer**.**

**1.6 COEFFICIENT OF RETROREFLECTION**

The coefficients of retroreflection shall be determined in accordance with ASTM E-810, for the minimum requirements of Table 5 (Type IV) and Table 10 (Type XI) found in ASTM D 4956.

1.6.1 Units

Coefficients of retroreflection shall be specified in units of candelas per lux per square meter.

1.6.2 The observation angles shall be 0.2°, 0.5°, and 1.0°.

1.6.3 The entrance angles shall be -4°, and 30°

1.6.4 For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficients of retroreflection shall not be less than 70% of the values for corresponding color in Table 5 and Table 10 in ASTM D 4956.

**1.7 SPECULAR GLOSS**

The retroreflective sheeting shall have an 85° specular gloss of not less than 40 when tested in accordance with ASTM D 523.

**1.8 COLOR PROCESSING**

The retroreflective sheeting shall be designed to work in concert with recommended imaging systems. Color processing with compatible transparent and opaque process colors shall be possible in accordance with the sheeting manufacturer’s recommendation at temperatures of 60° to 100°F (16° to 38°C) and relative humidity of 20% to 80%. The sheeting shall be heat resistant and permit force curing without staining of applied or unapplied sheeting at temperatures recommended by the sheeting manufacturer.

**1.9 SHRINKAGE**

The retroreflective sheeting shall comply with the shrinkage requirements contained in ASTM D 4956 Section 6.6.

**1.10 ADHESIVE**

The retro reflective sheeting shall comply with the liner removal and adhesion requirements contained in ASTM D 4956 Section 6.8 and 6.9 respectively.

**1.11 OPTICAL STABILITY**

The retroreflective surface of the sheeting shall be weather resistant, showing no appreciable cracking, blistering, crazing, or dimensional change when subject to three years of unprotected outdoor exposure according to ASTM G7, inclined at an angle of 45° relative to horizontal, and facing the equator. After cleaning, the coefficient of retroreflection shall not be less than 80% of the values in ASTM 4956 and the colors should conform to ASTM 4956

**1.12 FUNGUS RESISTANCE**

The retro reflective sheeting shall comply with the supplementary requirements contained in Section S1 of ASTM D 4956.

**1.13 GENERAL CHARACTERISTICS AND PACKAGING**

The retro reflective sheeting as supplied shall be of good appearance, free from ragged edges, cracks and extraneous materials and shall be furnished in either rolls or sheets.

When furnished in continuous rolls, the number of splices shall not be more than two per 50 yards (45.7 m) of material, with a maximum of three pieces in any 50-yard (45.7 m) length. Splices shall be butted or overlapped and shall be suitable for continuous application as furnished.

The sheeting shall be packaged in accordance with commercially accepted standards. Each carton shall clearly stipulate the brand, quantity, size, lot or run number, color and type adhesive. Stored under normal conditions, the retro reflective sheeting as furnished shall be suitable for use for a minimum period of one year.

**1.14 PERFORMANCE REQUIREMENTS AND OBLIGATIONS**

1.14.1 **CERTIFICATION**

The sheeting manufacturer shall submit with each lot or shipment, a certification that states the material supplied will meet all the requirements listed herein.

**1.15 FIELD PERFORMANCE REQUIREMENTS**

1.15.1 Sheeting processed and applied to sign blank materials in accordance with sheeting manufacturer’s recommendations, shall perform effectively for the number of years stated in Table IVA. The retro reflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that:

* the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day night driving conditions; or
* the coefficient of retro reflection is less than the minimum specified for that sheeting during that period listed.

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| Table IVA  Warranty Life |
|  |
| Type IV: 80% of values listed in ASTM D4956 Table 5 up to 7 years and  70% of values listed in ASTM D4956 Table 5 up to 10 years. |
| Type XI: 80% of values listed in ASTM D4956 Table 10 up to 7 years and  70% of values listed in ASTM D4956 Table 10 up to 12 years. |

1.15.2 Failure of process colors or overlay films provided and/or sold for use on recommended sheeting shall constitute a failure of entire sign and shall be replaced under manufacturer’s replacement obligations (Section 1.16).

1.15.3 For screen printed transparent colored areas or transparent colored overlay films on white sheeting, the coefficients of retro reflection shall not be less than 70% of the values for the corresponding integral color.

1.15.4 All measurements shall be made after sign cleaning according to sheeting manufacturer’s recommendations.

**1.16 SHEETING MANUFACTURER’S REPLACEMENT OBLIGATION**

1.16.1 For standard colors where it can be shown that retro reflective signs, supplied and used according to the sheeting manufacturer’s recommendations, have not met the performance requirements of Section 1.14, the sheeting manufacturer shall cover restoration costs as follows for sheetings shown to be unsatisfactory during:

1.16.1.1 The entire 12 years (Type XI): the sheeting manufacturer will replace the sheeting required to restore the sign surface to its original effectiveness.

1.18.1.2 In addition, during the first 7 years, the sheeting manufacturer will cover the cost of restoring the sign surface to its original effectiveness at no cost to the Nevada Department of Transportation for materials and labor.

1.16.2 For fluorescent colors where it can be shown that retro reflective signs, supplied and used according to the sheeting manufacturer’s recommendations, have not met the performance requirements of Section 1.16, the sheeting manufacturer shall cover restoration costs as follows for sheeting shown to be unsatisfactory during:

1.16.2.1 For sheeting with a 10-year warranty, if the failure occurs within the first 7 years from the date of fabrication, the sheeting manufacturer shall, at its expense, restore the sign surface to its original effectiveness.

1.16.2.2 If the failure occurs in the 8th through the 10th year from the date of fabrication, the sheeting manufacturer will furnish the necessary amount of sheeting to restore the sign surface to its original effectiveness.

1.16.2.3 Replacement sheeting shall carry the unexpired warranty of the sheeting it replaces.

**1.17** **AGENCY OBLIGATION**

The Nevada Department of Transportation shall be responsible for requiring the dating of all signs at the time of application. That date constitutes the start of the field performance obligation period.

**1.18 TECHNICAL ASSISTANCE REQUIREMENT**

The manufacturer supplying the retro reflective sheeting requirements shall provide the services of a qualified technician for instruction and training at the primary sign manufacturing facility designated by the Nevada Department of Transportation (or other using entity). Instruction shall include, but not be limited to training films, material application, equipment operation, silk screening techniques, packaging, storage, and other proven sign shop practices as they apply to the reflective sheeting supplied by the manufacturer and to assure that the resulting signs can comply with the applicable specifications.

Additional on-site technical assistance by the manufacturer supplying the retro reflective sheeting shall be provided at each of the sign shops designated in the bid invitation.

The sheeting manufacturer shall provide the sign shops with competent technical service and product information, including service on screen printing problems with the inks furnished or recommended by the manufacturer for their sheeting. The manufacturer supplying the retroreflective sheeting shall provide technical assistance for their recommended sheeting application equipment. The manufacturer shall certify that trained personnel will be available on 72 hours’ notice to render such service to facilitate the manufacture of finished signs. “Service” is understood to mean the capability of calibration and troubleshooting, as well as the training and retraining of personnel as required. In addition, a manufacturer’s representative shall be available on site within 24-hour notice to assess and advise on any manufacturing difficulty that arises.

**1.19 APPLICABLE DOCUMENTS**

The following documents, of the issues in effect on the date of invitation for bid, form a part of this specification to the extent specified herein.

1.19.1 ASTM d 4956 Standard Specification for Retroreflective Sheeting for Traffic Control;

1.19.2 E 810 Standard Test Method for Coefficient of Retro reflection of Retro reflective Sheeting.

**1.20 BALANCE OF THE LINE**

In addition to the item(s) being requested, purchasing entities of the State of Nevada will be allowed to order from the successful vendor’s regular product line for delivery F.O.B. destination to any point within the State of Nevada. Bidders shall state the discount percentage from their product line’s list price for other items. This discount percentage may be considered during the award of this contract. A copy of the bidder’s catalog(s) if available or a list of product lines should be submitted with the bid.

Balance of the Line Discount Percentage \_\_\_\_\_\_\_\_\_%