

# Special Specification 4126

## Transparent Noise Barrier Panels



### 1. DESCRIPTION

Furnish the materials and construct transparent noise barrier panels as shown on the plans and required by this specification.

### 2. MATERIALS

Use materials conforming to the pertinent requirements of the following:

#### ASTM Standards:

- D 635 – Standard Test Method for Rate of Burning and/or Extent and time of Burning of Plastics in a Horizontal Position
- D638–Standard Test Method for Tensile Properties of Plastics
- D785–Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
- D 790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- D 1003 – Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics
- D1929–Standard Test Method for Determining Ignition Temperature of Plastics
- D 2843 – Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics
- E 90 – Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- E413–Classification for Rating Sound Insulation
- E 1996 – Standard Specification for performance of exterior windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
- G21 – Standard Practice for Determining Resistance of Synthetic Polymer Materials to Fungi
- G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

#### Other Standards:

- ANSI Standard Z97.1- Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test
- EN1794–Road Traffic Noise Reducing Devices- Non Acoustic Performance  
Part 1 –Mechanical Performance and Stability Requirements  
Part 2 –General Safety and Environmental Requirements

The transparent noise barrier will be a rigid monolithic sheet, complying with all requirements of this specification.

The structural components of the system will be designed in accordance with the 7th edition, of the AASHTO LRFD Bridge Design Specification, Section 15 "Design of Sound Barriers."

Materials will conform to applicable design drawings.

Manufacturers must have a minimum 5 year history of producing transparent noise barrier assemblies for highway noise barriers.

**Source:** Materials will be supplied by Armtec, 1-866-801-0999 or an approved equal meeting all requirements of this specification.

**Shop Drawings:** Shop drawings will be provided by the supplier, detailing all relevant aspects of panel installation and connection details, and stamped by a professional engineer.

**Transparent Panel Assemblies:** If so required by the contract specifications and drawings, the transparent sheet will be assembled within a frame, to provide a Transparent Panel Assembly. All details of the Transparent Panel Assembly will be detailed on shop drawings and submitted for approval.

Additional requirements for Transparent Panel Assembly are found in Appendix 1 and Appendix 2.

**Color:** Unless otherwise specified, do not tint the transparent noise barrier.

**Dimensions:** Dimensions of the transparent noise barrier panel will be specified by the applicable drawings. Unless otherwise specified, the tolerance on length and width dimensions will be  $-0, +0.25$  in. Minimal transparent panel thickness is 15mm.

**Performance Characteristics:** The transparent noise barrier panel will meet the performance requirements of Table 1 when tested in accordance with the associated ASTM method.

**TABLE 1**  
**Performance Requirements**

PROPERTY	REQUIREMENT	ASTM Method
Tensile Strength	>9,250 psi	D638
Flexural Modulus	>445,000 psi	D790
Rockwell Hardness	M-90	D785
STC	>27	E90 / E413

The transparent noise barrier will meet the optical requirements of Table 2.

**TABLE 2**  
**Optical Requirements**

PROPERTY	REQUIREMENT	ASTM Test Method
Light transmission	>90%	D1003
Haze	<1.5%	D1003
Yellowness Index	< 1	D1003

**Resistance to Weathering:** After exposure to outdoor weathering for a period of ten years or accelerated weathering in accordance with ASTM G 155 for a period of 10,000 hours, the transparent noise barrier panel will show no evidence of cracking or crazing and will comply with the requirements of Table 3.

**TABLE 3**  
**Weathering Requirements**

PROPERTY	REQUIREMENT	ASTM Test Method
Light transmission	>88%	D1003
Haze	<10%	D1003
Yellowness Index	< 5	D1003
Tensile strength	> 75% of initial value	D638
Flexural strength	> 75% of initial value	D790

**Fire Resistance:** The transparent noise barrier will meet the flammability requirements of Table 4 when tested in accordance with the associated test method.

**TABLE 4**  
**Flammability Requirements**

PROPERTY	REQUIREMENT	Test Method
Resistance to brush fire	Minimum, Class 3	EN1794-2
Horizontal burn rate	<2.5 in/min	ASTM D635
Smoke density	<50%	ASTM D 2843

**Shatter Resistance:** If so required by the contract specifications and drawings, when the transparent sheet is to be mounted on a structure or in such a way that if damaged they could pose a hazard to road users or others, the transparent sheet will be required to retain all broken pieces by employing either an internal or external restraint system.

**Impact Resistance:** The transparent noise barrier will meet the requirements of EN 1794-1, Appendix C. The transparent noise barrier will meet the requirements of ANSI Z97.1 as a safety glazing material. The transparent noise barrier will pass the large missile impact test, ASTM E1996.

**Wind Load Resistance:** The maximum elastic deflection  $d_{max}$  under the design wind load will be less than 3in.

When a load factor of 1.5 is applied to the design wind load:  
The sheet will not show any symptoms of failure such as buckling or cracks.  
The sheet will not become detached from its supports or fittings

**Resistance to Roadside Chemicals:** The transparent noise barrier will be resistant to standard de-ice chemicals such as:

Calcium Chloride, Magnesium Chloride, Potassium Acetate, Calcium/Magnesium Acetate, and Sodium Acetate

**Resistance to Fungi:** The transparent noise barrier will undergo testing in accordance with ASTM G21 and have a zero rating, show no signs of fungi growth, after the standard 28 day test period.

**Assembled Panels**

Following assembly, the manufacturer will perform an inspection on each panel to ensure the panels have the following characteristics:

**Dimensions, Assembled Panels:**

- A. Length Target  $\pm 0.25$  in.
- B. Height Target  $\pm 0.25$  in.
- C. Squareness No more than 0.25 in. difference between the two diagonals
- D. Waviness  $\pm 0.25$  in. out of flat

**Hardware, Torque Setting:**

- A. Bolts will be tested to confirm a torque of at least 30 ft.-lbs.
- B. Bolts will be fully engaged (no exposed threads).
- C. Bolts will not be cross threaded.

**Other Criteria:**

- A. When assembled, film is not under gasket.
- B. Gasket is installed to the full length, less up to ¼ in. at each end, of the U channel section in which the sheet edge resides.
- C. Hardware (when applicable) is coated to match.
- D. Coating (where applicable) is not damaged or flaking.
- E. Touch-up coating (where applicable) is available for inclusion with shipment.
- F. Transparent Noise Wall bottom panels will be cast or trimmed to closely match the grade of the top of the existing concrete noise wall. Where necessary, gaps no greater than those left by an 8 ft. long level line will be allowed between the top of the existing concrete noise wall and the bottom of the Transparent Noise Wall and will be filled with approved filler.

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**3. CONSTRUCTION**

Install transparent noise barrier panels in accordance with PLANS, manufacturers' recommendations, approved fabrication/shop drawings, and as directed.

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**4. MEASUREMENT**

This Item will be measured by the square foot of the front surface area of the transparent noise barrier panels complete in place.

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**5. PAYMENT**

The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Transparent Noise Barrier Panels". This price will be full compensation for furnishing and installing all transparent noise barrier panels including framing, welding, fasteners, hardware, all labor, equipment, and incidentals necessary to complete the work.

**Appendix 1- Structural Aluminum Framing Assembly Requirements for Transparent Panels:****Framing members will:**

Consist of profile as approved by the Department unless otherwise defined and approved in the project design process.

Comply with the requirements of ASTM B221, Alloy-Temper 6061-T6.

Meet tolerances as defined by ANSI H35.2 – American National Standard Dimensional Tolerances for Aluminum Mill Products.

**Framing members (fabrication):****Welding**

Welds on the bottom surface of the bottom framing member will be ground flush.

Welding will comply with the requirements of AWS D1.2, Structural Welding Code – Aluminum. Visual inspection reports.

**Machining:**

Removal of U channel section on side framing members should result in a smooth, flush surface. Limit of +0 in., -0.030 in. is allowed only in the immediate area of the U channel.

**Gasket:**

EPDM gasket will use non migratory plasticizers, must be tested for compatibility with the transparent noise barrier panel.

**Fasteners & Hardware:**

Hex Head Bolts will be ½ in.-13 UNC 2A type 304/304L stainless steel conforming to ASTM A276. Washers will be ½ in. diameter type 304/304L or 316/316L stainless steel conforming to ASTM A276.

**Coating(when applicable):****Anodize**

Per AAMA 611-98-Voluntary Specification for Anodized Architectural Aluminum. Use a Class I anodized finish (requires minimum coating thickness of 0.7 mil).

**PowderCoat:**

1. Solvent Clean per SSPC-SP1
2. Abrasive blast per SSPC-SP10 using aluminum oxide to produce a 1–2mil profile.
3. Apply powder coating electrostatically using a Gema EZ Selector equivalent.
4. Cure powder per powder manufacturers' recommendations.
5. Perform cross hatch adhesion test in accordance with ASTM D3359.

**Paint (aluminum):**

1. Surface Preparation–Solvent Clean per SSPC-SP1
2. Surface Preparation – Abrasive blast per SSPC-SP7 brush blast cleaning with DuPont Starblast non- metallic fine abrasive or equivalent.
3. Apply 1 sealer coat of CarboCoat 120 water based bonding primer, or equivalent, thickness 1-2 mils.
4. Apply 1 finish coat of Carboline 133hb polyurethane, or equivalent, thickness 3-5 mils. Color to be specified.

5. Perform crosshatch adhesion test in accordance with ASTM D3359.

**Documentation Requirements:**

Prior to the shipment of any panels, the assigned fabricator will provide a letter stating that the panels have been completed in accordance with the Specifications of this item. This letter will be sent with the required certifications and test reports as specified in this Item.

**Typical documentation required of the assigned fabricator include:**

- A. Aluminum Profile–Certification to ASTM B 221, Alloy-Temper 6061-T6.
- B. Aluminum Bar–Certification to ASTM B 209, Alloy-Temper 6061-T6.
- C. Hardware–Certificate of test to ASTM A276.
- D. Welding–Visual inspection reports per AWS D1.2.
- E. Machining–Framing Members (fabrication) of Appendix 1.
- F. Final Product–Inspection report to verify requirements per Assembled Panels.

**Appendix 2–Structural Steel Framing Assembly Requirements for Transparent panels:**

**Framing members will:**

Consist of profile as approved by the Department unless otherwise defined and approved in the project design process.

Comply with the requirements of AASHTO M270 (ASTM A709) Grade 50.

**Framing members (fabrication):**

**Welding**

Welding will comply with the requirements of ANSI / AASHTO / AWS D1.1, Structural Welding Code-Steel.

Visual inspection Reports

**Machining:**

Where machining is required, machine/ surfaces must be true to adjacent surfaces within tolerance of +0 in., -0.030 in.

**Gasket:**

EPDM gasket will use non migratory plasticizers, must be tested by compatibility with the transparent noise barrier panel.

**Fasteners & Hardware:**

Hex Head Bolts must be 1/2" ASTM A325 galvanized steel conforming to ASTM A123 or A153.

Washers must be 1/2" diameter galvanized steel conforming to ASTM A325.

**Coating:**

Galvanization and painting of steel.

All steel and hardware must be hot dip galvanized per TX DOT Item 445, Galvanizing.

When called for on the plans, paint galvanized steel per Item 445.3.2, painting galvanized material. Provide paint system in accordance with DMS-8102, color as specified in the plans.

**Documentation Requirements:**

Prior to the shipment of any panels, the assigned fabricator will provide a letter stating that the panels have been completed in accordance with the Specification of this Item. This letter will be sent with the required certifications and test reports as specified in this item.

**Typical documentation required of the assigned fabricator includes:**

- A. Welding- Visual inspection reports per AWS D1.1.
- B. Steel Profile- Certification to AASHTO M270 (ASTM A709) Grade 50.
- C. Steel Bar- Certification to AASHTO M270 (ASTM A709) Grade 50.
- D. Machining-Framing Members (fabrication) of Appendix 2.
- E. Final Product- Inspection report to verify requirements per Assembled Panels.