

Special Specification 4086

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
- D 638 – Standard Test Method for Tensile Properties of Plastic
- D 785 – Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
- D 790 – Standard Test Methods 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
- D 1929 – 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
- E 413 – Classification for Rating Sound Insulation
- E 1996 – Standard Specifications 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
- EN 1794 – 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, comply 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 sheet installation and connection details, and stamped by a professional engineer registered in the applicable state.

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 to the Department's Representative for approval.

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

Color: Unless otherwise specified, the transparent noise barrier will be transparent in which light passes.

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.

Performance Characteristics: The transparent noise barrier 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	D 638
Flexural Modulus	>445,000 psi	D 790
Rockwell Hardness	M-90	D 785
STC	>27	E 90 / E 413

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

TABLE 2
Optical Requirements

PROPERTY	REQUIREMENT	ASTM Test Method
Light transmission	> 90%	D 1003
Haze	< 1.5%	D 1003
Yellowness Index	< 1	D 1003

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%	D 1003
Haze	< 10%	D 1003
Yellowness Index	< 5	D 1003
Tensile strength	> 75% of initial value	D 638
Flexural strength	> 75% of initial value	D 790

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	EN 1794-2
Horizontal burn rate	< 2.5 in/min	ASTM D 635
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 E 1996.

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

When a load factor of 1.5 is applied to the design wind load:

- A. The sheet will not show any symptoms of failure such as buckling or cracks.
- B. 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.

Appendix 1 – Transparent Panel Assembly Requirements:

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 (where 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).

Powder Coat:

1. Solvent Clean per SSPC-SP1
2. Abrasive blast per SSPC-SP10 using aluminum oxide to produce a 1 – 2 mil profile.
3. Apply powder coating electrostatically using a Gema EZ Select or equivalent.
4. Cure powder per powder manufacturers' recommendations.
5. Perform crosshatch 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.

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 ± 0.25 in.
- B. Height Target ± 0.25 in.
- C. Squareness No more than 0.25 in. difference between the two diagonals
- D. Waviness ± 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 $\frac{1}{4}$ 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.

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 B221, Alloy-Temper 6061-T6.
- B. Aluminum Bar – Certification to ASTM B209, 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 of Appendix 1.

3.**METHODS**

Install transparent noise barrier panels in accordance with manufacturers' recommendations or as directed.

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.

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.