

ITEM 607.9202 09 – TRANSPARENT ACRYLIC NOISE BARRIER SYSTEM

DESCRIPTION

This work shall consist of furnishing and installing a transparent acrylic noise barrier system as shown in the contract documents and as directed by the Engineer.

MATERIALS

The following ASTM Standards shall apply:

Standard Specification for Stainless Steel Bars and Shapes	A 276
Standard Specification for Aluminum and Aluminum –Alloy Extruded Bars, Rods, Wire, Profiles and Tubes	B 221
Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments	B244
Standard Test Method for Index of Refraction of Transparent Organic Plastics	D 542
Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs	F593
Standard Specification for Stainless Steel Nuts	F594
Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position	D 635
Standard Test Method for Tensile Properties of Plastic	D 638
Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials	D 785
Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials	D 790
Standard Test Methods for Density and Specific Gravity (Relative Density of Plastics by Displacement)	D792
Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics	D 1003
Standard Test Method for Determining Ignition Temperature of Plastics	D 1929
Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics	D 2843
Standard Test Methods for Measuring Adhesion by Tape Test	D 3359
Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates	E 313
Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements	E 90
Classification for Rating Sound Insulation	E 413
Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials	G 155

The following standards shall also apply:

LRFD Bridge Design Specifications	AASHTO LRFD
Safety Glazing Materials Used in Buildings - Safety Performance	ANSI Z97.1

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Specifications and Methods of Test	
American National Standard Dimensional Tolerances for Aluminum Mill Products	ANSI H35.2
Road Traffic Noise Reducing Devices – Non Acoustic Performance	
Part 1 – Mechanical Performance and Stability Requirements	EN 1794-1
Part 2 – General Safety and Environmental Requirements	EN 1794-2
Structural Welding Code - Aluminum.	AWS D1.2
Voluntary Specification for Anodized Architectural Aluminum	AAMA 611
Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings	AAMA 2604

The design of the transparent acrylic noise barrier system components shall conform to the latest edition of NYSDOT LRFD Bridge Design Specification.

The transparent acrylic noise barrier system includes:

- a transparent acrylic panel,
- an aluminum frame and
- associated hardware.

Together, the aluminum frame, associated hardware and transparent acrylic panel comprise the **transparent acrylic noise barrier panel assembly**. The manufacturer of the transparent acrylic panel shall also provide the aluminum frame and associated hardware. All details of the transparent acrylic panel assembly will be included in shop drawings and submitted for approval.

Product Samples:

The Contractor shall submit, for approval, product samples of the transparent acrylic noise barrier system, including acrylic panel, aluminum framing, associated hardware and any other materials (as requested) required to furnish and install the transparent acrylic noise barrier system under this specification. No materials can be ordered until samples are submitted and approved.

Shop Drawings:

Shop drawings shall be provided by the Contractor and approved before beginning any work related to the transparent acrylic noise barrier system. The shop drawings shall include design calculations and detail all relevant aspects of the acrylic panel installation, including connections. The shop drawings shall be stamped by a professional engineer who is licensed and registered in the State of New York.

Transparent Acrylic Noise Barrier Panels:

The transparent acrylic noise barrier panels shall:

- be a rigid monolithic sheet,
- meet the material requirements described in this specification, and
- be supplied by one of the following manufacturers:

Acrylite[®] Soundstop
as manufactured by Evonik Cyro L.L.C
299 Jefferson Road
Parsippany, NJ 07054
1-800-631-5384
www.acrylite.net

Optix[®]
as manufactured by Plaskolite, Inc
P.O Box 1497
Columbus, OH 43216
1-800-848-9124
www.plaskolite.com

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or equal as approved by the Engineer

Color: The transparent noise barrier shall be colorless.

Dimensions: Dimensions of the transparent noise barrier panel shall be specified by the applicable drawings. Unless otherwise specified, the tolerance on length and width dimensions shall be $-0, + 3$ mm (0.125 in).

Performance Characteristics: The transparent noise barrier shall meet the performance requirements of Table 1 when tested in accordance with the associated ASTM standard.

TABLE 1 Performance Requirements

PROPERTY	REQUIREMENT	Test Method
Specific Gravity	1.18 – 1.20	ASTM D792 (Test Method A)
Tensile Strength	> 62 MPa	ASTM D 638
Modulus of Elasticity	> 3065 MPa	ASTM D 790
Rockwell Hardness	> M-90	ASTM D 785
STC (Sound Transmission Class)	> 27	ASTM E 90 / E 413
Impact Resistance	Meets requirements	EN 1794-1
Safety Glazing	Meets requirements	ANSI Z97.1

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

TABLE 2 Optical Requirements

PROPERTY	REQUIREMENT	Test Method
Light Transmission Total	> 90%	ASTM D 1003
Light Transmission Haze	< 2%	ASTM D 1003
Yellowness Index	< 1	ASTM E 313
Refractive Index	1.48 – 1.50	ASTM D542 (Refractometric Method)

Resistance to Weathering: After exposure to outdoor weathering for a period of ten (10) years or accelerated weathering in accordance with ASTM G155 (or ZTV-Lsw 06), cycle 1 at a minimum, for a period of 10,000 hours, the noise barrier panel shall show no evidence of cracking or crazing and shall comply with the requirements of Table 3. Manufacturer must be able to furnish test reports showing compliance with the requirements of Table 3.

TABLE 3 Weathering Requirements

PROPERTY	REQUIREMENT	Test Method
Light Transmission	> 90% of initial value	ASTM D 1003
Yellowness Index	< 8	ASTM E 313

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Fire Resistance: The noise barrier shall 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 2	EN 1794-2
Horizontal burn rate	< 63.5 mm/min	ASTM D 635
Smoke density	< 75%	ASTM D 2843
Self ignition temperature	> 343°C	ASTM D 1929

Shatter Resistance: When the panel 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 panel shall be required to retain all broken pieces by employing either an internal or external restraint system. Supplier shall show evidence of ability for panels to retain all broken pieces after ten or more years of outdoor exposure.

Graffiti Resistance: The transparent acrylic panel shall be resistant to graffiti. The Manufacturer, through the Contractor, shall recommend an effective, compatible graffiti remover and upon request furnish a product sample and provide a graffiti removal demonstration.

Bird Deterrence: A bird deterrence feature shall be included on all panels. The panels shall have a pattern capable of minimizing bird impacts. The bird deterring pattern must be an integral part of the panel, capable of withstanding graffiti removal efforts. Application of patterns, via films or any other method, in a secondary, post production process is not allowed.

Wind Load Resistance: The maximum elastic deflection d_{max} , under the design wind load shall be less than 760 mm.

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

- The sheet shall not show any symptoms of failure such as buckling or cracks.
- The sheet shall not become detached from its supports or fittings.

Resistance to Roadside Chemicals: The transparent noise barrier shall be resistant to standard de-ice chemicals such as: Calcium Chloride, Magnesium Chloride, Potassium Acetate, Calcium/Magnesium Acetate, and Sodium Acetate.

Aluminum Framing:

Aluminum shall comply with the requirements of ASTM B221 and be of grade 6061-T6. Framing members shall meet tolerances as defined by ANSI H35.2-2006 - American National Standard Dimensional Tolerances for Aluminum Mill Products.

Welding:

For frame designs where welding is required:

- Welds on the bottom surface of the bottom framing member shall be ground flush.
- Welding shall comply with the requirements of AWS D1.2, Structural Welding Code - Aluminum.
- Visual inspection reports required.

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Machining:

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

Gasket:

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

Fasteners & Hardware:

All hardware shall be as specified in the contract documents and/or shop drawings.

Bolts shall conform to ASTM F593. Nuts shall conform to ASTM F594. Bolts and nuts shall be constructed of type 304/304L stainless steel conforming to ASTM A276.

Washers shall be constructed of 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 Aluminium

Use a Class I anodized finish (requires minimum coating thickness of 0.7 mil).

Anodizer shall perform and document oxide coating thickness in accordance with ASTM B244 for each process batch.

Transparent Acrylic Panel Assemblies:

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

<u>Dimensions</u>	<u>Assembled Panels</u>
Length	Target \pm 6 mm
Height	Target \pm 6 mm
Squareness	No more than 6 mm " difference between the two diagonals
Waviness	\pm 6 mm out of flat

Hardware, Torque Setting:

Bolts shall be tested to confirm a torque of at least 40 newton meter.

Bolts shall be fully engaged (no exposed threads).

Bolts shall not be cross threaded.

Other Criteria:

- When assembled, film is not under gasket.
- Gasket is installed to the full length, less up to 6 mm at each end, of the U channel section in which the sheet edge resides.
- Hardware (when applicable) is coated to match.
- Coating (where applicable) is not damaged or flaking.

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- Touch-up coating (where applicable) is available for inclusion with shipment.

Documentation Requirements:

Prior to the shipment of any panels, the assigned fabricator shall provide a letter stating that the panels have been manufactured in accordance with and comply with this specification, including all ASTM certifications, ANSI specifications and EN 1794 including but not limited to:

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|-------------------------------|---|
| a. Transparent Acrylic Panels | All applicable ASTM certifications, EN 1794, and ANSI Z97.1, demonstrating and self-certify compliance with specification requirements supplied upon request. |
| b. Aluminium Profile | Certification to ASTM B221, Grade 6061-T6. |
| c. Aluminium Bar | Certification to ASTM B221, Grade 6061-T6. |
| d. Hardware | Certificate of test to ASTM F593, F594 and A276. |
| e. Coatings | Documentation of cross hatch test & certifications as required (ASTM A3359. Test Method B, adhesion rating of 5B and ASTM B244). |
| f. Welding | Visual inspection reports per AWS D1.2. |
| g. Machining | Inspection report to verify requirements as listed above |
| h. Final Product | Inspection report to verify requirements as listed above |

CONSTRUCTION DETAILS

The Contractor shall install transparent acrylic noise barrier system in accordance with the contract documents, and manufacturer's instructions. Use manufacturers suggested material and techniques to prevent noise leaks (i.e., gaps, spaces, or holes capable of allowing light to pass from one side of the barrier to the other) between all joints within the noise barrier system and between the transparent acrylic panel assemblies and the columns.

Repair or replace any transparent acrylic noise barrier system components damaged during transportation or installation at no cost to the Department.

METHOD OF MEASUREMENT

This work will be measured as the number of square meters of transparent acrylic noise barrier system furnished and installed measured from the top to the bottom of each wall panel and from center to center of each post.

Only one side of the proposed wall will be measured for payment. No additional payment will be made for the canted panels.

No payment will be made for the portion of the post caps (all types) that extend above the top of the wall elevation.

BASIS OF PAYMENT

The unit price bid per square meter of transparent acrylic noise barrier system shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.