



**SPECIAL PROVISIONS
FOR
TL4 NOISE BARRIER SYSTEM**

**Effective Date
September 15, 2015**

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

120357.01 DESCRIPTION.

This work shall consist of furnishing materials, services, labor, tools, equipment and incidentals necessary to design, fabricate, inspect, test, certify and install the Armtec / Evonik Cyro LLC Acrylite Soundstop TL-4 System with NT CC Noise Barrier Sheet. Additionally, this work will consist of the detailing and submittal of calculations and drawings for the steel framing and anchorage members, as well as the fabrication drawings for the noise barrier sheet members. The Contractor's engineer shall design and detail the wall system to meet or exceed these minimum requirements.

This specification covers the minimum certification requirements of a crash worthy noise barrier or vandal barrier system for use on bridges and structures.

The specification provides minimum performance criteria for quality, reliability, longevity and safety.

A. Referenced ASTM Standards.

1. A 36 – Standard Specification for Carbon Structural Steel
2. A 123 – Standard Specification for Zinc (Hot Dipped Galvanized) on Iron and Steel Products
3. A 153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
5. A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
6. A 500 – Standard Specification for Steel Structural Tubing in Rounds and Shapes
7. A 709 – Standard Specification for Structural Steel Shapes, Plates and Bars
8. E 90 – Standard Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions

9. E 413 - Standard Classification for Determination of Sound Transmission Class
10. G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials
11. NCHRP Report 350 – National Cooperative Highway Research Program report relating to roadside safety criteria and validation.

B. Other Standards.

1. ANSI Standard Z97.1 – Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test
2. EN 1794-1 – Test for Resistance Against Damage by Stone Projectiles
3. EN 1794-2 – Test Method for Resistance to Brushwood Fire
4. EN 1794-2 – Secondary Safety: Danger from Falling Debris

120357.02 MATERIALS.

All components of the system shall meet the requirements of this specification.

A. Noise Barrier System Requirements.

1. The noise barrier system shall comply with all requirements of this specification and shall be listed on the applicable qualified products list. Manufacturers/suppliers shall have a minimum 5 year history of providing products that meet this specification.
2. The manufacturer shall provide facilities and qualified personnel to perform all specification tests and maintain an acceptable quality control program. An acceptable program is one that meets the requirements of QS 9000 and ISO 9002. To ensure total quality, all manufacturers shall provide proof of compliance for the production of noise barrier panels.
3. Manufacturers must have a minimum 5 year history of producing transparent noise barrier assemblies for highway noise barriers.
4. The System shall be capable of sustaining one collision up to the level specified in the NCHRP 350, Test Level 4 without being separated from the bridge railing or structure to which it has been properly attached under this specification.
5. The vendor shall provide a letter from a certified crash test facility indicating a physical crash test was conducted on the system and recommending acceptance by FHWA. The vendor shall be able to provide visual evidence of such crash test upon the request of the Contracting Authority.
6. The overall system shall be built in accordance with best engineering practices. The incremental total weight of the system as installed shall not exceed 30 pounds per square foot.
7. For noise barrier retrofit onto existing bridges, provide the service and applicable factored strength limit state design forces transmitted to the existing structure for review by the Engineer.

8. The system shall be attached to an approved crash-worthy concrete barrier with a minimum height of 32 inches.
9. Epoxyed anchor bolts shall be embedded 7 1/2 inches (minimum) into the concrete barrier following manufacturer's installation instructions. Final details will be as approved on manufacturers shop drawings.

B. Noise Barrier Panel.

1. The noise barrier panel shall be the NT CC noise barrier sheet, non-transparent light grey (No. 7N20).
2. Dimensions of the noise barrier panel shall be specified by the applicable drawings. Unless otherwise specified, the tolerance on length and width dimensions for the panel shall be -0 to +0.125 inch.
3. Height of the system will be specified in applicable project plans.
4. Panels will provide a noise insertion loss or STC, of no less than 27 dBA when tested under test method ASTM E90. The vendor shall supply a test report from a certified test laboratory.
5. Noise barrier panels that are installed in proximity to the travel lanes may be exposed to damage due to vehicle collision. In order to provide for the safety of the transportation system, such noise barrier panels will have the capability to contain fragments in the event that the panel is broken during the collision.

The noise barrier panel shall be secured in such a way that the fragments do not fall when they are deformed or broken.

After an impact of 53 kips in accordance with the test method below, those fragments that are released from the noise barrier panel shall meet the following requirements:

- a. Pieces of test specimen that are released shall be no larger than 4.0 square inches and shall weigh no more than 0.22 pounds.
- b. Pieces of test specimen that are released shall be no longer than 6 inches.
- c. Rigid pieces of the test specimen that are released shall have no angle of less than 15 degrees and shall weigh no more than 0.22 pounds.
- d. No pieces shall weigh more than 0.88 pounds.

These criteria shall only apply for one collision incident.

C. Test Method.

1. The noise barrier panel shall be tested by either EN 1794-2 Annex B, "Secondary Safety: Danger of Falling Debris" or the following test method.

The method of testing is to cause a heavy mass to strike normally to the center or the most sensitive point of the test specimen so that the specimen is destroyed or pushed out of the holding structure.

A pendulum shall produce the impact. The impactor shall swing on two wires fixed on two points above the structure holding the test sample as shown in Figure 2. In order to reach the impact energy of 53 kips, the height of the fall of the impactor shall be 5 feet, corresponding to a speed of 12.2 mph. The radius of the pendulum shall be a minimum of 13 feet.

2. The impactor consists of a rotational symmetrical full steel double cone with the dimensions shown in Figure A-1 and a weight of 880 pounds.
3. The test specimen shall be assembled in the supporting structure in the way intended by the manufacturer. Elements or systems with integrated or attached restraint systems shall be tested as complete assemblies.
4. In order to withstand impacts of stones thrown up from the road surface the noise barrier panel shall meet the requirements of EN 1794-1, Appendix C.

D. Resistance to Roadside Chemicals.

1. The noise barrier panel shall be resistant to standard de-ice chemicals such as: calcium chloride, magnesium chloride, potassium acetate, calcium/magnesium acetate and sodium acetate.
2. Supplier shall show documentation of the chemical resistance properties of the panels. Panels should be able to withstand direct exposure to the chemical for a period of not less than 24 hours. Panels should be exposed to the chemicals at 100% (undiluted) strength.

E. Structural Steel.

1. Steel components and hardware shall be galvanized finish.
2. Unless noted otherwise, all steel members and hardware shall be in accordance with Article 4155.02 of the Standard Specifications.
3. Welding materials shall be in accordance with AWS D1.1. Welders will be certified in accordance with AWS D1.1.
4. Provisions for expansion shall be placed in the noise barrier at locations of bridge deck expansion joints and at parapet deflection joints.

Provisions for expansion shall be placed within the noise barrier system to allow for expansion of the noise barrier panels.

5. The leading and trailing edge of the noise barrier shall incorporate sloped crash-rails to mitigate the severity of the impact of an errant vehicle. When the noise barrier is installed on a travelled way with a center median then only the leading edge of the noise barrier shall incorporate this sloped transition section.

F. Shop Drawings.

The manufacturer of the barrier system shall submit shop drawings, detailing all components of the barrier system including connections to bridge parapet with supporting calculations. Calculations shall include the dead load and wind load design forces transmitted to the existing structure (at the anchorage locations) at the service limit state (unfactored). Drawings and calculations shall be sealed by a Professional Engineer licensed in the State of Iowa.

G. Approved Supplier.

1. Armtec, 1-866-801-0999, 1-860-873-1737, eric.humphries@armtec.com
2. Approved equal.

120357.04 CONSTRUCTION.

Construct wall system in accordance with specifications, and notes and details shown in plans.

120357.04 METHOD OF MEASUREMENT.

TL-4 Noise Barrier System will be measured by the square foot on the outside surface of the completed Noise Barrier. Measurement will be based from the top of the barrier to the top of sheet, multiplied by the length of the wall. The length of the wall for calculation of wall area shall be measured between the centerline of anchorages at each end of the wall.

120357.05 BASIS OF PAYMENT.

The contract unit price per square foot for TL-4 Noise Barrier System will be full and complete payment for all materials, tools, equipment, inspection, services, storage, design and detailing of all members and submittals of items as specified, and incidentals necessary to furnish and install the TL-4 Noise Barrier System as shown in the plans, as specified herein, and as directed by the Engineer.