620-R-483 SOUND BARRIER SYSTEMS

(Revised 08-20-26)

The Standard Specifications are revised as follows:

SECTION 620, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 620 – ~~BLANK~~ *SOUND BARRIER SYSTEMS*

620.01 Description

This work shall consist of furnishing materials and placement of a sound barrier system and a coping in accordance with 105.03.

620.02 General Design Requirements

The sound barrier system shall be either wall mounted, bridge mounted or ground mounted, and shall consist of wall attachments or post foundations, vertical support posts, and sound barrier panels. For the purposes of this section, "panel" is defined as the reflective or absorptive component mounted between the posts, piers or columns.

All appurtenances behind, in front of, under, over, mounted upon, or passing through the wall, including drainage structures, fire hydrant access openings, highway signage, emergency access openings, utilities or other appurtenances shown on the plans, shall be accounted for in the design of the sound barrier system.

If the sound barrier manufacturer needs additional information to complete the design, the Contractor shall be responsible for obtaining such information. The Contractor shall be responsible for field verifying wall locations in areas of all existing traffic poles, utility poles, roadway lighting poles, drainage pipes, underdrain outlets, and bridge expansion joints and all other locations where the sound barrier system may conflict with existing conditions. The wall shall be realigned and designed to box out openings where conflicts occur with existing light poles and traffic control devices. The Contractor shall establish and account for the existing locations of all underdrain outlets, drainage pipes, and bridge expansion joints in the final wall plans. If the Contractor discovers that overhead utilities will be within 6 ft of the sound barrier, the Contractor shall notify the Engineer in accordance with 104.02 and 105.16.

The sound barrier wall design shall follow the general dimensions of the wall envelope as shown on the plans. The top of the sound barrier shall be at or above the acoustical profile line shown, unless noted. Changes in elevation shall be accomplished by stepping the sound barrier sections at the vertical support posts. Steps shall not exceed 3 ft vertically unless otherwise specified in the plans. Barrier heights shall be selected in groups of no fewer than three successive panels, except where barriers are to be stepped down for barrier termination. The ends of the sound barrier shall be tapered or stepped down to a height of 8 ft within the sound barrier end transitions or as shown on the plans. The bottom of ground mounted sound barrier shall be embedded a minimum of 6 in. into the ground. The bottom of wall mounted or bridge mounted sound barrier shall follow within 3 in. a profile 6 in. below the top of the existing concrete barrier railing or wall.

Caisson footings, vertical support posts, and connections for ground mounted sound barrier shall be designed as specified by the manufacturer, with minimum post

spacing of 15 ft. Exceptions will be allowed due to site-specific conditions such as access doors, drainage requirements or utility accommodations. These shall be reviewed and approved through the working drawing process. The foundation design shall use the COM 624P or LPILE Program. The foundation design shall be based on the soil model shown on the plans based on cyclic loading and shall consider the effects of a sloping ground surface. The post deflection shall be limited to L/100, measured from the top of the caisson to the top of the wall. The foundation depth shall not be less than 7 1/2 ft and shall not exceed the depth of the soil model except where the Contractor elects to drill deeper borings to extend the model. The foundation diameter shall not be less than 18 in. and shall not be less than 6 in. larger than the diagonal dimension of the post being used. The foundation shall be designed by the sound barrier manufacturer. Vertical support posts shall be attached to caisson footings by means of anchor bolts, or embedded wide flange steel posts.

A sound barrier system shall be selected for the type specified from those which are on the QPL of Sound Barrier Systems. The materials used in the fabrication of the sound barrier system shall be the same as those used for qualification of the sound barrier system. Sound Barrier Systems may be considered for addition to the QPL by completing the requirements of ITM 806, Procedure N.

The structural design of the sound barrier system shall be in accordance with the AASHTO LRFD Bridge Design Specifications, except as otherwise directed.

The post spacing for sound barriers mounted on any structure or safety barrier shall be limited to a distance that does not overstress the structure or safety barrier. The spacing shall also be limited to a distance that allows the sound barrier to conform to the existing horizontal and vertical alignments. The allowable loads on a structure or barrier shall be as shown on the plans. If no allowable loads are shown, the allowable loads on a sound barrier shall be in accordance with the AASHTO LRFD Bridge Design Specifications.

When sound barriers are to be installed on a bridge structure, design calculations shall be submitted to the Engineer that demonstrate structure loading limits will not be exceeded.

All materials shall have a minimum predicted maintenance free structural and acoustical lifespan of 20 years. All colorings and coatings shall have a minimum predicted maintenance free lifespan of 10 years.

The types of acoustic sound barrier systems that are accepted are as follows:

Type 1, single sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.70 on the roadway side. Type 1 sound barrier systems shall be tested in accordance with ASTM C423. Material samples for this test shall be provided with the coating applied, so as to determine that the color coating does not inhibit the acoustic performance. The sample shall be

mounted in accordance with ASTM E795, Type A.

Type 2, double-sided absorptive, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E90. Type 2 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.70 on the roadway and non-roadway sides. Type 2 sound barrier systems shall be tested in accordance with ASTM C423. To determine that the color coating does not inhibit the acoustic performance, material samples for this test shall be provided with the coating applied. The sample shall be mounted in accordance with ASTM E795, Type A.

Type 3, reflective, sound barrier systems and their components shall be designed to achieve a sound transmission loss equal to or greater than 20 decibels at all frequencies when tested in accordance with ASTM E90.

A Type 2 barrier system may be substituted for a Type 1 barrier system at the Contractor's discretion. A Type 1 or a Type 2 barrier system may be substituted, with written approval, for a Type 3 barrier system.

All molded finishes shall have a 1 in. minimum relief. All rolled finishes shall have a minimum 3/4 in. relief. Relief is defined by material that is provided in excess of the minimum wall thickness required to meet the Noise Reduction Coefficient required for the absorptive surfaces. Fluted finishes shall be coped at each end to avoid cracking.

Corrugations, ribs, or battens on sound barrier panels shall be oriented vertically when erected. The sound barrier shall be designed to prevent entrapment and ponding of water. The sound barrier shall not be designed with openings promoting the perching or nesting of birds, or the collection of dirt, debris, or water. The sound barrier shall not be designed with hand holds or grips promoting scaling or climbing of the system.

When shown on the plans, fire hydrant access points shall be included in the sound barrier and designed with additional reinforcement or bracing and protective coating around the opening as necessary to maintain structural integrity.

Closure plates shall be provided where new sound barrier is constructed adjacent to existing sound barrier. Where bridge mounted walls cross over expansion joints, expansion closure plates shall be used. The wall manufacturer shall provide expansion closure plates for each expansion joint unless directed otherwise. The minimum thickness of closure plates shall be 3/16 in.

The calculations for sound barriers which also retain earth shall show that the walls are adequate for earth retention. The earth retention areas shall be shown on the plans. The exposed face of the sound barrier earth retaining panel shall match the adjacent panel's color and texture.

(a) Precast Panel Design Criteria

Base-plated or embedded reinforced precast concrete posts may be substituted for wide flanged steel posts with the approval of the Department. Proposed substitutions for

wide flanged steel posts shall be shown on working drawings submitted for approval.

Support posts shall match the adjoining wall in color unless directed by the Engineer. Embedded reinforced precast concrete posts shall also match the adjoining wall in texture. Sound barrier systems utilizing stacked panels shall have ship-lapped or tongue and groove horizontal joints or other approved design which blocks the passage of light.

(b) Masonry Design Criteria

Reinforced masonry vertical support posts shall be faced to match the adjoining wall in color and texture unless directed by the Engineer.

Steel support posts shall match the adjoining wall in color unless directed by the Engineer.

620.03 Submittals

The Contractor shall submit a minimum of three alternative textured finishes for the wall to the Engineer. These shall include the following colors:

(a) light gray (SAE-AMS-STD-595A, color No. 36492),
(b) light brown (SAE-AMS-STD-595A, color No. 30450),
(c) light tan (SAE-AMS-STD-595A, color No. 37769).

The colors will be presented to the public for their input in accordance with 620.05. The final wall pattern and color will be approved before production of the wall panels may begin.

The Contractor shall submit design calculations in accordance with 105.02. Calculations for sound barriers on bridge structures shall include an analysis of the bridge structure that demonstrates the additional loads imposed by the sound barrier, in accordance with the AASHTO LRFD Bridge Design Specifications, will not exceed the structural capacity of the bridge. The Contractor shall submit working drawings in accordance with 105.02 after design calculations are approved and before beginning wall construction operations. Design calculations and working drawings shall meet the following minimum requirements:

(a) Design calculations shall include all structural design calculations and vertical support post design calculations.

(b) Design calculations for bridge mounted installations shall include the design unit weight and mass of the sound barrier and support systems.

(c) Design calculations for bridge mounted installations shall demonstrate that the structural loading limits of the structure will not be exceeded.

(d) Working drawings shall include all details, dimensions, quantities, and cross-sections necessary to construct the sound barrier systems and shall include but not be limited to the following:

1. *A plan and elevation sheet or sheets for each sound barrier systems location.*

2. *An elevation view of the sound barrier systems which shall include the elevation at the top of the wall at all horizontal and vertical break points at least every 50 ft along the face of the wall.*

3. *A plan view of the wall that indicates the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment. A plan view and elevation view which detail the placing position.*

4. *A typical cross-section or cross-sections showing elevation relationship between ground conditions and the sound barrier systems locations.*

5. *All general notes required for constructing the wall.*

6. *Each sheet shall show the complete project identification number.*

7. *All horizontal and vertical curve data affecting the wall.*

8. *A listing of the summary of quantities on the elevation sheet for each wall.*

9. *A list of manufacturer's recommendations with respect to maintenance, including repair of graffiti and other damages.*

10. *Typical sections, connection details, and elevation views for bridge mounted installations.*

(e) Working drawings shall include a detailed plan of aesthetic treatment for the entire sound barrier system, manufacturer-recommended installation requirements and sequence of construction, manufacturer-recommended repair requirements for damage caused by vandalism or graffiti prior to final acceptance, and a detailed bill of materials.

MATERIALS

620.04 Materials

Materials shall be in accordance with the following:

Cast-in-Place Portland Cement Concrete, Class A	*702*
Coarse Aggregate, Class A or Higher, Size No. 91	*904.03*
Coarse Aggregate, Class D or Higher, Size No. 2	*904.03*
Concrete Masonry Units	*905.06*
Fine Aggregate, Size No. 23	*904.02*
Joint Mortar	*901.08, 907.12*
Coatings for Metal	*909.02*

Portland Cement ..... 901.01(b)
Precast Concrete 707
Reinforcing Bars 910.01
Structural Aluminum Posts ..... 910.14(d)
Structural Steel 910
Water 913.01

Structural steel components shall be either uncoated steel or galvanized steel. All coating system components shall be from the same manufacturer, and the color of the finish coat shall be one of the colors listed below, as directed by the Engineer.

When uncoated steel components are provided, they shall be coated with the structural steel coating system in accordance with 619.09(a), 619.11, and 619.12, with the exception that the finish coat shall be a sound barrier post coating from the Department's QPL of Coating Formulations and in accordance with 909.02(e)2.

When galvanized steel components are provided, they shall be hot dipped in accordance with ASTM A123, coating grade 100, and then all exposed steel shall be coated in accordance with 619.09(b) with the exception that the finish coat shall be a sound barrier post coating from the Department's QPL of Coating Formulations and in accordance with 909.02(e)2. In lieu of using the system specified in 619.09(b), two 3-mil coats of a sound barrier post coating from the Department's QPL of Coating Formulations, and in accordance with 909.02(e)2, may be used. Exposed surfaces of galvanized components shall be prepared using a light brush-off blast cleaning in accordance with SSPC-SP16. The surface profile shall be 15 to 30 microns in accordance with ASTM D4417, prior to coating.

The color of the dried film shall match the color of the sound barrier panels:

(a) light gray (SAE-AMS-STD-595A, color No. 26492),
(b) light brown (SAE-AMS-STD-595A, color No. 20450),
(c) light tan (SAE-AMS-STD-595A, color No. 27769),
unless otherwise shown on the plans.

All structural steel hardware shall be in accordance with ASTM F3125, Grade A 325 and shall be hot-dipped galvanized in accordance with ASTM F2329 or shall be made of nonferrous material or stainless steel. All other non-structural fastening devices shall be made of nonferrous metal or stainless steel. Plastic members shall be connected with either screws or bolts. Aluminum members shall be connected with stainless steel fasteners. Anchor bolts shall be of the size shown with a minimum of 10 in. of 7NC threads on the upper end. Anchor bolts shall be in accordance with ASTM F1554. The threads, nuts, and washers shall be galvanized in accordance with ASTM F2329 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM B695, Class 55.

Solid portland cement concrete or composite concrete shall be coated or contain an integral pigment, as specified by the manufacturer, and shall meet the specified color requirements. Integral pigment shall be certified to be in accordance with ASTM C979.

The coating shall be tested for accelerated weathering in accordance with ASTM D6695. The test panel substrate shall be of the same portland cement concrete or composite concrete material used in the sound barrier system component. Cured coating or integral pigment shall not contain heavy metals that exceed the requirements of 40 CFR 261.24.

Concrete Class A for the coping shall be in accordance with the applicable requirements of 702, except the coarse aggregate for pre-cast units may be size No. 91 in accordance with 904. Reinforcing steel in the coping shall be in accordance with the applicable requirements of 703. The coping may be precast or cast-in-place.

Masonry block shall be tested in accordance with ASTM C90 and as follows:

(a) The average compressive strength of three units shall be a minimum of 3,000 psi with no single unit being less than 2,700 psi.

(b) The units shall be tested for water absorption in accordance with ASTM C140. The maximum absorption shall be 7%.

(c) Joint reinforcement for masonry block systems shall be in accordance with ASTM A951.

(d) Mortar for masonry block systems shall be in accordance with ASTM C270, Type S, Table 2 proportion requirements.

(e) Portland cement-lime or mortar cement may be used. Masonry cement shall not be used. Grout for masonry shall be in accordance with ASTM C476.

(f) Aggregate for masonry grout shall be in accordance with ASTM C404.

Masonry blocks shall be coated or contain an integral pigment, as specified by the manufacturer, and shall meet the specified color requirements. The integral pigment shall be certified to be in accordance with ASTM C979. The coating shall be tested for accelerated weathering in accordance with ASTM D6695. The test panel substrate shall be of the same masonry blocks used in the sound barrier system component. Cured coating or integral pigment shall not contain heavy metals that exceed the requirements of 40 CFR 261.24.

Certifications shall be provided for each of the materials to be supplied for the sound barrier system. A Type C certification in accordance with 916 shall be provided for the sound barrier materials, unless otherwise noted. A Type A certification in accordance with 916 shall be provided for compressive strength and absorption test values for masonry block, sampled and tested in accordance with ASTM C140. All test reports required to substantiate compliance shall be in accordance with the test method/material requirements cited herein. A Department approved laboratory shall conduct the testing.

CONSTRUCTION REQUIREMENTS

620.05 Information for Public Input

Colored flyers with appropriate graphics shall be developed by the Contractor and furnished to the Department.

Wall color photos shall be provided for each color in accordance with 620.03 along with photos of each available texture alternative. A minimum of three wall samples of the non-roadway side textures shall be provided. All samples of the wall textures shall be a minimum of 3 sq ft in area, with a distinguishable pattern.

Based on comments received, the Department will select the final finishes and colors for each wall. Each wall shall have the selected color used throughout the entire wall on the roadway and the non-roadway sides. The Contractor shall coordinate all sound barrier wall issues with the Engineer prior to ordering any materials.

620.06 Construction Requirements

Sound barrier components shall not be stored on the right-of-way unless written permission is given by the Department. Requests for permission to store materials on the right-of-way will not be accepted until after the contract has been awarded.

The sound barrier supplier shall provide technical instruction, guidance in preconstruction activities including the preconstruction conference, and on-site technical assistance during construction. The Contractor is responsible for following installing instructions from the supplier unless otherwise directed in writing by the Engineer.

Clearing and grading shall be in accordance with 201 and 202 as required.

The foundations for ground mounted sound barrier systems shall be constructed as shown on the working drawings. Holes for footings shall be drained of free water prior to installing any components. Placing concrete shall be in accordance with 702.

The integrity of the sound barrier system continuity shall be such that no light will be visible through any vertical joint between sound barrier panel and vertical support post, through any horizontal joint between sound barrier panels, between the bottom of any ground mounted sound barrier and the adjacent ground, or between the bottom of any wall mounted sound barrier and the top of the adjacent wall. Exceptions may be allowed as necessary for drainage as indicated on the plans.

Sound barrier wall posts shall be placed vertical with a tolerance of 1/2 in. per 10 ft on each axis. Sound barrier wall posts shall be placed at the distance indicated on the plans with a tolerance of 1 in. from centerline to centerline. Sound barrier wall posts shall be aligned to within 1 in. when measured from a straight line from the two adjacent posts. Sound barrier wall posts shall be at the height as shown on the plans. The posts shall project above the top sound barrier wall panel by 1 1/2 in. ±1/2 in. The top of the sound barrier wall shall be at or above the acoustical profile. Steel posts embedded in concrete shall have bottom cover of 8 in. ±4 in. Field-cut steel posts shall be primed with an organic zinc primer and coated in accordance with 619.

After post erection the area shall be backfilled to within 6 in. of the required final grade or as specified in the plans. The aggregate pad shall be placed as required. Positive

drainage of the work area shall be maintained.

An aggregate pad of No. 2 coarse aggregate shall be included that extends 4 in. outside of each side of the panel and 4 in. below the bottom of the panel.

The sound barrier system and sound barrier system components shall be maintained until final acceptance. Elements of the sound barrier system that are damaged or destroyed, including due to graffiti or other vandalism, shall be repaired or replaced as directed by the Engineer. Repairs and repainting or recoating shall be conducted in accordance with the manufacturer's guidance and 620.02.

After construction of the sound barrier system the site shall be restored to the original condition with grading, seeding and sodding in accordance with the plans.

(a) Construction Requirements for Precast Panels

Sound barrier wall panels shall be placed in accordance with the plans and centered between adjacent posts. The sound barrier wall panels shall be of sufficient length to span the entire length between posts less 1/2 the width of the smallest retaining flange.

Panels may be field-cut to facilitate erection in accordance with the manufacturer's recommendation. Field-cut panels shall be cut to have the least impact on any patterns present in the textured or colored finish. Field-cut panels or other field cut components shall be painted or coated in accordance with the manufacturer's guidance.

(b) Construction Requirements for Masonry

All grouting and reinforcing work for masonry block systems shall be performed by masonry craftworkers holding current International Masonry Institute, IMI, Grouting and Reinforcing Certification. Proof of certification shall be submitted prior to the beginning of work.

620.07 Acceptance

The Contractor shall submit 2 ft by 2 ft sound barrier panel samples or five masonry block units in the colors and textures proposed and a 2 ft sample of coated support post, prior to the approval of the working plans. Once approved, these samples will be used as a control sample to verify delivered products meet the aesthetic requirements. The sound barrier system will be accepted for color based on a visual comparison between the control sample and the color of the wall as constructed in place.

The sound barrier system will be accepted for quality based on a visual inspection of the components of the system by the Engineer. The sound barrier system shall be subject to rejection due to failure to be in accordance with the requirements specified herein. In addition, the following defects may also be sufficient cause for rejection:

(a) Defects that indicate imperfect fabrication

(b) Defects in physical appearance such as cracks, checks, dents, scrapes, chips, stains, or color variations.

The Engineer will determine whether a defective sound barrier shall be repaired or shall be cause for rejection. Repair, if permitted, shall be completed by the Contractor and will be approved by the Engineer.

620.08 Method of Measurement

Sound barrier panels and sound barrier erection will be measured by the square foot of wall surface area. The pay quantity will be based on the limits of the sound barrier envelope as shown on the plans. The vertical and horizontal distance for each section of the wall defines the sound barrier envelope. The vertical distance extends from the elevation at the bottom of the lowest panel to the elevation of the acoustic profile for each section of the wall. The horizontal distance extends from centerline to centerline of adjacent posts for each section of wall.

Coping will not be measured. Brackets required for the attachment of signs to the sound barrier will not be measured.

620.09 Basis of Payment

Wall mounted sound barrier panels, bridge mounted sound barrier panels, ground mounted sound barrier panels, wall mounted sound barrier erection, bridge mounted sound barrier erection, and ground mounted sound barrier erection will be paid for at the contract unit price per square foot.

The Department may choose to acquire additional precast sound wall panels or masonry blocks in the colors and patterns selected on the project. A maximum of 12 panels of each type would be paid for at the invoice cost of the panels and shall be delivered to the District Office. If the Department elects to acquire additional precast sound wall panels or masonry blocks, the Contractor shall provide the material as extra work in accordance with 104.03.

Partial payment will be made for sound barrier panels stockpiled on the project site or at the Contractor's approved storage location within the State of Indiana. Partial payment will be based on the delivered cost of the sound barrier panels, as verified by invoices that include freight charges. The Contractor shall furnish the invoices and all required certifications. Partial payment will not exceed 75% of the contract unit price for bridge mounted, ground mounted or wall mounted sound barrier panels. Prior to authorizing the partial payment, verification will be obtained that all required inspection has been made and that the panels are acceptable.

Payment for all costs associated with the collection of all information not shown on the plans, revisions due to conflicts, sound barrier system details, all additions or incidentals necessary to provide complete plans, any redesigning of plans or details, the public information meetings and public information planning and presentations will be paid for at the contract lump sum price for sound barrier design and layout.

Payment will be made under:

Pay Item	***Pay Unit Symbol***

Sound Barrier Design and Layout ..... LS
Sound Barrier Erection, _____, _____ ..... SFT
mounting type type***
Sound Barrier Panels, _____, _____ ..... SFT
mounting type type***

* *Mounting type of sound barrier system: bridge mounted (BM), ground mounted (GM), wall mounted (WM)*
** *Type 1, 2, or 3.*

The cost of sound barrier panel materials including vertical support posts, coating the posts, coping, aggregate pad, grout and joint reinforcement for masonry block, fasteners, closures, expansion plates, openings and incidentals shall be included in the cost of the sound barrier panels for the type of sound barrier panels.

The cost of designing, furnishing, and installing brackets for signs that attach to the sound barrier shall be included in the cost of the design and layout of the sound barrier panels.

Substituting Type 2 wall for Type 1 wall or substituting Type 1 or Type 2 wall for Type 3 wall shall be at no cost to the Department.

The cost of the selected texture and selected color shall be included in the cost of the sound barrier panel for the type of sound barrier panels.

The cost of all labor and materials to prepare and erect the sound barrier shall be included in the cost of sound barrier erection for the type of sound barrier panels.

The cost of foundation preparation and construction with associated work shall be included in the cost of sound barrier, ground mounted.

The cost of removal or construction of concrete barrier walls is not included in the cost of sound barrier erection, wall mounted.
