

620-R-483 SOUND BARRIER SYSTEMS

(Revised 12-24-08)

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

10 *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.

20 *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 (2 m) of the sound barrier, the Contractor shall notify the Engineer in accordance with 104.02 and 105.16.*

30 *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 (1 m) 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 (2.6 m) 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. (150 mm) into the ground. The bottom of wall mounted*
 40 *or bridge mounted sound barrier shall follow within 3 in. (75 mm) a profile 6 in. (150 mm) below the top of the existing concrete barrier railing or wall.*

50 *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 feet (5 m). 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 shop 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 7.5 ft (2.2 m) 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. (450 mm) and shall not be less than 6 in. (150 mm) 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.*

60 *A sound barrier system shall be selected from those which are on the Department's list of approved Sound Barrier Systems. The materials used in the fabrication of the sound barrier system shall be the same as those used for approval of the sound barrier system.*

The structural design of the sound barrier system shall be in accordance with the AASHTO Guide Specifications for Structural Design of Sound Barriers, except as otherwise directed. The sound barrier system shall be designed to withstand wind pressure as shown on the plans, as applied perpendicular to the barrier, in each direction.

70 *The post spacing for sound barriers mounted on any structure or safety barrier shall be limited to a distance that does not overstress the existing 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 will be shown on the plans. If no allowable loads are shown, the Contractor shall contact the project designer for this information.*

80 *When sound barriers are to be installed on a bridge structure, design calculations shall be submitted to the Engineer that demonstrate structure loading limits, as shown in the plans, 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:

90 *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 E 90. Type 1 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway*

side. Type 1 sound barrier systems shall be tested in accordance with ASTM C 423. 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 E 795, type A.

100 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 E 90. Type 2 sound barrier systems shall be designed to have a minimum noise reduction coefficient of 0.80 on the roadway side, and a minimum noise reduction coefficient of 0.70 on the non-roadway side. Type 2 sound barrier systems shall be tested in accordance with ASTM C 423. 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 E 795, 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 E 90.

110 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. Masonry block sound barrier systems shall not be mounted on a bridge structure.

120 All molded finishes shall have a 1.0 in. (25 mm) minimum relief. All rolled finishes shall have a minimum 0.75 in. (19 mm) 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. Each wall shall have the selected finish used throughout the wall on the roadway and non-roadway sides.

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.

130 Fire hydrant access points shall be 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 0.1875 in. (4.5 mm).

140 *The calculations for sound barriers which also retain earth must 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 will 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 shop drawings submitted for approval.

150 *Support posts must match the adjoining wall in color unless directed by the Engineer. Embedded reinforced precast concrete posts must 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.

160 *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 grey (federal color # 36492),*
- (b) light brown (federal color # 30450),*
- (c) light tan (federal color # 37769),*

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

180 *The Contractor shall submit one copy of the design calculations for approval. If the calculations are computer generated, one sample set of hand calculations, for one wall location shall also be submitted. 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, including dead load and wind load, will not exceed the structural capacity of the bridge. The Contractor shall submit four sets of design drawings for approval after design calculations are approved and before beginning wall construction operations. Design calculations and design drawings shall be signed and sealed by a professional engineer. Design calculations and 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.*

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(c) *Design calculations for bridge mounted installations shall demonstrate that the structural loading limits of the structure, as shown in the plans, will not be exceeded.*

(d) *Design 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:*

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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 (15 m) 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.*

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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.*

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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 and elevation views for bridge mounted installations.*

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(e) *Design drawings shall include a detailed plan of aesthetic treatment for the entire sound barrier system, manufacture 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:

	<i>Cast-in Place Portland Cement Concrete, Class A</i>	<i>702</i>
240	<i>Coarse Aggregate, Class D or Higher, Size No. 5.....</i>	<i>904</i>
	<i>Coarse Aggregate, Class D or Higher, Size No. 8.....</i>	<i>904</i>
	<i>Coarse Aggregate, Class A or Higher, Size No. 91</i>	<i>904</i>
	<i>Fine Aggregate, Size No. 23.....</i>	<i>904</i>
	<i>Paint.....</i>	<i>909.02</i>
	<i>Portland Cement</i>	<i>901.01(b)</i>
	<i>Precast Portland Cement Concrete</i>	<i>707</i>
	<i>Reinforcing Steel.....</i>	<i>910.01</i>
	<i>Structural Aluminum Posts</i>	<i>910.14(d)</i>
	<i>Structural Steel.....</i>	<i>910</i>
250	<i>Water.....</i>	<i>913.01</i>
	<i>Concrete Masonry Units</i>	<i>905.06</i>
	<i>Joint Mortar</i>	<i>901.08, 906.03</i>

Steel structural components shall be in accordance with ASTM A 36. Structural steel components shall be hot dipped galvanized in accordance with ASTM A 123, coating grade 100 or painted in accordance with 619.11 and 619.12. Exposed surfaces of galvanized components shall be coated in accordance with 619.09(b). The galvanized surfaces shall be prepared using a light brush-off blast cleaning in accordance with SSPC SP7/NACE No. 4. The surface profile shall be 15 to 30 microns in accordance with ASTM D 4417, prior to painting.

All structural steel hardware shall be in accordance with ASTM A 325 and shall be hot dipped galvanized in accordance with ASTM A 153 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. (250 mm) of 7NC threads on the upper end. Anchor bolts shall be in accordance with ASTM F 1554. The threads, nuts, and washers shall be galvanized in accordance with ASTM A 153 or be mechanically galvanized and conform to the coating thickness, adherence, and quality requirements of ASTM A 153, where required.

Filler Material used to increase sound absorption shall be manufactured in accordance with ASTM C 612. Mineral wool shall have a minimum density of 6 lb/ft³ (96 kg/m³), shall absorb less than 1% of water when tested in accordance with ASTM C 553, and shall be noncorrosive and nonhygroscopic. The filler material shall be fastened to the sound barrier system so as to prevent sagging when in a saturated condition. Test reports shall be submitted from an appropriate independent agency verifying that the filler material does not sag if separated after saturation and draining of the sound barrier system when in service, and that the acoustic qualities of the material are in accordance with the requirements herein after completion of testing.

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 C 979 and shall be tested for accelerated weathering in accordance with ASTM D 6695. 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.

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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 C 90 and as follows:

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(a) The average compressive strength of three units shall be a minimum of 3000_psi (21 MPa) with no single unit being less than 2700_psi (19 MPa).

(b) The units shall be tested for water absorption in accordance with ASTM C 140. The maximum absorption shall be 7%.

(c) Joint reinforcement for masonry block systems shall be in accordance with ASTM A 951.

(d) Mortar for masonry block systems shall be in accordance with ASTM C 270; type S, Table 1 proportion requirements.

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(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 C 476.

(f) Aggregate for masonry grout shall be in accordance with ASTM C 404.

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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 C 979. The coating or integral pigment shall be tested for Accelerated Weathering in accordance with ASTM D 6695. 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. Certifications shall be in accordance with a type C in accordance with 916, unless noted otherwise. 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 C 140. All test reports required to substantiate

330 compliance shall be in accordance with the test method/material requirements cited herein. A Department approved laboratory shall conduct the testing.

CONSTRUCTION

620.05 Public Information Meeting

340 The Contractor is responsible for planning and holding a public meeting to display and discuss the recommended sound barrier wall finishes and colors with the public. The meeting shall be arranged for in a locally available facility in or near the affected areas of the barrier walls at convenient times for the affected areas to review. The Contractor and the wall manufacturer shall be present at the meetings along with representatives from the Department.

The Contractor shall coordinate all meeting activities with the Department's hearings manager. The hearings manager will make all local media contacts two weeks prior to the meeting. The Contractor shall also notify the adjacent property owners and businesses, neighborhood associations, and local planning agencies two weeks prior to the meeting. The use of colored flyers with appropriate graphics shall be developed by the Contractor and coordinated with the hearings manager prior to distribution.

350 Wall colors photos shall be presented for each color in accordance with 620.03 along with photos of each available texture alternative. A minimum of three wall samples of both the roadway side and non-roadway side textures shall be presented. All samples of the wall textures shall a minimum of 3 square feet (0.27 square meters) in area, with a clearly distinguishable pattern.

Based on comments received during the meeting, 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.

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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.

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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 shop drawings. Holes for footings shall be drained of free water prior to installing any components. Placing concrete shall be in accordance with 702.

380 *The integrity of the sound barrier system continuity shall be such that no 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.*

390 *Sound barrier wall posts shall be placed vertical with a tolerance of 1/2 in. per 10 ft (13 mm per 3 m) on each axis. Sound barrier wall posts shall be placed at the distance indicated on the plans with a tolerance of 1 in. (25 mm) from centerline to centerline. Sound barrier wall posts shall be aligned to within 1 in. (25 mm) 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 1.5 in. \pm 0.5 in. (37 mm \pm 13 mm). 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. \pm 4 in. (200 mm \pm 100 mm). Field cut steel posts shall be primed with an organic zinc primer and painted in accordance with 619.*

After post erection the area shall be backfilled to within 6 in. (150 mm) 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.

400 *An aggregate pad of No. 5 or No. 8 coarse aggregate shall be included that extends 4 in. (100 mm) outside of each side of the panel and 4 in. (100 mm) 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 shall be conducted in accordance with the manufacturer's guidance and 620.02.

410 *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.

420 *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 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

430 *The Contractor shall submit 2 ft x 2 ft (0.6 m x 0.6 m) sound barrier panel samples or 5 masonry block units in the colors and textures proposed and a 2 ft (0.6 m) sample of painted support post, prior to the approval of the shop 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.*

440 *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.

450 *The Engineer will determine whether 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.*

(a) Precast Panels

460 *For precast wall panels, one verification sample will be required for each type of sound barrier system. The sample will be cut from a delivered panel and will be of sufficient size to provide for testing of sound absorption requirements in accordance with ASTM C 423 and for salt scaling resistance in accordance with ASTM C 672 and Item 13 of the Obtaining Approval Section of the Sound Barrier Systems Source Approval Criteria. The verification sample will be randomly selected for testing by the Engineer in accordance with ITM 802. Certification of the sample shall be provided in accordance with 620.04. A testing laboratory independent from the manufacturer, supplier, and the Contractor shall perform testing. This independent testing laboratory shall arrange for shipping and testing without the aid of the Contractor. The independent testing laboratory shall submit the test results to the Engineer, with a copy to the Contractor, upon completion. Failed materials will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03.*

(b) Masonry

470 *For masonry blocks delivered to the site, one verification sample per contract, per source, will be required for testing freeze thaw durability in accordance with ASTM C 1262 Item 14 in the Obtaining Approval Section of the Sound Barrier Systems Source Approval Criteria. The verification sample will be randomly selected for testing by the*

Engineer in accordance with ITM 802. A testing laboratory independent from the manufacturer, supplier, and the Contractor shall perform testing. This independent testing laboratory shall arrange for shipping and testing without the aid of the Contractor. The independent testing laboratory shall submit the test results to the Engineer, with a copy to the Contractor, upon completion. Failed materials will be adjudicated as a failed material in accordance with normal Department practice in accordance with 105.03.

480 **620.08 Method of Measurement**

Sound barrier panels and sound barrier erection will be measured by the square foot (square meter) 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.

490 **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 (square meter).

500 *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 twelve 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.*

510 *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 includes 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, _____, mounting type,* type**	SFT (m2)
Sound Barrier Panels, _____, mounting type,* type**	SFT (m2)
* Type of sound barrier system: (BM) bridge mounted, (GM) ground mounted, (WM) wall mounted	
** Type 1, 2, or 3.	

530 *The cost of sound barrier panel materials including vertical support posts, coping, aggregate pad mortar, 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.*

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.

540 *The cost of services including the testing laboratory, delivery to the testing laboratory, certified testing personnel, and the testing and inspection of the sound barrier panels shall be included in the cost of sound barrier panels for the type of sound barrier panels.*

The cost of sampling, shipping and testing of verification samples shall be included in the cost of the sound barrier panels for the type of sound barrier panels.

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.

550 *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.

SOUND BARRIER SYSTEMS SOURCE APPROVAL CRITERIA

Obtaining Approval

The supplier requesting approval of a sound barrier system and inclusion on the Department's list of approved Sound Barrier Systems shall comply with the following.

1. *The supplier shall send a letter to the office of Materials Management requesting approval of the sound barrier system. The letter shall include supporting documents, all of which shall be bound, organized and include the following, as applicable:*
 - (a) a letter requesting approval of sound barrier system*
 - (b) list of sound barrier system installations*
 - (c) inspection report of sound barrier system*
 - (d) list of all materials, specification and manufacturer*
 - (e) test report of sound transmission loss*
 - (f) test report of sound absorption average, roadway side*
 - (g) test report of sound absorption average, non-roadway side*
 - (h) test report for accelerated weathering*
 - (i) test report for flame index*
 - (j) test report concrete resistance to scaling*
 - (k) test report steel resistance to corrosion*
 - (l) test report for filler material*
2. *The supplier shall ensure that all tests were performed within two years from the date of submission.*
3. *The supplier shall ensure that all tests were performed on samples selected from a production run of the product.*
4. *The supplier shall ensure that all tests were performed in an accredited independent testing laboratory. Each test report shall be accompanied with proof of accreditation.*
5. *The supplier shall provide evidence of prior construction of a sound wall system of the type to be approved; including location, date, and purchaser.*
6. *The supplier shall submit an inspection report detailing the condition of a sound barrier system of the type to be approved. The inspection report shall identify the location and type of the sound wall system, and provide comments on the structural integrity of each component and the condition of any surface coatings. The inspection report shall be prepared and signed by a registered professional engineer independent from the supplier. The field location of the sound barrier system shall be in an area with a climate similar to Indiana. The sound barrier system shall have been subjected to at least two winters of exposure.*

7. *The supplier shall submit a list of all materials used in the manufacture and construction of the type of sound barrier system to be approved. The list shall include the material specification which each material component meets, and the name of the manufacturer of each material component.*
8. *The supplier shall submit a test report that shows the sound barrier system has a sound transmission loss of 20 dbl or greater for each frequency in accordance with ASTM E 90.*
9. *For absorptive wall systems type 1 and 2 the supplier shall submit a test report that shows the sound barrier system has a sound absorption average of 0.80 or greater on the roadway side in accordance with ASTM C 423 with specimens mounted in accordance with ASTM E 795, type A.*
10. *For absorptive wall systems type 2 the supplier shall submit a test report that shows the sound barrier system has a sound absorption average of 0.70 or greater on the non-roadway side in accordance with ASTM C 423 with specimens mounted in accordance with ASTM E 795, type A.*
11. *The supplier shall submit a test report that shows the sound barrier system complies with the accelerated weathering requirements listed below when tested in accordance with ASTM D 6695 cycle 1. Four specimens shall be used in the test, one as a reference, one to be removed from the test and evaluated at 800, 1600 and 2400 hours. The color of the specimens shall be light tan, light brown, or light grey. The test report shall include a color photo of each specimen at the time of evaluation. The sample must show:*
 - (a) no checking in accordance with ASTM D 660*
 - (b) no blistering in accordance with ASTM D 714*
 - (c) no loss of adhesion in accordance with ASTM D 3359*
 - (d) chalking of 7 or greater in accordance with ASTM D 4214, Method C*
 - (e) color difference of 5 Δ NBS units or less as compared to the reference sample in accordance with ASTM D 2244*
12. *The supplier shall submit a test report that shows the sound barrier system has a flame spread index of 15 or less at 10 minutes, a flame spread index of 25 or less at 30 minutes in accordance with ASTM E 84.*
13. *For precast concrete panel systems, the supplier shall submit a test report that shows the concrete components of the sound barrier system have a mass loss 0.2 lb/1.0 ft² (91 g/0.0929 m²) or less in accordance with ASTM C 672 and as follows. The specimens shall be from different production runs and shall have a testable surface area of 1.00 ft² (0.0929 m²) or more. The specimens shall be sealed around the edges to retain the salt solution to a depth of at least 1/8 in. (6 mm) over the entire*

surface. Before the start of the test each specimen shall be brushed clean. After each five cycles of the test all salt solution and all rinse water from each specimen shall be collected. After each five cycles the surface of each specimen shall be thoroughly rinsed to remove all loose particles. The collected liquid shall be filtered and all particles removed. The retained particles shall be dried to a constant mass and the mass determined to the nearest 0.01 lb (1 g). The test report shall indicate the mass of particles after each five cycles and the total mass after 50 cycles for each specimen. The report shall include a color photo of each specimen before and after the test.

- 14. For masonry block systems, the supplier shall submit a test report that shows the concrete masonry units have a mass loss of one percent material or less in accordance with ASTM C 1262 and as follows. The specimens shall be subjected to 100 cycles of freezing and thawing in a water test solution.*
- 15. The supplier shall submit a test report that shows the steel components of the sound barrier system comply with the following corrosion requirements when tested in accordance with ASTM D 1654 and salt spray exposure in accordance with ASTM B 117. Four pairs of specimens shall be used in the test, one pair as a reference, one pair to be removed from the test and evaluated at 800, 1600 and 2400 hours. One specimen from each pair shall be scribed and one specimen shall be un-scribed. Scribed specimens shall be evaluated in accordance with procedure A, method 1. Un-scribed specimens shall be evaluated in accordance with procedure B and D. A color photo of each specimen at the time of evaluation shall be provided. The test results must show:*
 - (a) corrosion rating shall not be less than 10*
 - (b) no checking in accordance with ASTM D 660*
 - (c) no blistering in accordance with ASTM D 714*
 - (d) no loss of adhesion in accordance with ASTM D 3359*
 - (e) no other defects in accordance with the above methods*
- 16. The supplier shall submit a test report that shows the filler material for sound barrier system in a dry and saturated state does not sag, separate, delaminate, deform or otherwise create voids that allow sound to penetrate the component.*

Maintaining Approved List

- 1. The supplier shall manage the continued approval of their sound barrier system.*
- 2. The supplier shall notify the Department of changes in material components.*

3. *The supplier shall ensure that all documents and test reports for their sound barrier system are current.*
4. *Sound barrier systems that have records at the office of Materials Management in compliance with this procedure will be maintained on the Department's list of approved Sound Barrier Systems.*

Removal from Approved List

1. *The office of Materials Management is responsible for removing sound barrier systems from the approved list.*
 2. *Sound barrier systems that are not in compliance with this procedure will be removed from the approved list.*
 3. *Sound barrier systems that exhibit poor field performance as determined by the office of Materials Management will be removed from the approved list in accordance with Department procedures.*
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