



# Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

April 20, 2022

SUBJECT: FAI Route 57 (I-57)  
Project NHPP-VDCD(210)  
Section 10-(33,34,5,14)R & (10-34)B  
Champaign County  
Contract No. 70C01  
Item No. 174, April 29, 2022 Letting  
Addendum A

## NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised pages ii and v of the Table of Contents to the Special Provisions.
2. Revised pages 31-40 of the Special Provisions.
3. Added pages 174-190 to the Special Provisions.

Prime contractors must utilize the enclosed material when preparing their bid and must include any changes to the Schedule of Prices in their bid.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Jack A. Elston'.

Jack A. Elston, P.E.  
Bureau Chief, Design and Environment

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### **CONDUIT ATTACHED TO STRUCTURE, 1" DIA., STAINLESS STEEL**

**Description:** This work shall consist of furnishing and installing raceways, fittings, and accessories attached to supports. This work shall be according to Section 811 of the Standard Specifications for Road and Bridge Construction, except as modified herein.

**Method of Measurement:** Measurement shall be in accordance with Article 811.04 of the Standard Specifications.

**Basis of Payment:** Payment shall be in accordance with Article 811.05 of the Standard Specifications.

### **CONNECTION OF EXISTING PIPE UNDERDRAIN**

**Description:** This work shall consist of connecting the proposed pipe underdrains to the existing pipe underdrain as required by construction staging or at the locations indicated in the plans.

This work shall be performed in accordance with applicable portions of Section 601 of the Standard Specifications, and shall include all materials, labor, and equipment to connect the existing and proposed pipe underdrains together for the continuation of the underdrain systems.

**Basis of Payment:** This work will not be measured and paid for separately but considered included in the contract unit price per foot for the proposed PIPE UNDERDRAIN being connected, which price shall be payment in full to complete the work as specified.

### **CONCRETE BARRIER, SINGLE FACE, 44 INCH HEIGHT**

This work shall consist of constructing a single-face concrete barrier along the outside edge of shoulder at the locations shown in the plans in accordance with applicable portions of Section 637 of the Standard Specifications and the detail shown in the plans for a concrete barrier single face.

**Basis of Payment:** This work will be measured and paid for at the contract unit price per foot for CONCRETE BARRIER, SINGLE FACE, 44 INCH HEIGHT, which price shall be payment in full to construct both the 5'-7" wide moment slab base in addition to the 44" height constant slope barrier wall, as specified.

Revised April 20, 2022

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## **DELINEATOR REMOVAL**

Delineators, as indicated on the plans, shall be removed and disposed of in accordance with the applicable portions of Sections 635 and 202 of the Standard Specifications for Road and Bridge Construction.

Basis of Payment. Payment for this work shall be at the contract price per each for DELINEATOR REMOVAL which price shall be payment in full for removal and disposal of these items.

## **DIRECT CONNECTIONS OF STORM SEWER AND CULVERT PIPES**

This work shall consist of connecting the necessary temporary or permanent drainage pipes to existing or proposed drainage structures as shown on the details included in the plans or as directed by the Engineer and in accordance with applicable portions of Sections 542 and 550 of the Standard Specifications in order to accommodate positive drainage during the various stages of construction. The Contractor will be allowed to make temporary connections to the existing or proposed crossroad culverts to allow for an outlet during construction. The method of connection shall be approved by the Engineer and done in a manner so as not to damage the culvert or drainage structure being connected to. If the Contractor damages the structures as part of the connection or ultimate removal, the structure shall be repaired by the Contractor to the satisfaction of the Engineer at no additional cost to the contract.

These temporary or permanent connections will not be paid for separately but considered included in the contract unit price for the sewer or pipe that is being connected.

Revised April 20, 2022

## **GROUND MOUNTED CONCRETE NOISE ABATEMENT WALLS (ABSORPTIVE AND REFLECTIVE)**

Effective: September 5, 2008

Revised: June 22, 2016

This work shall consist of furnishing the design, shop drawings, materials, post anchorage, and construction of ground mounted concrete noise abatement walls (noise walls) according to this Special Provision, the Contract Plans and/or as directed by the Engineer.

**General.** The noise abatement wall shall consist of precast concrete panels spanning between vertical posts supported by concrete drilled shaft foundations (ground mounted) as shown on the plans. Driven piles will not be allowed. The posts shall be steel or concrete, unless otherwise specified on the Contract Plans. The design, material, fabrication and construction shall comply with this Special Provision and the requirements specified by the noise wall supplier selected by the Contractor for use on this project. The walls shall have no omissions or gap except as detailed in the Contract Plans.

The Contractor shall verify the locations for the proposed ground mounted wall for conflicts and inform the Engineer in writing of any conflicts before realigning or redesigning the wall. The Contractor shall realign or redesign the wall to avoid any conflicts.

Post spacing shall avoid existing and proposed underground utilities and storm sewers.

Wall components shall be fabricated and erected to produce a precast concrete reflective noise wall system and/or an absorptive noise reduction system at the locations shown in the Contract Plans. The noise reduction system shall satisfy the acoustical requirements as specified on the Contract Plans. An absorptive noise reduction system may be used as an alternate to a reflective noise wall system. Substitution of alternate materials in lieu of precast concrete panels will not be allowed.

All appurtenances behind, in front of, under, over, mounted upon, or passing through the noise wall, such as drainage structures, fire hydrant access, highway signage, emergency access, utilities, and storm sewers shall be accounted for in design of the wall.

The noise walls shall be designed and constructed to extend to the minimum lines, grades and dimensions of the wall envelope, with no omissions or gaps, as shown on the Contract Plans and as directed by the Engineer.

**Submittals.** A complete wall and foundation design submittal, including design calculations for wall panels, posts, foundations, and all connections and shop drawings shall be submitted to the Department for review and approval no later than 90 days prior to beginning construction of the wall. The time required for the preparation and review of these submittals shall be charged to the allowable contract time. Delays caused by untimely submittals or insufficient data will not be considered justifications for any time extensions. No additional compensation will be made for any additional material, equipment or other items found necessary to comply with the project specifications as a result of the Engineer's review. The Contractor will be required to submit the necessary shop drawings. All submittals shall be prepared and sealed by an Illinois Licensed Structural Engineer.

Added April 20, 2022

Submittals shall include all structural calculations, details, dimensions, quantities and cross sections necessary for the construction of the noise abatement walls including but not be limited to:

- (1) Structural design calculations for all structural members, foundations, and connections prepared and sealed by an Illinois Licensed Structural Engineer, and prints of shop drawings on reduced size 11 x 17 in. (275 x 425 mm) sheets in accordance with Article 503.05 and 1042.03(b) of the Standard Specifications.
- (2) A plan view of the wall indicating the stations and offsets required to locate the drilled shaft foundations. The proposed foundation diameter(s) and spacing(s) shall be indicated with all changes to the horizontal alignment shown. Each panel and post shall be numbered and any changes in type or size shall be noted. The centerline of any utilities passing under the wall and locations of expansion joints, access doors, lighting, signing, curb cuts, and drainage structures shall also be shown.
- (3) An elevation view of the wall, indicating the elevations of the top of the posts and panels as well as the elevations of the bottom of the panels, tops of the shaft foundations, all steps in wall system, the finished grade line, and vertical clearances to existing utilities and storm sewers. Each post size and length, panel type and size, and foundation depth shall be designated.
- (4) A typical cross section(s) that shows the panel, post, foundation, and the elevation relationship between existing ground conditions and the finished grade as well as slopes adjacent to the wall.
- (5) All general notes required for constructing the wall.
- (6) All details for the steps in the bottom of panels shall be shown. The bottom of the panels shall be located at or below the theoretical bottom of panel line shown on the Contract Plans. The theoretical bottom of panel line is assumed to be 8 in (200 mm) below the finished grade line at front face of the wall for ground mounted noise walls, unless otherwise shown on the Contract Plans.
- (7) Tops of the panels and posts shall extend to or above the theoretical top of wall line shown on the Contract Plans. All panel tops shall be cast and placed horizontally with any changes in elevation accomplished by stepping adjacent panel sections at posts. Steps shall not exceed 1 ft (300 mm) in height, except within the last 50 ft (15 m) where 2 ft (600 mm) steps will be permitted.
- (8) All panel types shall be detailed. The details shall show panel weight, orientation, all dimensions necessary to cast and/or fabricate each type of panel, the reinforcing steel, and location of post or foundation connection hardware as well as lifting devices embedded in the panels. The Noise Reduction Coefficient (NRC) of each panel of the absorptive face shall be noted.
- (9) All post types shall be detailed. The details shall show post weight, orientation, all dimensions necessary to cast and/or fabricate each type of post, the reinforcing steel, connecting plates, and anchorage details as well as lifting devices embedded in or attached to the posts. Post spacing for walls shall be limited to a distance that does not over stress the supporting structure.

Added April 20, 2022

- (10) Details of wall panels with appurtenances attached to or passing through the wall, as shown on the contract plans, such as utilities, emergency access doors, framed openings, drainage structures, signs, etc. shall be shown. Any modifications to the design or location of these appurtenances to accommodate a particular system shall also be submitted.
- (11) All architectural panel treatment, including color, texture and form liner patterns shall be shown. All joints shall be placed horizontal or vertical and shall be aligned with adjacent panels.
- (12) The details for the connection between panels and posts as well as their connection to the foundation, shall be shown. Foundation details, including details showing the dimensions, reinforcement, and post anchorage system for the drilled shaft foundations, shall be shown. The method of securing the reinforcement in the foundation prior to concrete placement shall be shown.
- (13) Testing, certifications and reports from independent laboratories documenting that the panel's sound Transmission Loss (TL) and NRC for the panel satisfy the criteria shown in the design criteria section of this specification. The testing results for the flame spread, smoke density and freeze-thaw/salt scaling requirements described in the materials section of this specification shall also be submitted. If unable to document panel and post deflections by calculations, reports of full scale testing shall be submitted to demonstrate the deflection criteria have been met.
- (14) Manufacturer recommended installation requirements, a sequence of construction and a detailed bill of materials shall be included.
- (15) The color of the wall panels and support posts identified by Federal Standard 595-B color number.

The Contractor shall deliver to the Department, a 2 ft x 2 ft (600 mm x 600 mm) precast concrete sample of the wall which contains the colors, textures and patterns proposed for use on the project for approval.

The samples shall be made at the same plant manufacturing the product for the noise walls under this contract, and shall be representative of those which will be tested per this specification. Once the color sample is approved, a batch shall be designated by batch number and date and will remain the standard for the entire project.

The Contractor shall submit site access plans showing access and limits of the work areas for the installation of the wall. Any required traffic controls shall be according to the requirements in the plans or the special provision for TRAFFIC CONTROL PLAN.

The initial wall and foundation design submittal shall include three (3) sets of shop drawings and calculations. One set of drawings will be returned to the Contractor with any corrections indicated. The Contractor shall do no work or ordering of materials for the structure until the Engineer has approved the submittal.

Added April 20, 2022



**Design Criteria.** The wall system shall be designed to withstand wind pressure, applied perpendicular to the panels in either direction, according to the AASHTO LRFD Bridge Design Specifications, Chapter 15, for the Design of Sound Barriers. The noise wall design life shall be 75 years unless otherwise noted. The wall system shall be designed to withstand active earth pressure and live load surcharge at locations indicated on the plans. The contractor shall be responsible for the structural adequacy of the panels, posts, foundations and connections as well as overall wall overturning stability. Prestressed and/or post tensioned panel concepts will not be permitted.

The factored Strength I design wind loading shall be as specified on the plans but not less than 35 psf (1.7 kPa). The Service I factored design wind loading shall be as specified on the plans but not less than 15 psf. When a sound wall is also required to support earth pressures, the unfactored design active earth pressure shall be based on an equivalent fluid pressure of 55 pounds per cubic foot (880 kg/m<sup>3</sup>) and a minimum live load surcharge pressure of 2 feet (600 mm) of earth pressure. The earth pressure fill height shall be defined by the proposed grade line elevation and the theoretical bottom of panel line.

The post shall be connected to the foundation by either embedding the post inside the concrete foundation shaft or by attaching the post to the foundation shaft with base plates and anchor bolts as required by design. Embedded posts shall extend into the shaft for the full length of the shaft. For base plate and anchor bolt connections, the minimum number of anchor bolts per post shall be four 1 in. (M24) diameter bolts, with a minimum embedment depth of 18 in. (450 mm). The concrete shaft for base plate and anchor bolt type connections shall be reinforced. For embedded post type connections, the shaft need not be reinforced unless the minimum clear cover over the post exceeds 10 inches (250 mm). When reinforcement of the concrete shaft is required as specified above, the reinforcement shall consist of a minimum of eight #5 (#15) vertical bars symmetrically placed and tied with #3 (#10) ties at 6 in. (150 mm) centers. An additional tie shall be provided at the top and bottom of the foundation. As an alternative to the ties, a #3 (#10) spiral at a 6 in. (150 mm) pitch with an additional 1 1/2 turns at the top and bottom of the foundation or an equivalent 4 x 4 – W12.3 x W7.4 welded wire fabric may be substituted. Reinforcement bars inside the concrete foundations do not require epoxy coating.

Posts shall be oversized by 0.0625 in. in each direction to account for corrosion.

The material and construction of the foundations (drilled shafts) shall be according to Section 516 of the Standard Specifications.

The shaft foundation dimensions shall be determined according to AASHTO LRFD Bridge Design Specifications. Soil borings from prior soil investigations when available are shown in the plans, and may be used to generate foundation design parameters. The design shall utilize load and resistance factors as specified in the AASHTO LRFD Bridge Design Specifications, and shall account for the effects of a sloping ground surface and water table indicated on the plans. In the event that insufficient data is shown on the plans, the following parameters should be assumed for the foundation design:

Effective unit weight	70 pcf (1120 kg/m <sup>3</sup> )
Internal friction angle	30 degrees
Cohesion intercept	0 ksf (0 kg/m <sup>3</sup> )

Added April 20, 2022

Except where otherwise indicated on the plans, the maximum post spacing shall be as specified in the Contractor's approved design.

The maximum allowable panel deflection shall be no more than the panel length (L) divided by 240 (L/240). The maximum post deflection due to post curvature shall be  $H/180$ , where H is the height of the post above the foundation. The maximum total post deflection due to post curvature, foundation curvature, and top-of-foundation rotation shall be  $H/90$ . A method utilizing P-y springs for different soil layers shall be used to calculate the total post deflection. When meeting the deflection limits cannot be demonstrated by calculations, a lateral load test and report shall be submitted to the Engineer indicating that the above noted design lateral loads can be applied to the panels and/or posts without exceeding noted deflection tolerance. The test shall apply lateral loads to the panel simulating uniform wind pressure, and earth pressure when present.

The design shall account for the presence of all appurtenances mounted on or passing through the wall such as drainage structures, existing or proposed utilities, emergency access doors and other items.

Corrugations, ribs or battens on the panel shall be oriented vertically when erected. The panels shall be designed to prevent entrapment and ponding of water. The walls shall not have openings allowing the perching or nesting of birds or the collection of dirt, debris or water.

The walls shall not have handholds or grips promoting climbing of the walls. Any bolts or fasteners used to connect material to the supporting panel, posts, or foundations shall be recessed or embedded in concrete, hidden from view and weather exposure. No external mechanical fastening devices such as frames or clips shall be used for these connections.

The noise abatement material shall be designed to achieve a sound TL equal to or greater than 20 dB in all one-third octave bands from 100 hertz to 5000 hertz, inclusive, when tested according to ASTM E-90. The sound absorptive material shall have a minimum NRC as indicated in Table 1. For the side of the walls specified as reflective, no minimum NRC is required.

**Table 1**

Noise Wall No.	From	To	Noise Wall Side	NRC*	Comments
North Noise Wall	Station 6010+25.71	Station 6033+77.36	Interstate side	Reflective	
	Station 6010+25.71	Station 6033+77.36	Frontage Road side	Absorptive - 0.80	
South Noise Wall	Station 5000+00	Station 5045+76.20	Interstate Side	Reflective	
	Station 5000+00	Station 5045+76.20	Frontage Road side	Absorptive - 0.80	

The NRC shall be determined per ASTM E795, tested according to ASTM C423 (mounting type A). The ratio of noise absorptive material on the panel surface to total wall area (including posts) shall be greater than 90 percent. NRC testing shall be performed on coated samples, utilizing the stain that will be applied for color.

Added April 20, 2022

**Access Doors.** All access doors shall be designed to fit within the design of the noise wall as shown on the plans. Doors shall be complete with hardware and locking devices. Each door shall provide a 3 ft (0.9 m) wide by 7 ft (2.1 m) high minimum clear access opening. Both door jambs shall be securely fastened to anchored posts. Front and back face of the installed door shall be flush with the faces of the noise wall.

Perimeter and internal door frames shall consist of welded hot dip galvanized steel channels and miscellaneous angle stiffeners and plates designed to provide support for noise wall panels to match the noise wall material as specified in this special provision. Infill noise panel geometry and color shall match the adjacent noise wall panels. Noise wall panels shall be fastened to steel frames as per panel manufacturer's recommendations.

The door, jambs, head, hinges, door appurtenances, and adjacent ground mounted posts shall be designed to withstand the wind pressure of 30 psf (1.4 kPa) with the door in fully open and fully closed positions and support the weight of the door and a 300 lb (136 kg) vertical load on the non-hinged side of the door. Provide steel bracing as required. Door bottom shall be equipped with drainage holes to avoid accumulation of trapped moisture.

Door jambs and head section shall be hot dip galvanized steel. Door hinges shall be barrel type, edge mount, extra heavy-duty, hot dip galvanized steel or stainless steel. The hinges shall be designed to support the weight of door assembly, wind loads on the open door, and a 300 lb (136 kg) vertical load on the non-hinged side of the door.

Door pulls shall be provided on both sides of access door(s). Door locking hardware shall be hasp-type to be used with a padlock and shall be located according to local fire department or other requirements as applicable. A solid steel emergency access lock box system shall be provided and mounted near the hasp location at the steel post on the locking hardware side of door. The lock box for emergency access doors shall be according to local fire department requirements.

Doors shall be equipped with lifting bolts or beams as required for safe lifting of door units.

**Materials.** Noise wall materials shall conform to the supplier's standards, AASHTO Specifications for noise walls and the following:

- (a) Reinforcement bars shall satisfy ASTM A706 Grade 60 (400). Welded wire fabric shall be according to AASHTO M 55. All reinforcement in the wall panels shall be epoxy coated.
- (b) Anchor bolts shall conform to ASTM F1554 Grade 55 or 105 and shall be galvanized per AASHTO M232.
- (c) The precast elements shall be according to applicable portions of Section 1042 of the Standard Specifications. The precast elements are considered to be Precast Concrete Structural Members. Coarse Aggregate shall meet the requirements of Article 1004.02(f)) of the Standard Specifications. Concrete shall be Class PC with a minimum compressive strength of 4500 psi (31,000 kPa) at 28 days. Dry cast concrete element will not be permitted.

Added April 20, 2022

- (d) For sound absorptive panels, the manufacturer shall provide test information from an independent lab that the panels meet specified durability requirements. This information shall be either a freeze/thaw test according to AASHTO T 161 (ASTM C 666) Procedure A or B, or it shall be a salt scaling test according to ASTM C 672.

For the freeze/thaw test, a minimum of three specimens shall have been tested. The maximum weight (mass) loss after 300 cycles shall be 7.0 percent. The panel shall have no cracks, delamination (applies to composite material panel), or other excessive physical distress upon completion of the test.

For the salt scaling test, the test method shall be modified as outlined in Appendix D of the Guidelines for Evaluating the Performance of Highway Sound Barriers by the Highway Innovative Technology Evaluation Center (HITEC), A Service Center of the Civil Engineering Research Foundation, CERF REPORT: HITEC 96-04, Product 24 (October 1996). The maximum weight (mass) loss after 50 cycles using a 3 percent sodium chloride solution shall be 0.2 psf (0.1 kg/m<sup>2</sup>).

The panel shall have no cracks, delamination (applies to composite material panel), or other excessive physical distress upon completion of the test.

For sound reflective panels, evidence of durability by one of the two previously mentioned tests is required for all materials except Class PC concrete.

- (e) The manufacturer for the noise abatement wall shall provide their quality control plan for testing the product, and test results shall be provided upon request by the Engineer. Manufacturers on the Department's Qualified Product List of Certified Precast Concrete Producers who are approved for noise abatement walls will be considered in compliance with this requirement.
- (f) Steel plates and posts shall conform to AASHTO M 270 (M 270 M) Grade 36 (250) or 50 (345). All portions of the post shall be galvanized according to AASHTO M111 and ASTM A385 or primed according to Section 506 of the Standard Specifications. The exposed portions of the steel posts shall be painted according to Section 506 of the Standard Specifications. The adjacent concrete panels shall be protected from over spray. The color shall closely match the color of the concrete panels, unless otherwise specified on the plans. Steel bolts, nuts, and washers shall be galvanized according to AASHTO M232.
- (g) Lifting inserts cast into the panels shall be hot dipped galvanized.
- (h) Non shrink grout shall be according to Section 1024 of the Standard Specifications.

Added April 20, 2022

- (i) The default color of both sides of the panels, posts and other visible elements shall be a light brown earth tone unless specified otherwise on the Contract Plans. Colors shall be achieved through the use of integral pigments or stains, which are in compliance with the environmental regulation of the State of Illinois. Components manufactured with integral pigment shall be tested and certified in conformance to ASTM C979. Stains shall be non film forming, penetrating stains. Stains shall be applied to concrete at the cured age of the manufacturer's recommendation. Surface preparation and application shall be according to manufacturer written recommendations. Coloring of concrete elements shall be accomplished using a single component water based, sound absorptive, penetrating, architectural stain that is weather resistant. Stains and/or pigments must be applied at the manufacturing plant; application in the field on site will not be allowed. The final color shall be consistent with the quality and appearance of the approved sample.
- (j) The finish pattern of the precast panels shall be as specified on the Contract Plans.
- (k) With the exception of the steel and Portland cement concrete elements of the wall, all materials shall be tested for flame spread and smoke density developed according to ASTM E84. The material must exhibit a flame-spread index less than 10 and a smoke density developed value of 10 or less.

**Fabrication.** All precast units shall be manufactured according to Section 504 of the Standard Specifications, and the following requirements and tolerances with respect to the dimensions shown on the approved shop drawings.

- (a) The minimum reinforcement bar cover shall be 1 1/2 in (40 mm).
- (b) Panel dimensions shall be within 1/4 in (6 mm).
- (c) All hardware embedded in panels or posts shall be within 1/4 in (6 mm).
- (d) Angular distortion with regard to panel squareness, defined as the difference between the two diagonals, shall not exceed 1/2 in (13 mm).
- (e) Surface defects on formed surfaces measured on a length of 5 ft (1.5 m) shall not be more than 0.10 in (2.5 mm).
- (f) Posts shall be installed plumb to within 1/2 in (13 mm) of vertical for every 15 ft (5 m) of height and to within 1/2 in (13 mm) of the station and offset indicated on the approved shop drawings.
- (g) Drilled shaft foundations shall be placed within 2 in (50 mm) of the station and offset indicated on the approved shop drawings.
- (h) Panel reinforcement and lifting devices shall be set in place to the dimension and tolerances shown on the plans and these special provisions prior to casting.

The date of manufacture, the production lot number, and the piece-mark shall be clearly noted on each panel.

Absorptive material shall be permanently attached to their supporting elements and no external mechanical fastening systems such as frames or clips shall be used. Any bolts or fasteners used shall be recessed or embedded below the surface.

Any chipping, cracks, honeycomb, or other defects, to be allowed, shall be within acceptable standards for precast concrete products according to Section 1042 of the Standard Specifications and as determined by the Engineer.

Added April 20, 2022

**Construction.** The Contractor shall obtain technical assistance from the supplier during wall erection to demonstrate proper construction procedures and shall include any costs related to this technical assistance in the contract unit price for Noise Abatement Wall. The instructions provided by the wall supplier are guidelines and do not relieve the contractor of the responsibility to adhere to contract requirements.

It is recommended that all bottom panels be installed for a length of wall prior to placing middle or top panels. After bottom panels are in-place, finish grading can be accomplished with heavy equipment by reaching over the in-place panels.

Site excavations and/or fill construction shall be completed to plan elevations and profiles prior to the start of wall foundation construction. All underground utility or drainage structure installation shall be completed prior to foundation installation. The ground elevations as shown on the plans and the approved noise wall shop drawings shall be verified by the contractor and discrepancies corrected prior to material fabrication. Buried utilities shall be marked to verify proper clearance from the drilled foundations. The Contractor should consider overhead obstruction such as electric and telephone wires prior to wall erection.

If the soils encountered during drilling of the foundations do not satisfy the design strengths shown on the Contract Plans, the Engineer shall be notified to evaluate the required foundation modifications. The shaft foundation will normally require additional length, which may be paid separately under Article 104.03 of the Standard Specifications. All drilled shaft excavations shall be filled with concrete within 6 hours of their initiation. The concrete for the drilled shaft foundations shall be placed against undisturbed, in-place soils. The concrete at the top of the shaft shall be shaped to provide the panels on each side of the post adequate bearing area and correct elevation per the approved shop drawings.

The panels shall be delivered to the project site in full truckload quantities. They may be off-loaded individually or by forklift with a solid steel plate spanning between the forks providing uniform, fully distributed bearing support to the underside of the panels. Units shall be shipped, handled and stored in such a manner as to minimize the danger of staining, chipping, spalling, development of cracks, fractures, and excessive bending stresses. Panels shall be stored and shipped in bundles, on edge. Any touch up and repair is at the Contractor's expense and shall be carried out according to the manufacturer's recommendations.

**Method of Measurement.** Noise abatement walls will be measured in square feet (square meters) from the wall envelope, defined by the theoretical top of wall line to the theoretical bottom of panel line for the length of the wall as shown on the Contract Plans.

Drilled shafts, concrete, reinforcement bars and other elements for supporting the ground mounted noise abatement walls will not be measured for payment.

Access doors shown on the Contract Plans will also be measured for payment.

Added April 20, 2022

**Basis of Payment.** This work will be paid for at the contract unit price per square foot (square meter) for NOISE ABATEMENT WALL, GROUND MOUNTED.

The costs for drilled shafts, concrete, reinforcement bars and other elements supporting the noise abatement walls will not be paid for separately but will be included in the item for NOISE ABATEMENT WALL, GROUND MOUNTED.

Access doors, including all required hardware and labor, will be paid at the contract unit price (lump sum) for NOISE ABATEMENT EMERGENCY ACCESS GATE, GROUND MOUNTED.

### **STRUCTURE MOUNTED CONCRETE NOISE ABATEMENT WALLS (ABSORPTIVE AND REFLECTIVE)**

Effective: September 5, 2008

Revised: June 22, 2016

This work shall consist of furnishing the design, shop drawings, materials, post anchorage, and construction of structure mounted concrete noise abatement walls (noise walls) according to this Special Provision, the Contract Plans and/or as directed by the Engineer.

**General.** The noise abatement wall shall consist of precast concrete panels spanning between vertical posts attached to/supported by another structure (structure mounted) as shown on the plans. The posts shall be steel, unless otherwise specified on the Contract Plans. The design, material, fabrication and construction shall comply with this Special Provision and the requirements specified by the noise wall supplier selected by the Contractor for use on this project. The walls shall have no omissions or gap except as detailed in the Contract Plans.

The Contractor shall verify the locations for the proposed structure mounted wall for conflicts and inform the Engineer in writing of any conflicts before realigning or redesigning the wall. The Contractor shall realign or redesign the wall to avoid any conflicts.

Wall components shall be fabricated and erected to produce a precast concrete reflective noise wall system and/or an absorptive noise reduction system at the locations shown in the Contract Plans. The noise reduction system shall satisfy the acoustical requirements as specified on the Contract Plans. An absorptive noise reduction system may be used as an alternate to a reflective noise wall system. Substitution of alternate materials in lieu of precast concrete panels will not be allowed.

All appurtenances behind, in front of, under, over, mounted upon, or passing through the noise wall, such as drainage structures, fire hydrant access, highway signage, emergency access, utilities, and storm sewers shall be accounted for in design of the wall.

The noise walls shall be designed and constructed to extend to the minimum lines, grades and dimensions of the wall envelope, with no omissions or gaps, as shown on the Contract Plans and as directed by the Engineer.

Added April 20, 2022

**Submittals.** A complete wall design submittal, including design calculations for wall panels, posts, and all connections and shop drawings shall be submitted to the Department for review and approval no later than 90 days prior to beginning construction of the wall. The time required for the preparation and review of these submittals shall be charged to the allowable contract time. Delays caused by untimely submittals or insufficient data will not be considered justifications for any time extensions. No additional compensation will be made for any additional material, equipment or other items found necessary to comply with the project specifications as a result of the Engineer's review. The Contractor will be required to submit the necessary shop drawings. All submittals shall be prepared and sealed by an Illinois Licensed Structural Engineer.

Submittals shall include all structural calculations, details, dimensions, quantities and cross sections necessary for the construction of the noise abatement walls including but not be limited to:

- (16) Structural design calculations for all structural members, and connections prepared and sealed by an Illinois Licensed Structural Engineer, and prints of shop drawings on reduced size 11 x 17 in. (275 x 425 mm) sheets in accordance with Article 503.05 and 1042.03(b) of the Standard Specifications.
- (17) A plan view of the wall indicating the stations and offsets required to locate the wall.. Each panel and post shall be numbered and any changes in type or size shall be noted. The centerline of any utilities passing under the wall and locations of expansion joints, access doors, lighting, signing, curb cuts, and drainage structures shall also be shown.
- (18) An elevation view of the wall, indicating the elevations of the top of the posts and panels as well as the elevations of the bottom of the panels, , all steps in wall system, the finished grade line, and vertical clearances to existing utilities and storm sewers. Each post size and length, panel type and size, shall be designated.
- (19) A typical cross section(s) that shows the panel, post, , and the elevation relationship between the supporting structure and the finished grade as well as slopes adjacent to the wall.
- (20) All general notes required for constructing the wall.
- (21) All details for the steps in the bottom of panels shall be shown. The bottom of the panels shall be located at or below the theoretical bottom of panel line shown on the Contract Plans. The theoretical bottom of panel line is assumed to be at the top of the structure to which it is mounted, unless otherwise shown on the Contract Plans.
- (22) Tops of the panels and posts shall extend to or above the theoretical top of wall line shown on the Contract Plans. All panel tops shall be cast and placed horizontally with any changes in elevation accomplished by stepping adjacent panel sections at posts. Steps shall not exceed 1 ft (300 mm) in height, except within the last 50 ft (15 m) where 2 ft (600 mm) steps will be permitted.

Added April 20, 2022



- (23) All panel types shall be detailed. The details shall show panel weight, orientation, all dimensions necessary to cast and/or fabricate each type of panel, the reinforcing steel, and location of post or foundation connection hardware as well as lifting devices embedded in the panels. The Noise Reduction Coefficient (NRC) of each panel of the absorptive face shall be noted.
- (24) All post types shall be detailed. The details shall show post weight, orientation, all dimensions necessary to cast and/or fabricate each type of post, the reinforcing steel, connecting plates, and anchorage details as well as lifting devices embedded in or attached to the posts. Post spacing for walls shall be limited to a distance that does not over stress the supporting structure.
- (25) Details of wall panels with appurtenances attached to or passing through the wall, as shown on the contract plans, such as utilities, emergency access doors, framed openings, drainage structures, signs, etc. shall be shown. Any modifications to the design or location of these appurtenances to accommodate a particular system shall also be submitted.
- (26) All architectural panel treatment, including color, texture and form liner patterns shall be shown. All joints shall be placed horizontal or vertical and shall be aligned with adjacent panels.
- (27) The details for the connection between panels and posts as well as their connection to the supporting structure shall be shown.
- (28) Testing, certifications and reports from independent laboratories documenting that the panel's sound Transmission Loss (TL) and NRC for the panel satisfy the criteria shown in the design criteria section of this specification. The testing results for the flame spread, smoke density and freeze-thaw/salt scaling requirements described in the materials section of this specification shall also be submitted. If unable to document panel and post deflections by calculations, reports of full scale testing shall be submitted to demonstrate the deflection criteria have been met.
- (29) Manufacturer recommended installation requirements, a sequence of construction and a detailed bill of materials shall be included.
- (30) The color of the wall panels and support posts identified by Federal Standard 595-B color number.

The Contractor shall deliver to the Department, a 2 ft x 2 ft (600 mm x 600 mm) precast concrete sample of the wall which contains the colors, textures and patterns proposed for use on the project for approval.

The samples shall be made at the same plant manufacturing the product for the noise walls under this contract, and shall be representative of those which will be tested per this specification. Once the color sample is approved, a batch shall be designated by batch number and date and will remain the standard for the entire project.

Added April 20, 2022

The Contractor shall submit site access plans showing access and limits of the work areas for the installation of the wall. Any required traffic controls shall be according to the requirements in the plans or the special provision for TRAFFIC CONTROL PLAN.

The initial wall and foundation design submittal shall include three (3) sets of shop drawings and calculations. One set of drawings will be returned to the Contractor with any corrections indicated. The Contractor shall do no work or ordering of materials for the structure until the Engineer has approved the submittal.

**Design Criteria.** The wall system shall be designed to withstand wind pressure, applied perpendicular to the panels in either direction, according to the AASHTO LRFD Bridge Design Specifications, Chapter 15, for the Design of Sound Barriers. The noise wall design life shall be 75 years unless otherwise noted. The wall system shall be designed to withstand any active earth pressure and live load surcharge at locations indicated on the plans. The contractor shall be responsible for the structural adequacy of the panels, posts, and connections. Prestressed and/or post tensioned panel concepts will not be permitted.

The factored Strength I design wind loading shall be as specified on the plans but not less than 35 psf (1.7 kPa). The factored Service I design wind loading shall be as specified on the plans but not less than 15 psf. When a sound wall is also required to support earth pressures, the unfactored design active earth pressure shall be based on an equivalent fluid pressure of 55 pounds per cubic foot ( $880 \text{ kg/m}^3$ ) and a minimum live load surcharge pressure of 2 feet (600 mm) of earth pressure. The earth pressure fill height shall be defined by the proposed grade line elevation and the theoretical bottom of panel line.

The post spacing for structure mounted noise walls shall be as shown on the plans but in no case greater than 15 feet (4.6 m) center to center.

Posts shall be oversized by 0.0625 in. in each direction to account for corrosion.

The maximum allowable panel deflection shall be no more than the panel length (L) divided by 240 ( $L/240$ ). The maximum post deflection due to post curvature shall be ( $H/180$ ), where H is the height of the post above the foundation. For noise abatement walls on retaining walls, the maximum total post deflection due to post curvature, retaining wall curvature, and top-of-retaining-wall rotation shall be  $H/90$ . When meeting the deflection limits cannot be demonstrated by calculations, a lateral load test and report shall be submitted to the Engineer indicating that the above noted design lateral loads can be applied to the panels and/or posts without exceeding noted deflection tolerance. The test shall apply lateral loads to the panel simulating uniform wind pressure, and earth pressure when present.

The design shall account for the presence of all appurtenances mounted on or passing through the wall such as drainage structures, existing or proposed utilities, emergency access doors and other items.

Corrugations, ribs or battens on the panel shall be oriented vertically when erected. The panels shall be designed to prevent entrapment and ponding of water. The walls shall not have openings allowing the perching or nesting of birds or the collection of dirt, debris or water.

Added April 20, 2022

The walls shall not have handholds or grips promoting climbing of the walls. Any bolts or fasteners used to connect material to the supporting panel, posts, or foundations shall be recessed or embedded in concrete, hidden from view and weather exposure. No external mechanical fastening devices such as frames or clips shall be used for these connections.

The noise abatement material shall be designed to achieve a sound TL equal to or greater than 20 dB in all one-third octave bands from 100 hertz to 5000 hertz, inclusive, when tested according to ASTM E-90. The sound absorptive material shall have a minimum NRC as indicated in Table 1. For the side of the walls specified as reflective, no minimum NRC is required.

**Table 1**

Noise Wall No.	From	To	Noise Wall Side	NRC*	Comments
North Noise Wall	Station 6000+00	Station 6010+25.71	Interstate side	Reflective	
	Station 6000+00	Station 6010+25.71	Frontage Road side	Absorptive - 0.80	

The NRC shall be determined per ASTM E795, tested according to ASTM C423 (mounting type A). The ratio of noise absorptive material on the panel surface to total wall area (including posts) shall be greater than 90 percent. NRC testing shall be performed on coated samples, utilizing the stain that will be applied for color.

**Access Doors.** All access doors shall be designed to fit within the design of the noise wall as shown on the plans. Doors shall be complete with hardware and locking devices. Each door shall provide a 3 ft (0.9 m) wide by 7 ft (2.1 m) high minimum clear access opening. Both door jambs shall be securely fastened to anchored posts. Front and back face of the installed door shall be flush with the faces of the noise wall.

Perimeter and internal door frames shall consist of welded hot dip galvanized steel channels and miscellaneous angle stiffeners and plates designed to provide support for noise wall panels to match the noise wall material as specified in this special provision. Infill noise panel geometry and color shall match the adjacent noise wall panels. Noise wall panels shall be fastened to steel frames as per panel manufacturer's recommendations.

The door, jambs, head, hinges, door appurtenances, and adjacent ground mounted posts shall be designed to withstand the wind pressure of 30 psf (1.4 kPa) with the door in fully open and fully closed positions and support the weight of the door and a 300 lb (136 kg) vertical load on the non-hinged side of the door. Provide steel bracing as required. Door bottom shall be equipped with drainage holes to avoid accumulation of trapped moisture.

Door jambs and head section shall be hot dip galvanized steel. Door hinges shall be barrel type, edge mount, extra heavy-duty, hot dip galvanized steel or stainless steel. The hinges shall be designed to support the weight of door assembly, wind loads on the open door, and a 300 lb (136 kg) vertical load on the non-hinged side of the door.

Added April 20, 2022

Door pulls shall be provided on both sides of access door(s). Door locking hardware shall be hasp-type to be used with a padlock and shall be located according to local fire department or other requirements as applicable. A solid steel emergency access lock box system shall be provided and mounted near the hasp location at the steel post on the locking hardware side of door. The lock box for emergency access doors shall be according to local fire department requirements.

Doors shall be equipped with lifting bolts or beams as required for safe lifting of door units.

**Materials.** Noise wall materials shall conform to the supplier's standards, AASHTO Specifications for noise walls and the following:

- (l) Reinforcement bars shall satisfy ASTM A706 Grade 60 (400). Welded wire fabric shall be according to AASHTO M 55. All reinforcement in the wall panels shall be epoxy coated.
- (m) Anchor bolts shall conform to ASTM F1554 Grade 55 or 105 and shall be galvanized per AASHTO M232.
- (n) The precast elements shall be according to applicable portions of Section 1042 of the Standard Specifications. The precast elements are considered to be Precast Concrete Structural Members. Coarse Aggregate shall meet the requirements of Article 1004.02(f) of the Standard Specifications. Concrete shall be Class PC with a minimum compressive strength of 4500 psi (31,000 kPa) at 28 days. Dry cast concrete element will not be permitted.
- (o) For sound absorptive panels, the manufacturer shall provide test information from an independent lab that the panels meet specified durability requirements. This information shall be either a freeze/thaw test according to AASHTO T 161 (ASTM C 666) Procedure A or B, or it shall be a salt scaling test according to ASTM C 672.

For the freeze/thaw test, a minimum of three specimens shall have been tested. The maximum weight (mass) loss after 300 cycles shall be 7.0 percent. The panel shall have no cracks, delamination (applies to composite material panel), or other excessive physical distress upon completion of the test.

For the salt scaling test, the test method shall be modified as outlined in Appendix D of the Guidelines for Evaluating the Performance of Highway Sound Barriers by the Highway Innovative Technology Evaluation Center (HITEC), A Service Center of the Civil Engineering Research Foundation, CERF REPORT: HITEC 96-04, Product 24 (October 1996). The maximum weight (mass) loss after 50 cycles using a 3 percent sodium chloride solution shall be 0.2 psf (0.1 kg/m<sup>2</sup>).

The panel shall have no cracks, delamination (applies to composite material panel), or other excessive physical distress upon completion of the test.

For sound reflective panels, evidence of durability by one of the two previously mentioned tests is required for all materials except Class PC concrete.

Added April 20, 2022

- (p) The manufacturer for the noise abatement wall shall provide their quality control plan for testing the product, and test results shall be provided upon request by the Engineer. Manufacturers on the Department's Qualified Product List of Certified Precast Concrete Producers who are approved for noise abatement walls will be considered in compliance with this requirement.
- (q) Steel plates and posts shall conform to AASHTO M 270 (M 270 M) Grade 36 (250) or 50 (345). All portions of the post shall be galvanized according to AASHTO M111 and ASTM A385 or primed according to Section 506 of the Standard Specifications. The exposed portions of the steel posts shall be painted according to Section 506 of the Standard Specifications. The adjacent concrete panels shall be protected from over spray. The color shall closely match the color of the concrete panels, unless otherwise specified on the plans. Steel bolts, nuts, and washers shall be galvanized according to AASHTO M232.
- (r) Lifting inserts cast into the panels shall be hot dipped galvanized.
- (s) Non shrink grout shall be according to Section 1024 of the Standard Specifications.
- (t) The default color of both sides of the panels, posts and other visible elements shall be a light brown earth tone unless specified otherwise on the Contract Plans. Colors shall be achieved through the use of integral pigments or stains, which are in compliance with the environmental regulation of the State of Illinois. Components manufactured with integral pigment shall be tested and certified in conformance to ASTM C979. Stains shall be non film forming, penetrating stains. Stains shall be applied to concrete at the cured age of the manufacturer's recommendation. Surface preparation and application shall be according to manufacturer written recommendations. Coloring of concrete elements shall be accomplished using a single component water based, sound absorptive, penetrating, architectural stain that is weather resistant. Stains and/or pigments must be applied at the manufacturing plant; application in the field on site will not be allowed. The final color shall be consistent with the quality and appearance of the approved sample.
- (u) The finish pattern of the precast panels shall be as specified on the Contract Plans.
- (v) With the exception of the steel and Portland cement concrete elements of the wall, all materials shall be tested for flame spread and smoke density developed according to ASTM E84. The material must exhibit a flame-spread index less than 10 and a smoke density developed value of 10 or less.

**Fabrication.** All precast units shall be manufactured according to Section 504 of the Standard Specifications, and the following requirements and tolerances with respect to the dimensions shown on the approved shop drawings.

- (i) The minimum reinforcement bar cover shall be 1 1/2 in (40 mm).
- (j) Panel dimensions shall be within 1/4 in (6 mm).
- (k) All hardware embedded in panels or posts shall be within 1/4 in (6 mm).
- (l) Angular distortion with regard to panel squareness, defined as the difference between the two diagonals, shall not exceed 1/2 in (13 mm).

Added April 20, 2022

- (m) Surface defects on formed surfaces measured on a length of 5 ft (1.5 m) shall not be more than 0.10 in (2.5 mm).
- (n) Posts shall be installed plumb to within 1/2 in (13 mm) of vertical for every 15 ft (5 m) of height and to within 1/2 in (13 mm) of the station and offset indicated on the approved shop drawings.
- (o) Panel reinforcement and lifting devices shall be set in place to the dimension and tolerances shown on the plans and these special provisions prior to casting.

The date of manufacture, the production lot number, and the piece-mark shall be clearly noted on each panel.

Absorptive material shall be permanently attached to their supporting elements and no external mechanical fastening systems such as frames or clips shall be used. Any bolts or fasteners used shall be recessed or embedded below the surface.

Any chipping, cracks, honeycomb, or other defects, to be allowed, shall be within acceptable standards for precast concrete products according to Section 1042 of the Standard Specifications and as determined by the Engineer.

**Construction.** The Contractor shall obtain technical assistance from the supplier during wall erection to demonstrate proper construction procedures and shall include any costs related to this technical assistance in the contract unit price for Noise Abatement Wall. The instructions provided by the wall supplier are guidelines and do not relieve the contractor of the responsibility to adhere to contract requirements.

It is recommended that all bottom panels be installed for a length of wall prior to placing middle or top panels. After bottom panels are in-place, finish grading can be accomplished with heavy equipment by reaching over the in-place panels.

The Contractor should consider overhead obstruction such as electric and telephone wires prior to wall erection.

The panels shall be delivered to the project site in full truckload quantities. They may be off-loaded individually or by forklift with a solid steel plate spanning between the forks providing uniform, fully distributed bearing support to the underside of the panels. Units shall be shipped, handled and stored in such a manner as to minimize the danger of staining, chipping, spalling, development of cracks, fractures, and excessive bending stresses. Panels shall be stored and shipped in bundles, on edge. Any touch up and repair is at the Contractor's expense and shall be carried out according to the manufacturer's recommendations.

**Method of Measurement.** Noise abatement walls will be measured in square feet (square meters) from the wall envelope, defined by the theoretical top of wall line to the theoretical bottom of panel line for the length of the wall as shown on the Contract Plans.

Access doors shown on the Contract Plans will also be measured for payment.

**Basis of Payment.** This work will be paid for at the contract unit price per square foot (square meter) for NOISE ABATEMENT WALL, STRUCTURE MOUNTED.

Access doors, including all required hardware and labor, will be paid at the contract unit price (lump sum) for NOISE ABATEMENT EMERGENCY ACCESS GATE, GROUND MOUNTED.

Added April 20, 2022