

DPWH Standard Specification for Item 615 - NOISE BARRIER

615.1 Description

This Specification covers the minimum material, mechanical and noise reduction performance requirements of noise barrier. This Item shall be used in conjunction with steel support posts to provide noise abatement on both sidewalls of all bridges and on part of the approach structures, along highway/flyover, and in other applications requiring long term outdoor durability, vandal resistance and ease of construction.

615.1.1 Design

The Contractor shall provide design calculation (as per latest AASHTO LRFD Bridge Design Specifications), shop drawings, erection methodology, and detailed erection plan for approval by the Engineer. The design requirements shall be in accordance with these Specifications and/or as indicated in the Plans.

The Contractor shall determine the final location plan, grades and elevation for ground/viaduct mounted noise barrier wall and anchor bolts (furnish plans and elevations to develop the foundation/installation drawings, including a complete elevation view of each wall section including top and bottom elevations, project final ground/viaduct elevations established in the field) for the duration of the project and no adjustment shall be made after shop drawing has already been approved.

The base plate, post, anchor bolts inside side wall and noise barrier are to be designed following the wind load (2.4 kN/m^2) of AASHTO LRFD Article 3.8.1 same as bridge main structures. The structural design detail of post and base plate shall be indicated on the Plans for the minimum requirements referring to Item 403 – Metal Structures and Item 409 - Welded Structural Steel.

615.1.2 Design Considerations

Placement of noise barrier walls on bridges and retaining walls should be avoided if possible. These structures may cause increase in risk to traffic below during seismic events or in case of vehicular impact. However, if necessary to place a noise barrier wall on a bridge or a retaining wall, the following guidelines shall be considered as minimum requirements for design and detailing of these walls:

1. The total height of noise barrier walls on bridges, from top of slab to top of noise barrier wall, shall be limited to 245 cm.
2. The total height of noise barrier walls on retaining walls, from top of roadway to top of noise barrier wall, shall be limited to 425 cm.
3. Noise barrier wall thickness shall be 17.5 cm minimum
4. Two layers of reinforcing bars shall be specified in the cross section, with 3.8 cm cover, minimum, over both faces as shown in the attached detail.
5. The vehicular collision force shall be based on the LRFD Table A13.2-1 for design forces for traffic railing. The transverse force shall be applied horizontally at 1.0 m height above deck.

Seismic Dead Load = $A \times f \times D$

Where:

A = Acceleration on coefficient from the Geotechnical Report

D = Dead load of the wall

f = Dead load coefficient (see Table below)

Dead Load Coefficient	f
Dead load coefficient, except on bridges – monolithic connection	1.0
Dead load coefficient, on bridges – monolithic connection	2.5
Dead load coefficient, for connection of precast wall to bridge barrier	8.0
Dead load coefficient, for connection of precast walls to retaining wall or moment slab barriers	5.0

7. Joints for noise barrier wall placed on bridges and retaining walls shall be plumb.
8. AASHTO LRFD Bridge design specifications shall be used for the structural design of noise barrier walls.

Noise barrier walls on bridges and retaining walls shall be considered special design and shall be designed on a case-to-case basis.

The design requirements for precast wall panel connections to bridge and retaining wall barriers shall be different for cast-in-place construction. Changing the noise barrier wall type from cast-in-place to precast requires approval of the Bridge Design Engineer.

If base plate of barrier shall be attached to traffic railing/ parapet, the Contractor shall provide structural calculations for railing/parapet due to loads induced by the addition of noise barrier to be approved by the Engineer.

615.2 Materials Requirements

All materials delivered to the construction site should be visually inspected for proper dimensions, cracks, voids, surface defects, inconsistency in color and texture, and any other damage or imperfections.

615.2.1 Noise Absorption Panels

Table 615.2.1.1 Materials for Noise Barrier Fix Type

Name	Size	Qty	Unit Weight (kg/m)	Weight (kg.)	Material (Qty./m ³)	Cover
1. Acoustic Panel	1960x95x500	4	-	-	-	-
2. Acoustic Panel Fix Plate	W5x16	8	-	-	t=1.6mm, L=311mm Bended Spring Plate	-
3. Post	W5x16	1	23.60	49.84	A 36	Hot Dip Galvanized Coating
4. Top Plate	PL-6x185x190	1	47.10	1.66	A 36	
5. Top Plate Fix Plate	L-30x30x5x190	2	2.16	0.82	A 36	
6. Base Plate	PL-23x240x360	1	219.80	18.99	A 36	
7. RB Plate 1	PL-12x65x230	2	94.20	2.82	A 36	
8. RB Plate 2	PL-12x65x95.5	4	94.20	2.34	A 36	
9. Acoustic Panel Fixing Plate	PL-6x40x50	2	47.10	0.19	A 36	

Name	Size	Qty	Unit Weight (kg/m)	Weight (kg.)	Material (Qty./m ³)	Cover
10. Bolt Unloosen Nut & Washer	M8x25	4	-	-	SUS304	-
11. Fall Prevention Wire	Ø6.3x8281 mm	1	-	-	Wire Rope	Covered with Nylon
12. Under Cover Plate	1.6x270x160x1990	1	-	-	A 36	Hot Dip
13. Anchor Plate	Ø22x650	2	-	-	ASTM A 490	Galvanized Coating

Table 615.2.1.2 Materials for Noise Barrier Joint Type

Name	Size	Qty	Unit Weight (kg/m)	Weight (kg.)	Material (Qty./m ³)	Cover
1. Acoustic Panel	1960x95x500	4	-	-	-	-
2. Acoustic Panel Fix Plate	For W5x16	8	-	-	t=1.6mm, L=311mm Bended Spring Plate	-
3. Post	W5x16	1	23.60	49.84	A 36	Hot Dip Galvanized Coating
4. Top Plate	PL-6x185x190	1	47.10	1.66	A 36	
5. Top Plate Fix Plate	L-30x30x5x190	2	2.16	0.82	A 36	
6. Base Plate	PL-23x240x360	1	219.80	18.99	A 36	
7. RB Plate 1	PL-12x65x230	2	94.20	2.82	A 36	
8. RB Plate 2	PL-12x65x95.5	4	94.20	2.34	A 36	
9. Acoustic Panel Fixing Plate	PL-6x40x50	2	47.10	0.19	A 36	
10. Bolt Unloosen Nut & Washer	M8x25	4	-	-	Stainless Steel Plate	-
11. Fall Prevention Wire	Ø6.3x8281 mm	1	-	-	Wire Rope	Covered with Nylon
12. Under Cover Plate	1.6x270x160x1990	1	-	-	A 36	Hot Dip
13. Anchor Bolt	Ø22x650	2	-	-	ASTM A490	Galvanized Coating
14. Joint Plate	PL-125*2180, SM400, 4pcs HDZ-55					

615.2.2 Inspection Window

Inspection window shall be placed at every streetlight pole for maintenance and are provided with the material component as shown on the Plans.

Table 615.2.1.3 Inspection Window (1960x95x1000)

NO.	KINDS	MATERIALS
1.	PL	High Corrosion Resistant Hot-Dip Zinc Coated Steel Plate 3.2t
2.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
3.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 2.3t
4.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
5.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
6.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 2.3t
7.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
8.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 2.3t
9.	Eye Shaped Ring	For M8 SS400
10.	PL	High Corrosion Resistant Hot-Dip Zinc Coated Steel Plate 3.2t

NO.	KINDS	MATERIALS
11.	PL	High Corrosion Resistant Hot-Dip Zinc Coated Steel Plate 3.2t
12-1	PL	SS400 HDZ35: 6t
12-2		
13.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
14.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
15.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
16.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
17.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
18.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
19.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
20.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
21.	Front Panel	Aluminum Alloy Sheet - A5052P, 1.0t, Louver Finish
22.	Sound Absorbing Material	Polyester Fiber
23.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
24.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
25.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
26.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
27.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
28.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
29.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
30.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
31.	Front Panel	Aluminum Alloy Sheet - A5052P, 1.0t, Louver Finish
32.	Sound Absorbing Material	Polyester Fiber
33.	PL	High Corrosion Resistant Hot Zinc Coated Steel Plate 1.6t
34.	B.N.W	M12 x 30 : SUS304
35.	Grip	SUS304
36.	Axle	M12 x 32.5 : SUS304
	Pulley	SUS316
	Washer	t = 1.0 Teflon Resin ®
	M12 Nut	SUS304
37.	Latch Lock	ZINC ALLOY
38.	Chloroprene Rubber	t = 2.0 x 0x30
39.	Rivet	SUS305
40.	PL	SS400 HDZ35 : 9t
41.	B.N.W	M8 x 25 : SUS304
42-1	PL	SS400 HDZ35:6t
42-2		
43.	Wire Rope	φ6.3x1678 NYLON COATED
44.	Nut Washer	M10 : SS400
45.	B.UN.W	M8x15 : SUS304

615.2.3 Sound Absorption Panels

Sound absorption panels' minimum requirement shall be indicated on the Plans or in accordance with Table 615.2.1.4 below:

Table 615.2.1.4 Minimum Requirements for the Sound Absorption Panels

Component of Noise Panel	Minimum Performance Required
1. Front Panel Material	Aluminum Alloy (Louver Finish)
2. Back Panel Material	High Corrosion Resistant Hot-dip Zinc Coated (1.6 mm)
3. Sound Absorbing Material	Polyester Fiber
4. Sound Absorption Ratio*	More than 100% (400 Hz); more than 90% (1000 Hz)
5. Strength for Wind Load	More than 2.4 kN/m ²
6. Fall Prevention Wire	Should be included

* Method for measurement of sound absorption coefficient in a reverberation should conform to the acceptable standard indicated in the Plans or as approved by the Engineer.

615.3 Construction Requirements

Prior to construction, shop drawings shall be submitted by the Contractor including fabrication details, handling/transportation, and construction procedures for all wall elements including connections for approval by the Engineer.

Extra efforts should be made during construction stages as well as in the design stage to avoid holes, slits or gaps, either with the adjoining panels, along the bottom edge or gaps for road traffic signs, lighting poles, fire hydrants, construction joints or expansion joints.

In most cases, recess should be formed along the barrier to accommodate the street furniture as far as possible.

When the installation of a noise barrier interferes with the access to existing, or proposed fire hydrants, the noise barrier installation should include fire hose access openings and associated identification signs. Location and demand for these openings to be established in cooperation with local fire department.

615.3.1 Workmanship

The noise barrier panel shall exhibit good workmanship and be free of burrs, cracks, or other objectionable defects, which would adversely affect the barrier's performance or serviceability. Panels assembled together with caulked joint shall not permit light leaks through horizontal joints.

All damaged panels will be rejected either at the fabrication shop or on the construction site even after installation.

The posts shall be set vertically with levelling nuts and shall be fixed by double nuts to avoid loosening due to traffic vibration. When the galvanized casting is damaged, galvanized painting repair shall be done.

615.3.2 Warranty and Maintenance

The material and installation of the noise barrier system, including landscaping materials, shall be guaranteed for a minimum period of five (5) years from the date of initial Certification and Performance Acceptance. A final unconditional warranty inspection shall be prepared by the Engineer after five (5) years from the date of original Initial Certification and Performance Acceptance of the barrier to certify that there are no deficiencies/ defects of any component of the barrier system; this includes but shall not necessarily be limited to grading, berm, posts, panels, landscape materials and soil condition.

615.4 Method of Measurement

The quantities to be measured and paid for shall be the actual lengths of noise barriers installed and materials test results accepted by the Engineer.

615.5 Basis of Payment

The accepted quantities measured as prescribed in Section 615.4 - Method of Measurement shall be paid at the Contract unit price as shown in the Bill of Quantities which price and payment shall be full compensation for furnishing, installing and all labor, equipment, tools and incidentals necessary to complete the Item.

Payment shall be made under:

Pay Item Number	Description	Unit of Measurement
615 (1)	Noise Barrier (H = 2.0 m)	Linear Meter
615 (2)	Noise Barrier	Lump Sum

Reference:

1. FHWA Highway Noise Barrier Design Handbook (Final Report, February 2000)
2. DPWH Standard Specifications for Highways, Bridges and Airports, Volume II, 2012 Edition.
 - a. Item 403 – Metal Structures
 - b. Item 409 - Welded Structural Steel.
3. Comments from Different DPWH Offices
 - a. Bureau of Construction
 - b. Bureau of Design
 - c. Bureau of Quality and Safety
 - d. UPMO-RMC2
 - e. Bureau of Maintenance