264 Noise Walls and Perimeter Walls

264.1 General

Noise abatement measures identified as reasonable and feasible during the PD&E phase are re-evaluated during final design based on detailed design data and the public involvement process. This chapter contains the process for the final noise wall analysis, reasonableness and feasibility determinations, design and public involvement concerning noise abatement during the development of the contract plans.

This chapter also contains the process for the consideration, design and incorporation of perimeter walls in the contract plans.

264.2 Noise Walls

Chapter 23 of the ***Code of Federal Regulations, Part 772 (23 CFR 772)*** entitled ***"Procedures for Abatement of Highway Traffic Noise and Construction Noise"*** contains the federal regulations for the assessment of traffic noise impacts and abatement on federal aid projects. ***Section 335.17*** of the ***Florida Statutes*** (***F.S.***) requires the use of ***23 CFR 772*** for traffic noise impact assessment on highway projects, regardless of funding type. The policy for abatement of traffic noise on Department projects and the requirements for assessing the noise impacts and abatement commitments are detailed in FDOT's Noise Policy (***Part 2, Chapter 18*** of the ***Project Development and Environment Manual (PD&E Manual) (Topic No. 650-000-001)***. The initial evaluation of noise impacts is made during the PD&E phase of a project. A commitment to perform a detailed noise analysis during final design to support the need for reasonable and feasible noise abatement measures on a project are included in the Noise Study Report (NSR) and summarized in the Environmental Document. Review the Environmental Document and any subsequent re-evaluations to identify all preliminary noise abatement commitments.

Noise abatement commitments made during the PD&E phase are subject to design changes made during final design, such as:

(1) Roadway profiles and horizontal alignments

(2) Typical section elements

(3) Land use changes

(4) Proposed ground elevation at noise wall locations.

PD&E assumptions are appropriate for preliminary reasonableness and feasibility assessment; however, the final determinations concerning noise abatement are based on the contract plans developed during final design. Coordinate with the District Noise Specialist in the District Environmental Management Office to ensure proper analysis and public involvement occurs. Final top of noise wall elevations should be based on modeled heights and coordinated with the District Noise Specialist.

Modification for Non-Conventional Projects:
Delete the above two paragraphs and replace with the following: See the RFP for noise wall requirements. If an Alternative Technical Concept proposes changes to the horizontal or vertical alignments depicted in the Concept Plans, any associated required changes to the noise wall locations must also be addressed. Any modifications or additions to noise wall location and height requirements depicted in the RFP must be approved by the Department based on the information from a Noise Study Report Addendum (NSR Addendum) provided by the Design-Build Firm. The Design-Build Firm must coordinate with the noise specialist in the District Environmental Management Office to ensure proper public involvement occurs during final design. Changes will trigger a re-evaluation, which must be approved by the Department.

If no feasible and reasonable noise abatement is identified in the Environmental Document or any subsequent environmental re-evaluations, no further effort is required during final design unless design changes are made that may affect noise impacts. However, it is still necessary to evaluate construction noise and vibration impacts and develop any Special Provisions to be included in the plans.

Modification for Non-Conventional Projects:
Delete the above paragraph and replace with the following: If noise walls are not specified in the RFP, no further effort is required during final design. If design changes are proposed, a reevaluation of traffic noise and abatement reasonableness and feasibility shall be performed. Evaluate construction noise and vibration impacts and develop the necessary Special Provisions to be included in the plans.

Consider all noise receptors identified in the Environmental Document and NSR in the final design re-evaluation. Noise receptors resulting from development completed after the approval date of the Environmental Document (Date of Public Knowledge) are not to

be considered, as the Department is not responsible for providing noise abatement at these sites.

During final design:

(1) Re-evaluate noise abatement identified as reasonable and feasible during the PD&E phase based on detailed design data or changes made during the development of final plans.

(2) Evaluate locations where significant design changes are likely to affect noise impacts and require consideration of additional noise abatement.

Document the final noise abatement measures for the project in a Noise Study Report Addendum (NSR Addendum).

Modification for Non-Conventional Projects:
Delete the above two paragraphs and replace with the following: If an Alternative Technical Concept is proposed to change the horizontal or vertical alignments depicted in the Concept Plans, any associated required changes to the noise wall locations must also be addressed. Any modifications/additions to noise wall location and height requirements depicted in the RFP must be evaluated for approval by the Department . See RFP for requirements.

See ***Structures Design Guidelines (SDG), Section 1.4.5*** for the policy on noise wall surface finishes.

264.2.1 Noise Study Report Addendum

The re-evaluation of preliminary noise abatement commitments during final design is documented in an NSR Addendum. The re-evaluation must be based on the final roadway geometry and the proposed noise abatement design, including noise wall type, location, dimensions and estimated costs. The final design re-evaluation should be conducted using the latest version of the FHWA's Traffic Noise Model (TNM).

Noise abatement measures are considered when noise levels at a receptor(s) approach or exceed the noise abatement criteria or substantially exceed existing noise levels. The noise abatement criteria are listed in ***Table 264.2.1***. Approaching the criteria means within 1 dB(A) of the noise abatement criteria. A predicted increase of 15 dB(A) or more

is considered substantial. Noise abatement is considered only for Activity Categories A, B, C, D and E.

The NSR Addendum should contain a description of the methodology for selecting final noise wall dimensions including any evaluation matrix used.

264.2.2 Noise Abatement Criteria

A noise wall should be both reasonable and feasible to be provided on the project.

264.2.2.1 Feasibility

Factors for noise abatement measures include both acoustic (noise reduction) and engineering considerations. The noise wall must attain a minimum acoustic insertion loss of 5 dB(A) to at least two impacted receptors. The insertion loss is defined as the level of noise reduction because of abatement.

Engineering factors to consider is the constructability of the noise wall; e.g., lane closures, sight distance, terrain changes, utilities, bridges, overpasses, access, maintenance, and drainage. Consideration should also be given to whether a noise wall can be constructed using standard construction methods and techniques.

264.2.2.2 Reasonableness

A noise wall is considered reasonable if it provides an insertion loss design goal of 7 dB(A) to at least one benefited receptor at a reasonable cost of $42,000 per benefited receptor or less. A benefited receptor is a receptor that receives a noise reduction at or above the minimum threshold of 5 dB(A) (whether impacted or not).

The cost reasonableness is calculated by multiplying the statewide average unit cost (per square foot) by the square footage of the noise wall and dividing it by the number of benefited receptors. The statewide average unit cost of noise wall to be used in determining cost reasonableness is established by the Office of Environmental Management. The statewide average unit cost of noise walls to be used in the calculation of the cost/benefited receptor is $30.00/ft^2. Refer to the ***PD&E Manual*** for the latest unit cost update.

Additional costs such as required right of way, special drainage features, special bridge support and special foundations associated with the installation of a noise wall should be added to the unit cost. If these additional costs increase the cost per benefited receptor

above the $42,000 limit, a determination to provide noise abatement must be made in consultation with the District Environmental Management Office, and the Office of Environmental Management (OEM), pursuant to ***Title 23 United States Code (U.S.C.), Chapter 3, Section 327*** and ***Memorandum of Understanding (MOU)*** dated December 14, 2016. Any decision to eliminate a noise wall from consideration based on the inclusion of these additional costs will require clear demonstration that the additional costs are associated only with the noise wall and cannot be mitigated by other considerations.

Do not exceed the following heights:

(1) For ground mounted noise walls use a maximum height of 22 feet. Shield non-crash tested noise walls within the clear zone.

(2) For noise walls on bridge and retaining wall structures use a maximum height of 8 feet. Walls taller than 8 feet require approval by the State Structures Design Engineer.

Modification for Non-Conventional Projects:
Delete condition (2) above and replace with the following: (2) For noise walls on bridge and retaining wall structures use a maximum height of 8 feet unless otherwise specified in the RFP.

(3) For ground mounted Traffic Railing/Noise Wall combinations use a maximum height of 14 feet.

Noise wall heights greater than those specified above require a Design Variation and project specific designs. Justification for a variation should include, as a minimum, a description of site conditions requiring the increased height and a comparison to the standard height of both insertion loss and cost per benefited receptor.

Refer to the NSR prepared during the PD&E phase for the analytical results used to evaluate noise wall heights necessary to achieve minimum, desired and optimum insertion loss. The optimum noise wall height is the most cost effective in consideration of noise reduction benefits per unit cost of the noise wall. Perform a comparative analysis to evaluate an appropriate range of noise wall configurations (height, length and roadway offset). Determine the number of benefited receptors and calculate the cost per benefited receptor for each configuration evaluated. Select a noise wall configuration that can provide the insertion loss design goal (7 dB(A)) at a reasonable cost (less than $42,000 per benefited receptor). If this is not achievable, select a noise wall configuration that optimizes insertion loss per impacted receptor and cost per benefited receptor.

The height of the noise wall is measured from the ground elevation to the top of the noise wall. Tall noise walls are seldom necessary at the top of roadway embankments or berms since the elevation of the embankment contributes to the effective height of the noise wall. In addition, changes in the vertical grade of the top of the noise wall should be gradual and abrupt changes in wall heights should be avoided. Natural ground elevations at the base of the noise wall fluctuate, even in flat terrain. Therefore, provide plan details that make clear to the contractor the final top of wall elevations, post spacing and foundation step locations. See the ***Standard Plans Instructions, Index 534-200***, and ***Indexes 521-510*** thru ***521-515*** for additional design requirements. See ***LRFD Section 15*** and ***SDG, Sections 3.16*** and ***3.18*** for the Noise Wall design criteria.

When an otherwise continuous noise wall is broken resulting in a horizontal separation between the wall sections, it is often necessary to overlap the wall sections to reduce insertion loss degradation. Examples of horizontal separation include:

- When the mainline noise wall is located at the right of way line, but is moved to the shoulder break at a bridge location.
- When transitioning from the mainline to a ramp at interchanges.

The overlap distance of noise walls is generally equal to four times the separation; however, an analysis by the Noise Specialist is necessary to determine the optimum overlap. Review the need or effectiveness of a noise wall in the infield area of an interchange during final design. The attenuation of ramp traffic may provide adequate insertion loss when considering the intersecting roadway's noise contribution. When selecting wall termini details, consider maintenance access, clear zone and line of sight.

Table 264.2.1 Noise Abatement Criteria

Noise Abatement Criteria [Hourly A-Weighted Sound Level-decibels (dB(A))]				
Activity Category	Activity Leq(h)		Evaluation location	Description of activity category
	FHWA	FDOT		
A	57	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	66	Exterior	Residential
C	67	66	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	-	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	-	-	-	Undeveloped lands that are not permitted.

Notes:

(1) Based on *Table 1 of* ***23 CFR Part 772***

(2) Activity Leq(h) criteria values are for impact determination only, and are not design standards for noise abatement measures.

(3) Activity Category B, C and E include undeveloped lands permitted for these activities.

(4) FDOT defines that a substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 decibels or more as a result of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

264.2.3 Final Noise Abatement Measures

Document the final noise abatement measures in the environmental re-evaluation and the NSR Addendum prior to construction advertisement. Refer to ***Part 2, Chapter 18*** of the ***PD&E Manual*** for required documentation in the NSR Addendum.

Modification for Non-Conventional Projects:
Replace the above paragraph with the following: Any modifications to noise abatement locations, noise wall types, lengths and heights must be documented in the NSR Addendum for approval by the Department prior to beginning noise wall construction.

The District Noise Specialist will verify that the noise walls shown in the contract plans comply with the final noise abatement measures included in the NSR Addendum.

The District Environmental Management Office will ensure that the final noise abatement measures are reflected in the re-evaluation of the Environmental Document and will obtain concurrence from OEM, if appropriate.

264.3 Perimeter Walls

Modification for Non-Conventional Projects:
Delete ***FDM 264.1.2*** and replace with the following: See the RFP for perimeter wall requirements. If an Alternative Technical Concept is proposed that changes the horizontal or vertical alignments depicted in the Concept Plans, any associated required changes to the perimeter wall locations must also be addressed. Any modifications/additions to perimeter wall location requirements depicted in the RFP must be assessed by the Department based on the information provided by the Design-Build Firm and are subject to Department approval. The Design-Build Firm must coordinate with the District Environmental Management Office to ensure proper public involvement occurs during final design.

Perimeter walls provide a barrier between a highway and adjacent properties; however, they are not intended to provide any measurable noise reduction. Benefits of perimeter walls include:

(1) minimizing visual impacts,

(2) providing a visual screen when existing vegetation is removed,

(3) providing a physical separation,

(4) maintaining access control restrictions.

The initial assessment for the use of a perimeter wall would typically be performed during the PD&E phase and documented in a Perimeter Wall Justification Report (PWJR). The final decision for the use of a perimeter wall is made during final design when the conditions and cost are available for consideration. Add decisions made during final design to the PWJR by addendum. See the ***Standard Plans Instructions, Index 534-250*** design requirements. See ***LRFD Section 15*** and ***SDG, Sections 3.16*** and ***3.18*** for the design criteria

264.3.1 Consideration of Perimeter Walls

Perimeter walls may be considered:

(1) On new construction and reconstruction projects when requested by a local municipality or group of directly affected property owners. The distance from the edge of the proposed travel lane to the closest portion of the adjacent structure should be less than 150 feet; and when one or more of the following are met:

- The capacity of an existing highway is expanded by adding lanes to the outside.
- Horizontal and/or vertical alignment of an existing highway is significantly altered as defined in the ***PD&E Manual*** (Part 2, Chapter 18, Section 18.1.3.1 Type I Projects).
- The highway project is proposed on a new alignment or location.
- Existing vegetation or other visual barriers are removed.

(2) Around Department facilities (e.g., rest areas, weigh stations), to separate the facility from adjacent land uses.

Consider the following factors when determining if a requested perimeter wall would provide a benefit:

(1) Functional Classification: Perimeter walls will not be recommended on arterial roadways where multiple openings would be required to maintain access.

(2) Context Classification; e.g., dense residential, educational facilities, recreation areas. Land on which the structure is located should be immediately adjacent to the R/W.

(3) Highway traffic is visible from the adjacent properties.

(4) No new Right of Way is required to construct the wall (further consideration will be made if Department is granted an easement from adjacent properties).

(5) Constructability, safety, cost, access, drainage and utility conflicts.

(6) Cost of perimeter wall must not exceed $25,000 for each adjacent property, including the cost of utility relocation.

To assure consistent application of these guidelines, partial or complete funding from third party sources will not be accepted and no custom designs are allowed.

See ***SDG***, ***Section 3.18*** for additional limitations on where perimeter walls may be located.

264.3.2 Restrictions on Consideration of Perimeter Walls

Perimeter walls are not considered on the following conditions unless an exception is granted by the Assistant Secretary of Engineering and Operations:

(1) Retrofitting existing conditions where highway improvements are not proposed,

(2) Mitigation of environmental impacts,

(3) Building(s) that received a building permit after the Date of Public Knowledge.

264.3.3 Local Municipality Concurrence

The Department will approach the local government during the design phase of the project to seek concurrence on the inclusion of proposed perimeter wall; including location and aesthetics. The local government will be responsible for obtaining support from the majority (simple majority) of the adjacent residents/property owners prior to construction of a perimeter wall. The local government or land owner assumes responsibility for maintenance and structural repairs of perimeter walls located on non-FDOT owned lands.

The local government or land owner will provide formal concurrence with the recommendation (resolution or letter) and a Maintenance Agreement for the perimeter wall, if applicable. Include these documents in the PWJR Addendum.

264.4 Public Involvement

Public coordination is often necessary to finalize wall locations, length and heights, color, textures and other aesthetic features. Coordinate required public involvement activities with the District Public Involvement or Community Liaison Coordinator.

264.4.1 Noise Walls

Conduct a written survey to establish that a simple majority of the benefited receptors are in favor of the construction of the noise wall. If the public is not in favor, the Department may elect not to build the wall. The Department will make the final determination on the use of noise walls if consensus cannot be reached by a neighborhood. This survey is typically conducted during final design, but may have occurred during the PD&E phase. Coordinate survey issues with the District Environmental Management Office.

Noise walls located on arterial roadways can potentially impact access. The ability to construct an effective noise wall can depend on an individual property owner's willingness to sign a right of way indenture allowing access to be cut off or modified. For these conditions, it is a general practice to obtain a written statement from each affected property owner demonstrating support for the noise wall. If an adjacent property owner declines to sign the indenture, evaluate alternative noise wall layouts to determine the effectiveness of noise abatement on the project segment. Document in the NSR Addendum that the noise wall is not feasible if the insertion loss criteria cannot be met.

264.4.2 Perimeter Walls

Coordination with the local government for the identification and design of perimeter walls may require public involvement. Public involvement may be necessary to finalize wall locations and aesthetic features, especially if there are substantial changes to conditions or previously requested needs. Coordinate required public involvement activities with the District Public Involvement or Community Liaison Coordinator.

Perimeter walls located on arterial roadways can potentially impact access. The ability to construct perimeter wall(s) can depend on an individual property owner's willingness to sign a right of way indenture allowing access to be cut off or modified. For these type projects, it is a general practice to obtain a written statement from each affected property owner demonstrating support for the perimeter wall. If an adjacent property owner(s) declines to sign the indenture the Department may elect not to build the perimeter wall. Document the final determination in the PWJR Addendum if the perimeter wall is not feasible.

264.4.3 Outdoor Advertising Signs

Section 479.25, F.S. ***"Erection of noise-attenuation barrier blocking view of sign; procedures; application"***, provides procedures and requirements for allowing permitted, conforming, lawfully erected outdoor advertising signs to be increased in height if visibility is blocked due to construction of noise walls (or "noise attenuation barriers" as referred to in the statute). The statute also provides procedures that address various coordination requirements (e.g., notification requirements, survey requirements, public hearing requirements, and approval requirements) for the involved parties. The involved parties include the Department, the local government or local jurisdiction, and the benefited receptors (or "impacted property owners" as referred to in the statute). Refer to Part 1, Chapter 11 Public Involvement, of the ***PD&E Manual*** for additional details about meeting notification requirements.