SECTION 765 - NOISE ATTENUATION WALLS

##This section cross-references Sections 173, 204, 610, 630, 631, 685 and 686.

If any of the above sections are relevant, they should be included in the specification.

If any of the above sections are not included in the specification, all references to those sections should be struck out, ensuring that the remaining text is still coherent:

765.01 DESCRIPTION

This section covers the requirements for the supply of materials and the erection of noise attenuation walls (noise walls).

765.02 GENERAL

(a) The following shall be as shown on the drawings:

 (i) type of noise wall

 (ii) acoustic requirements

 (iii) protective coatings

 (iv) foundation details.

(b) The structural design of the noise wall shall be as described in Bridge Technical Note BTN 007 Noise attenuation walls.

(c) Timber posts shall not be used.

(d) If an existing fence or noise wall is being replaced, existing timber posts shall be removed.

(e) Openings in noise walls for inspection, maintenance and emergency access shall be provided in the position and of the size and type shown on the drawings.

(f) The design life of noise panels and their fasteners and fixings shall be as follows:

 (i) posts and other structural components 50 years

 (ii) panels, panel fixings and fasteners 30 years

(g) If construction of the noise wall requires access over or work adjacent to a landscaped area, the Contractor shall take steps to minimise damage to vegetation. The Contractor must submit to the Superintendent a methodology for avoiding damage to vegetation.

(h) If a noise wall is located on or adjacent to a private property boundary, the Contractor shall ensure that there is no damage to private property including gardens, vegetation and garden furniture. Any damage to private property shall be repaired by the Contractor to the satisfaction of the Superintendent.

765.03 NOISE WALL MATERIALS

All materials shall be stable when exposed to Ultra-Violet (UV) radiation for a minimum of 10 years which shall be warranted by the supplier. All materials shall be stable when exposed to water, wind, air pollutants and temperature change.

All materials shall be supplied by the Contractor and shall also comply with the following:

(a) Steel for Posts and Panels

 Steel posts and other steel components shall be:

 (i) compliant with the Australian Standard for Structural steel - hot rolled bars and sections

 (ii) compliant with the Australian Standard for Cold-formed structural steel hollow sections

 (iii) the grade specified on the drawings

 (iv) supplied and fabricated in accordance with Section 630

 (v) galvanised in accordance with:

 • the Australian Standard for Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

 • Section 631.

**©** Department of Transport November 2018

Section 765 (Page 1 of 7)

 On completion of galvanising, components shall receive decorative coatings and finishes as specified on the drawings and/or in the landscape architectural design brief.

 Galvanised components that have been damaged or cut shall be repaired with a minimum of two coats of inorganic zinc-rich paint in accordance with the Australian Standard for [Paints for steel structures - Inorganic zinc silicate paint](http://infostore.saiglobal.com/store/Details.aspx?ProductID=374468) and the Australian Standard for Hot‑dip galvanized (zinc) coatings on fabricated ferrous articles and in accordance with Section 631.

 After repair of the galvanising, damaged paint coatings shall be repaired in accordance with Section 631.

(b) Concrete for Foundations

 Concrete for foundations shall be grade VR330/32 in accordance with Section 610.

(c) Concrete Panels

 Concrete panels shall have sufficient strength to resist the loads to which they will be subjected including the self-weight of other panels and the imposed loads due to earth pressure and other load-effects due to thermal expansion, handling and accidental impact.

(d) Transparent Panels

 (i) Panels shall be as specified on the drawings.

 (ii) Panels shall have a minimum thickness of 20 mm.

 (iii) If panel sizes are specified, the dimensions are deemed to be at a material temperature of 25ºC. The Contractor shall make allowance for temperature variations.

 (iv) Coloured or tinted transparent panels shall be as described on the drawings or in the architectural design brief.

 (v) Materials shall be scratch and fade-resistant.

 (vi) The physical properties of transparent materials shall be stable when subjected to sunlight, atmospheric gases and liquids such that the panel will retain sufficient strength and rigidity to meet the requirements of the design for the duration of the design life.

 (vii) Recycled products may be used provided that their physical properties comply with this section.

 (viii) Panels shall have a finish that minimises reflection of sunlight or vehicle headlights.

(e) Plywood Panels

 Plywood panels shall be:

 (i) compliant with the Australian Standard for Plywood - Structural

 (ii) made with structural plywood of the stress grade described on the drawings but not less than stress grade F14

 (iii) made with B‑quality softwood face and back veneers

 (iv) compliant with the shape and dimensional requirements stated in the Australian Standard for Plywood - Structural

 (v) free of spurs and splinters

 (vi) consistent in texture and appearance

 (vii) of minimum density 18 kg/m²

 (viii) branded in accordance with the Australian Standard for Plywood – Structural.

**©** Department of Transport November 2018

Section 765 (Page 2 of 7)

(f) Preservative Treatments of Panels

 Copper chromium arsenic (CCA) preservatives shall not be used.

 (i) Preservative treatments for panels shall be:

 • compliant with the Australian Standard Specification for preservative treatment - Plywood

 • applied before construction

 • applied to areas of timber revealed by cross cuts such as holes, notches and rebates in accordance with the manufactures recommendations.

 (ii) The lowest panel together with any panel in contact with the ground is to be veneer-treated to hazard level 4 in accordance with the Australian Standard Specification for preservative treatment Plywood. All other plywood is to be treated to hazard level 3.

 (iii) Veneer treatment shall be compatible with the specified stain finish.

 (iv) Panels shall be re‑dried or air-dried to a moisture content of less than 18 per cent after preservative treatment to ensure dimensional stability prior to erection.

 Treated timber shall not be re-sawn, dressed, planed or modified except as required at specified points for fitting or joining.

**HP The Contractor shall submit to the Superintendent preservation and grading certificates from the treatment plant showing chemical retention, penetration of the preservation and compliance with the requirements of the Australian Standard Specification for preservative treatment - Plywood before delivery of material to the site commences. Methods of analysis and testing of the material must comply with the Australian Standard.**

(g) Fire Resistance

 Panels shall have a low ignitability defined as an ignitability index less than 5 in accordance with the Australian Standard for methods for fire tests on building materials, components and structures and a low spread of flame (defined as a spread of flame index less than 3 in accordance with the Australian Standard).

 Materials for fire retardants for plywood shall be water-based and non-toxic.

(h) Fittings and Fastenings

 (i) Panels shall not be drilled for mounting purposes.

 (ii) Panels shall be mounted in metal channels fixed to the posts which shall include rubber or similar gaskets to grip the panels but have sufficient freedom to allow their normal range of thermal expansion and contraction without damage to the panel or posts.

 (iii) Channels shall be galvanised in accordance with the Australian Standard for Hot-dip galvanized (zinc) coatings on fabricated ferrous articles.

 (iv) All fittings and fasteners shall have a 30‑year design life and shall be suitable for external use in moderate industrial or marine environments (corrosivity categories C2 and C3 classified in accordance with ISO 9223).

 (v) The use of self-tapping, self-locking, self-loading or thread-rolling fasteners or any similar products is not permitted. Fasteners shall comprise a threaded bolt, nut and washer in a pre-drilled clearance hole.

 (vi) Fasteners for connections between channels and structural members shall be of grade 316 stainless steel that complies with ATIC‑SP39 Fasteners for Structural Purposes.

**©** Department of Transport November 2018

Section 765 (Page 3 of 7)

(i) Coatings

 Anti-graffiti coatings shall comply with Section 685 and the following requirements:

 (i) clear-film type sacrificial anti-graffiti coatings shall not be used

 (ii) liquid sacrificial anti-graffiti coatings are permitted provided that the coating is soluble in warm water

 (iii) coating shall be clear

 (iv) coating shall be applied to the extent described on the drawings or in the specification.

 Decorative coatings shall be as shown on the drawings and/or the architectural design brief and shall comply with Section 686 and shall be applied in accordance with the manufacturer’s recommendations.

 In addition to the directions and application rate recommended by the manufacturer:

 • prior to applying the stain, the panels must be clean, free of dust, and free of dirt

 • the designated colours for both front and rear panels shall be stained over the full width and height of the panel, including the edges

 • the first coat shall be an undiluted full and generous flood-coat

 • a minimum 24 hours drying time shall be allowed following the application of the first coat prior to application of the second coat.

**HP The Contractor shall submit colour samples and proposed arrangement to the Superintendent for approval not less than two weeks prior to application to the noise walls. These samples shall be applied to the specified noise wall panel material and shall be a minimum of one square metre. Each sample shall show all separate stages of coating.**

(j) Recycled Materials

**HP Noise attenuation panels made from recycled and recovered materials are permitted subject to approval by the Superintendent. The following details shall be submitted for review by the Superintendent not later than 12 weeks prior to the intended use of the panels. If requested by the Superintendent, the Contractor shall submit documents that allow materials to be traced, including:**

 (i) the composition of the materials including the systematic name of each material component and the percentage by weight in the finished product

 (ii) the proportion of recycled and recovered materials in the finished product. Definitions shall be taken from the Australian Standard for Environmental labels and declarations - Self-declared environmental claims (Type II environmental labelling)

 (iii) laboratory analysis of the finished material that demonstrates the composition

 (iv) the source of the component materials including the state of origin

 (v) full description of the process of recycling and recovery and combination of the materials including the type of machinery involved and the source, type and quantity of energy required by weight to produce the finished product

 (vi) test results that demonstrate the density of the recycled material

 (vii) test results that demonstrate the acoustic properties of the finished panel

 (viii) test results that demonstrate the strength of the material in the finished panel

 (ix) test results that demonstrate the transparency and translucence of the finished panel

 (x) test results that demonstrate the stability of the physical properties of the finished product over the required design life when exposed to sunlight and weathering

**©** Department of Transport November 2018

Section 765 (Page 4 of 7)

 (xi) test results that demonstrate the linear coefficient of expansion of the material

 (xii) the method of fixing the panel

 (xiii) the proposed size of the finished panel.

 All testing shall be in accordance with the relevant Australian Standards to the satisfaction of the Superintendent. All test reports or certificates shall be endorsed in accordance with the AS ISO/IEC 17025 accreditation for the testing laboratory.

(k) Other Materials

 Materials other than those described above may be permitted as follows:

**HP If the Contractor proposes the use of alternative materials for posts and panels, full details of the strength, durability, acoustic properties, appearance and other physical properties of the proposed material shall be submitted to the Superintendent for approval not less than 12 weeks prior to the intended use of the material.**

 **The Contractor shall supply test certificates that demonstrate compliance with the specified requirements. All test reports or certificates shall be endorsed in accordance with the AS ISO/IEC 17025 accreditation for the testing laboratory If requested by the Superintendent, the Contractor shall submit documents that allow materials to be traced to their point of origin.**

765.04 CONSTRUCTION AND INSTALLATION OF NOISE WALLS

(a) General

 Noise walls shall be free of holes or gaps. The formation of gaps or holes at the lower edges of noisewalls will lead to the passage of noise under the wall.

(b) Set Out of Noise Wall

 Noise walls shall be located in accordance with the drawings.

**HP If the Contractor proposes an alternative alignment, details of the alternative shall be submitted to the Superintendent for approval not less than four weeks prior to commencement of works.**

(c) Post Holes

**HP Prior to boring post holes the Contractor shall review their location with the Superintendent. The Contractor must seek the Superintendent’s approval of any proposed relocations.**

 Post holes shall be in the locations shown on the drawings.

 Post holes shall be covered until the post has been installed.

 Unsuitable or excess excavated material shall be removed from site on completion of the works.

(d) Foundations

 The size, type and depth of foundations shall be as shown on the drawings.

 Excavation for foundations shall be as shown on the drawings and shall comply with Section 204.

 Excavation for noise wall foundations shall include all excavation necessary to provide the specified depth of bedding, working space and space required for filling, including the removal and replacement of unsuitable material. The foundations shall be test rolled in accordance with Section 173.

 Soft or wet material that does not achieve the required ground bearing pressure stated on the drawings or does not pass the test rolling shall be treated as unsuitable material. Unsuitable material shall be excavated and replaced with 40 mm Class 3 crushed rock or cement treated crushed rock compacted in layers not exceeding 150 mm to achieve the required ground bearing pressure stated on the drawings. Replacement material shall comply with the requirements of Section 812.

**©** Department of Transport November 2018

Section 765 (Page 5 of 7)

 If the foundation is in rock, all loose rock, unsound material or water shall be removed and the surface shall be brought to the required level with blinding concrete.

**HP Prior to the placement of reinforcement and posts, the Contractor shall review the excavation for compliance with the specified requirements and shall inform the Superintendent of any unsuitable soil conditions.**

 Cast-in-place concrete surrounding foundation posts shall be brought to a level surface 100 mm above the finished surface level and shall then be tapered for a minimum distance of 300 mm from the base of the post to ensure that water drains away from the foundation.

(e) Installation of Posts

 Posts shall be straight and vertical with a tolerance of 1 in 100 of the height of the post.

 Where the design requires non‑vertical or curved posts these shall be erected to the required angle or profile with a tolerance of 1 in 100 of the height of the post.

 Tops of adjacent posts shall be level or to the grade line on the drawings with a tolerance of ± 10 mm.

(f) Installation of Panels

 Panels dimensions shall be to the sizes shown on the drawings with a tolerance of ± 5 mm in each dimension.

 Adjacent panels of stepped or sloping walls shall be stepped equally to meet the alignment of the wall or as shown on the drawings.

 Panels and planks shall be either horizontal or sloping as required on the drawings with a tolerance of ± 5 mm in 3 m.

 If the specified span for the panel cannot be achieved the Contractor shall submit details of the alternative panel length to the Superintendent for approval.

**HP The Contractor shall submit details of alternative panel lengths to the Superintendent not less than two weeks prior to commencing the fabrication of that section of the noise wall.**

 The lowest plank, panel or units of a concrete noise wall shall be continuously supported by a plain concrete rectangular spread foundation with a minimum width of the panel thickness +300 mm, and minimum depth of 150 mm. The spread foundation shall be symmetrical about the centre of the panel unless the noise wall is on a boundary in which case the position of the spread foundation shall be adjusted.

 The concrete strip foundation shall be grade VR330/32 placed and compacted in accordance Section 610.

 Top-soil shall be removed from the plan area of the strip foundation. The excavation for the spread foundation shall be treated in accordance with clause 765.04(d).

 The maximum depth of soil against the lowest concrete panel shall not exceed 150 mm.

(g) Installation of Transparent Panels

 Transparent panels shall be installed in accordance with the following requirements:

 (i) all panels shall be supplied with masking film or protective sheets on both surfaces which shall not be removed until handling and installation of the panel are complete

 (ii) care shall be taken during the installation of panels to prevent cracking, scratching or damage

 (iii) panels that are cracked, scratched or damaged shall be replaced

 (iv) panels shall be restrained vertically at posts as detailed by the drawings.

**©** Department of Transport November 2018

Section 765 (Page 6 of 7)

(h) Doors

 The Contractor shall install doors of the type and in the position shown on the drawings.

 Openings and doors shall be framed with a suitably rigid frame which shall be made from the same materials as the noise wall panels and of the same colouration.

 Doors shall be hung securely and fitted with a locking mechanism that can be operated from either side of the noise wall. All locks shall be Lockwood – Assa Abloy (334 Padlock Series) which will be supplied by VicRoads.

 **The Contractor shall give the Superintendent a minimum of four weeks notice of the need for locks.**

 Gaps at openings for doors shall be sealed to ensure minimal noise transmission.

**HP The Contractor shall submit details of the door and frame design to the Superintendent not less than two weeks prior to commencing the fabrication of that section of the noise wall.**

765.05 TEMPORARY FENCING

During construction, the Contractor shall provide temporary mesh fencing with a minimum height of 1.8 m which shall be covered with shade cloth to secure and screen any private properties and to prevent access to the freeway reserve and/or private properties by animals, people or vehicles.

765.06 SAFETY

Noise walls shall be erected in a safe manner and in accordance with the requirements of the Occupational Health and Safety Act 2004 and the accompanying Regulations.

Subject to suitable risk assessments and hazard identification the Contractor shall:

(a) employ suitable mechanical lifting devices to erect posts and panels. Mechanical lifting devices shall be stable, sited in a suitable location and shall be operated by experienced personnel;

(b) provide temporary supporting structures to ensure stability of the noise wall during erection and assembly;

(c) provide temporary access in the form of mechanical platforms and/or scaffolds if it is necessary to work at height.

765.07 DISPOSAL OF MATERIALS

On completion of the project, the Contractor shall remove all surplus excavated and fill material, unsuitable materials and noise wall materials from the site. The site shall be left in a clean and tidy condition free from contamination.

765.08 DAMAGE TO NOISE WALL COMPONENTS

The Contractor shall ensure all components are handled with care to avoid breakage, scratches and other damage. Damaged components shall be replaced at the Contractor’s expense to the satisfaction of the Superintendent.

**©** Department of Transport November 2018

Section 765 (Page 7 of 7)