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1 Purpose

To ensure *habitable rooms* of particular residential buildings located in *transport noise corridors* are designed and constructed to reduce the extent to which *transport noise* intrudes into those rooms.

2 Commencement

This version of Mandatory Part 4.4 (this QDC part):

- (a) commences on 17 August 2015; and
- (b) replaces the version of Mandatory Part 4.4 that commenced on 1 September 2010.

3 Application

This QDC part applies to building work for a *relevant residential building* if the work is the subject of a building development application made on or after 17 August 2015.

4 Referral Agency

There is no referral agency for this QDC part.

5 Associated Requirements

- (a) *Building Act 1975*
- (b) *Building Regulation 2006*
- (c) Building Code of Australia

Referenced Documents

| Number | Date | Title |
|---|------|--|
| AS/NZS 2107 | 2000 | Acoustics – Recommended design sound levels and reverberation times for building interiors. |
| AS 3671 | 1989 | Acoustics – Road traffic noise intrusion – Building siting and construction. |
| AS/NZS ISO 717.1 | 2004 | Acoustics – Rating of sound insulation in buildings and building elements – Airborne sound insulation. |
| ISO 140.3 (incorporating Amendment No. 1) | 1995 | Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Laboratory measurements of airborne sound insulation of building elements. |
| | 2013 | Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise (Department of Transport and Main Roads). |
| | 2013 | Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure (Department of Transport and Main Roads). |

| | | |
|--|------|---|
| | 2013 | State Development Assessment Provisions Supporting Information Community Amenity (Noise) (Department of Transport and Main Roads) |
|--|------|---|

6 What is a *relevant residential building*

A building is a *relevant residential building* if:

- (a) a building development application for the construction of the building is made after 31 August 2010; and
- (b) the building:
 - (i) is a class 1, 2, 3 or 4 building; and
 - (ii) is located in a *transport noise corridor*; and
 - (iii) is not a *relocated building*; and
- (c) the building development approval for the construction of the building was not given under the building assessment provisions in force immediately before 1 September 2010, under section 37 of the *Building Act 1975*.

7 What is a *relocated building*

A building is a *relocated building* if the building:

- (a) is a class 1, 2, 3 or 4 building; and
- (b) was constructed on an allotment (the *first allotment*), where it was used as a residence; and
- (c) is relocated from:
 - (i) the *first allotment* to another allotment; or
 - (ii) a site on the *first allotment* to another site on the *first allotment*.

Note: Relocated buildings are also known as removal buildings.

8 Definitions

Note: *Italicised* words within the body of the text, other than legislation titles, are defined below.

Acceptable solution means a relevant building solution which is deemed to satisfy the relevant performance requirement for the purposes of section 14 (4) (a) (ii) of the *Building Act 1975*.

Acoustically rated plasterboard means plasterboard that has been measured to achieve an R_w in accordance with AS/NZS ISO 717.1.

Acoustically rated seals means seals that have been measured with a door to achieve an R_w in accordance with AS/NZS ISO 717.1.

Annual Average Daily Traffic (AADT) has the meaning given in section 246X(7) of the *Building Act 1975*.

A-weighted sound pressure level is the level of the frequency weighted sound pressure determined in accordance with AS/NSZ 2107:2000.

BCA means the Building Code of Australia.

dB(A) means decibels measured on the 'A' weighting frequency.

External envelope means the structural elements and components of a building, including the roof, ceiling, walls and floors, which separate a *habitable room* from the exterior of the building.

Floor means a slab on ground or part of the *external envelope* which is elevated and exposed to the source of the *transport noise*, but does not include internal floors providing separation between individual sole-occupancy units or storeys.

Habitable Room has the meaning given in the BCA.

L_A is the shortened form of *A weighted sound pressure level* as defined in AS/NZS 2107:2000.

L_{A10, 18hr} means the arithmetic average of the *A-weighted sound pressure level* that is exceeded for 10% of every hour over 18 consecutive hours between 6 am and 12 midnight.

L_{A90,T} means the *A-weighted sound pressure level* that is exceeded for 90 per cent of the measuring period (T).

L_{Aeq} means an *A-weighted sound pressure level* of a continuous steady sound that within a measuring period has the same mean square sound pressure as a sound level that varies with time as defined in AS/NZS 2107:2000.

L_{Amax} means the maximum *A-weighted sound pressure level* during the nominated assessment period.

Manufacturers' specifications means specifications that that have been measured in accordance with AS/NZS ISO 717.1 for a material or system and have been approved by a *registered testing authority*.

Noise assessment means an acoustic report, prepared in accordance with Schedule 3, which identifies the *noise category* applicable to a building or site based on site testing of acoustic properties.

Noise category means the category of *transport noise* that is applicable to a building or site within a designated *transport noise corridor*, based on the amount of noise monitored or modeled for the location as indicated in:

- (a) State or Local Government records, as identified in a gazettal notice following designation of a *transport noise corridor*, or

Note: In cases where there is any inconsistency between current designations of transport noise corridors by different State and Local Government authorities, the higher of the noise categories applies.

Note: As soon as practicable after designating land as a transport noise corridor, a Local Government must include a record of the transport noise corridor in its planning scheme. Information is also held and is available for public enquiry in a State Government website.

(b) a noise assessment prepared by a suitably qualified person.

Planning scheme has the meaning given in the *Sustainable Planning Act 2009*.

Railway land has the meaning given in the *Building Act 1975*.

Registered testing authority has the meaning given in the BCA.

Relevant residential building see section 6.

Relocated building see section 7.

R_w means the “weighted sound reduction index” as specified in ISO 140-3.

Single Event Maximum Sound Pressure Level has the meaning given in the Department of Transport and Main Road’s Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure (2013).

State-controlled road has the meaning given in the *Transport Infrastructure Act 1994*.

Suitably qualified person means a person who is assessed by a building assessment manager to be a competent person in accordance with Part 5 of the *Building Regulation 2006*.

Transport noise means airborne noise originating from a *transport noise corridor*.

Transport noise reduction means the level of reduction of *transport noise* required from the façade of the building to the internal environment, as identified in Schedule 1.

Note: The predicted levels of transport noise reduction will be achieved only when doors, windows and other openings in the relevant parts of the building’s external envelope are closed.

Transport noise corridor means land designated under Chapter 8B of the *Building Act 1975* as a *transport noise corridor*.

Note: This is identified in State and Local Government records as described in a gazettal notice following designation of the transport noise corridor.

**PERFORMANCE
REQUIREMENTS**

***Relevant residential
buildings***

P1 *Habitable rooms in a relevant residential building are adequately protected from transport noise to safeguard occupants' health and amenity.*

ACCEPTABLE SOLUTIONS

A1 *The external envelope of each habitable room in a relevant residential building must comply with the minimum R_w for each building component specified in Schedule 1 to achieve a minimum transport noise reduction level for the relevant noise category by:*

- (a) *using materials specified in Schedule 2; or*
- (b) *using materials with manufacturer's specifications that, in combination, achieve the minimum R_w value for the relevant building component and applicable noise category.*

Schedule 1

| <i>Noise category</i> | <i>Minimum transport noise reduction (dB (A)) required for habitable rooms</i> | <i>Component of building's external envelope</i> | <i>Minimum R_w required for each component</i> |
|-----------------------|--|--|---|
| Category 4 | 40 | Glazing | 43 |
| | | External walls | 52 |
| | | Roof | 45 |
| | | <i>Floors</i> | 51 |
| | | Entry doors | 35 |
| Category 3 | 35 | Glazing | 38 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²) |
| | | | 35 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²) |
| | | External walls | 47 |
| | | Roof | 41 |
| | | <i>Floors</i> | 45 |
| | | Entry doors | 33 |

| <i>Noise category</i> | <i>Minimum transport noise reduction (dB (A)) required for habitable rooms</i> | <i>Component of building's external envelope</i> | <i>Minimum R_w required for each component</i> |
|-----------------------|--|--|---|
| Category 2 | 30 | Glazing | 35 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²) |
| | | | 32 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²) |
| | | External walls | 41 |
| | | Roof | 38 |
| | | Floors | 45 |
| | | Entry doors | 33 |
| Category 1 | 25 | Glazing | 27 (where total area of glazing for a <i>habitable room</i> is greater than 1.8m ²) |
| | | | 24 (where total area of glazing for a <i>habitable room</i> is less than or equal to 1.8m ²) |
| | | External walls | 35 |
| | | Roof | 35 |
| | | Entry Doors | 28 |
| Category 0 | No additional acoustic treatment required – standard building assessment provisions apply. | | |

Schedule 2

| Component of building's external envelope | Minimum R_w | Acceptable forms of construction |
|---|---------------|---|
| Glazing | 43 | Double glazing consisting of two panes of minimum 5mm thick glass with at least 100mm air gap and full perimeter <i>acoustically rated seals</i> . |
| | 38 | Minimum 14.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> ; OR Double glazing consisting of one pane of minimum 5mm thick glass and one pane of minimum 6mm thick glass with at least 44mm air gap, and full perimeter <i>acoustically rated seals</i> |
| | 35 | Minimum 10.38mm thick laminated glass, with full perimeter <i>acoustically rated seals</i> . |
| | 32 | Minimum 6.38mm thick laminated glass with full perimeter <i>acoustically rated seals</i> . |
| | 27 | Minimum 4mm thick glass with full perimeter <i>acoustically rated seals</i> |
| | 24 | Minimum 4mm thick glass with standard weather seals |

| Component of building's external envelope | Minimum R_w | Acceptable forms of construction |
|---|---------------|---|
| External walls | 52 | Two leaves of clay brick masonry, at least 270mm in total, with subfloor vents fitted with noise attenuators. |
| | 47 | <p>Two leaves of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) cavity not less than 50mm between leaves; and (ii) 50mm thick mineral insulation or 50mm thick glass wool insulation with a density of 11kg/m³ or 50mm thick polyester insulation with a density of 20kg/m³ in the cavity. <p>OR</p> <p>Two leaves of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) cavity not less than 50mm between leaves; and (ii) at least 13mm thick cement render on each face <p>OR</p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) Mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and (iii) One layer of plasterboard at least 13mm thick fixed to outside face of studs. <p>OR</p> <p>Single leaf of minimum 150mm thick masonry of hollow, dense concrete blocks, with mortar joints laid to prevent moisture bridging.</p> |

| Component of building's external envelope | Minimum R_w | Acceptable forms of construction |
|---|---------------|---|
| | 41 | <p>Two leaves of clay brick masonry at least 110mm thick with cavity not less than 50mm between leaves</p> <p>OR</p> <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³ positioned between studs; and (iii) One layer of plasterboard at least 10mm thick fixed to outside face of studs <p>OR</p> <p>Single leaf of brick masonry at least 110mm thick with at least 13mm thick render on each face</p> <p>OR</p> <p>Concrete brickwork at least 110mm thick</p> <p>OR</p> <p>In-situ concrete at least 100mm thick</p> <p>OR</p> <p>Precast concrete at least 100mm thick and without joints.</p> |

| Component of building's external envelope | Minimum R_w | Acceptable forms of construction |
|---|---------------|---|
| | 35 | <p>Single leaf of clay brick masonry at least 110mm thick with:</p> <ul style="list-style-type: none"> (i) a row of at least 70mm x 35mm timber studs or 64mm steel studs at 600mm centres, spaced at least 20mm from the masonry wall; and (ii) One layer of plasterboard at least 10mm thick fixed to outside face of studs <p>OR</p> <p>Minimum 6mm thick fibre cement sheeting or weatherboards or plank cladding externally, minimum 90mm deep timber stud or 92mm metal stud, standard plasterboard at least 13mm thick internally.</p> |
| Roof | 45 | <p>Concrete or terracotta tile or sheet metal roof with sarking, <i>acoustically rated plasterboard</i> ceiling at least 13mm thick fixed to ceiling joists, cellulose fibre insulation at least 100mm thick with a density of at least 45kg/m³ in the cavity.</p> <p>OR</p> <p>Concrete or terracotta tile or sheet metal roof with sarking, 2 layers of <i>acoustically rated plasterboard</i> at least 16mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity.</p> |
| | 41 | <p>Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling joists, glass wool insulation at least 50mm thick with a density of at least 11kg/m³ or polyester insulation at least 50mm thick with a density of at least 20kg/m³ in the cavity.</p> <p>OR</p> <p>Concrete suspended slab at least 100mm thick.</p> |
| | 38 | <p>Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity, mineral insulation or glass wool insulation at least 50mm thick with a density of at least 11 kg/m³.</p> |

| Component of building's external envelope | Minimum R_w | Acceptable forms of construction |
|---|---------------|---|
| | 35 | Concrete or terracotta tile or metal sheet roof with sarking, plasterboard ceiling at least 10mm thick fixed to ceiling cavity. |
| Floors | 51 | Concrete slab at least 150mm thick. |
| | 45 | Concrete slab at least 100mm thick OR Tongued and grooved boards at least 19mm thick with: <ul style="list-style-type: none"> (i) timber joists not less than 175mm x 50mm; and (ii) mineral insulation or glass wool insulation at least 75mm thick with a density of at least 11kg/m³ positioned between joists and laid on plasterboard at least 10mm thick fixed to underside of joists; and (iii) mineral insulation or glass wool insulation at least 25mm thick with a density of at least 11kg/m³ laid over entire floor, including tops of joists before flooring is laid; and (iv) secured to battens at least 75mm x 50mm; and (v) the assembled flooring laid over the joists, but not fixed to them, with battens lying between the joists. |
| Entry Doors | 35 | Solid core timber not less than 45mm thick, fixed so as to overlap the frame or rebate of the frame by not less than 10mm, with full perimeter <i>acoustically rated seals</i> . |
| | 33 | Fixed so as to overlap the frame or rebate of the frame by not less than 10mm, fitted with full perimeter <i>acoustically rated seals</i> and constructed of - <ul style="list-style-type: none"> (i) solid core, wood, particleboard or blockboard not less than 45mm thick; and/or (ii) acoustically laminated glass not less than 10.38mm thick. |

| Component of building's external envelope | Minimum R_w | Acceptable forms of construction |
|---|---------------|---|
| | 28 | Fixed so as to overlap the frame or rebate of the frame, constructed of - <ul style="list-style-type: none"> (i) Wood, particleboard or blockboard not less than 33mm thick; or (ii) Compressed fibre reinforced sheeting not less than 9mm thick; or (iii) Other suitable material with a mass per unit area not less than 24.4kg/m²; or (iv) Solid core timber door not less than 35mm thick fitted with full perimeter <i>acoustically rated seals</i>. |

Schedule 3

The objective of the *noise assessment* is to clearly demonstrate that the *noise category* that is applicable to a particular part of or entire building, or site. The criteria for determining the relevant *noise category* are given below in Table 1:

Table 1 – Noise category levels

| <i>Noise Category</i> | Level of <i>transport noise</i> * ($L_{A10, 18hr}$) for <i>State-controlled roads</i> and designated local government roads | Single event maximum noise* (L_{Amax}) for <i>railway land</i> |
|-----------------------|---|--|
| Category 4 | ≥ 73 dB(A) | ≥ 85 dB(A) |
| Category 3 | 68 - 72 dB(A) | 80 – 84 dB(A) |
| Category 2 | 63 – 67 dB(A) | 75 – 79 dB(A) |
| Category 1 | 58 - 62 dB(A) | 70 - 74 dB(A) |
| Category 0 | ≤ 57 dB(A) | ≤ 69 dB(A) |

* measured at 1 m from the façade of the proposed building.

Noise assessment requirements – *State-controlled Roads* and Local Government roads:

A *noise assessment* for *State-controlled roads* and Local Government roads must be undertaken in accordance with the Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise (Department of Transport and Main Roads, 2013).

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - Location of *transport noise corridor*;

- Location of proposed *relevant residential building*;
- Location of noise monitoring equipment including distance to *transport noise corridor*;
- Any other existing or proposed structures, including but not limited to buildings, barriers, walls and fences;
- Any earth mounding, cuttings or other significant topographical features.
- Site photograph indicating the position of the noise monitor.
- Type of instrument used and field calibration checks.
- Noise monitoring results including:
 - Sample times and measurement intervals (both attended and unattended);
 - Weather conditions during measurement including wind speed, wind direction and rainfall;
 - Adjustments for reflecting surfaces;
 - Description of sources other than from the *transport noise corridor* (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of any affect on the results;
 - Table summarising measured noise levels;
 - Graphical presentation of monitored noise levels using 15 minute intervals and including the $L_{Aeq, adj, 15min}$ and $L_{A90, 15min}$ parameters for a minimum continuous duration of 48 hours.
- Methodology for determining noise levels at locations other than those monitored.

2) Transport Noise Corridor Noise Predictions

- Description of the noise model used and algorithms used in prediction modelling.
- All parameters used in the model including:
 - Traffic volumes, existing and future (future volumes a minimum of 10 years from the date of the assessment must be used for design purposes);
 - Road gradient;
 - Percentage component of heavy vehicles;
 - Vehicle speed;
 - Pavement surface and any surface correction;
 - Ground cover;
 - Reflections from buildings and barriers.
- Statement of the source, accuracy and resolution of data used for:
 - Topography;
 - Road gradient;

- Receiver heights;
- Any noise barriers, walls or earth mounds.
- Verification of the noise model using the measured levels to demonstrate that the model is capable of generating accurate outputs.
- Noise prediction results including:
 - A table summarising existing noise levels and predicted future levels;
 - Statements quantifying any adjustments made to the predicted noise levels for the purpose of assessment;
 - A table presenting the calculated *noise category* for all *habitable rooms**.

* Note: For multiple storey buildings each building storey must be considered individually. The calculated *noise category* may vary from level to level, particularly where barrier effects are present due to factors such as walls, fences, buildings, and topography.

Noise assessment requirements – *Railway land*:

A *noise assessment* for *railway land* shall be undertaken in accordance with the State Development Assessment Provisions Supporting Information Community Amenity (Noise) (Department of Transport and Main Roads, 2013).

In addition, the *noise assessment* must contain the following information as a minimum:

1) Background Information and Existing Acoustic Environment

- A brief description of the project.
- A brief description of the current noise environment.
- Documentation of noise monitoring equipment and procedures.
- A site plan showing:
 - Location of *transport noise corridor*;
 - Location of proposed *relevant residential building*;
 - Location of noise monitoring equipment including distance to *transport noise corridor*;
 - Any other existing or proposed structures, including but not limited to buildings, barriers, walls and fences;
 - Any earth mounding, cuttings or other significant topographical features.
- Site photograph indicating the position of the noise monitoring equipment.
- Type of instrument used and field calibration checks.
- Noise monitoring results including:
 - Sample times and measurement intervals (both attended and unattended);

- Weather conditions during measurement including wind speed, wind direction and rainfall;
- Adjustments for reflecting surfaces;
- Description of sources other than from the *transport noise corridor* (e.g. aircraft, industry, mechanical plant, dog barking) and discussion of any affect on the results;
- Table summarising measured noise levels;
- Graphical presentation of monitored noise levels (L_{Amax} , *Single Event Maximum Sound Pressure Levels*) determined over a minimum continuous duration of 48 hours within 100m of a *railway land*.
- Methodology for determining noise levels at locations other than those monitored.

2) Transport Noise Corridor Noise Predictions

- Description of the noise model used and algorithms used in prediction modelling.
- All parameters used in the model including:
 - Percentage component of freight trains;
 - Total number of train services;
 - Vehicle speed;
 - Ground cover;
 - Reflections from buildings and barriers.
- Statement of the source, accuracy and resolution of data used for:
 - Topography;
 - Gradient;
 - Receiver heights;
 - Any noise barriers, walls or mound bases.
- Verification of the noise model using the measured levels to demonstrate that the model is capable of generating accurate outputs.
- Noise prediction results including:
 - A table summarising existing noise levels and predicted future levels;
 - Statements quantifying any adjustments made to the predicted noise levels for the purpose of assessment;
 - A table presenting the calculated *noise category* for all *habitable rooms**.

* Note: For multiple storey buildings each building storey must be considered individually. The calculated *noise category* may vary from level to level, particularly where barrier effects are present due to factors such as walls/fences, buildings and topography.

Version history

| Version | Commencement date | Publication date |
|----------------|--------------------------|-------------------------|
| 1.1 | 17 August 2015 | 17 August 2015 |
| 1.0 | 1 September 2010 | 10 August 2010 |