



P40 Specification for road-traffic noise mitigation

February 2024

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February 2024

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1 Scope

This specification covers design, construction, documentation, post-construction review, and communication and engagement related to road-traffic noise mitigation.

2 Definitions and acronyms

2.1 Definitions used in this document

Term	Definition
Noise mitigation	<p>Noise mitigation includes:</p> <ol style="list-style-type: none">1. structural mitigation (noise barriers and low-noise road surfaces), and2. building-modification mitigation (acoustic treatment of buildings) <p>as defined in <i>NZS 6806 Acoustics – Road-traffic noise – New and altered roads</i> (NZS 6806). A noise barrier can be a noise wall, noise bund or a combination of both.</p> <p>Noise mitigation also includes:</p> <ol style="list-style-type: none">3. elements in the road corridor designed to promote gradual acceleration and deceleration of vehicles to minimise disturbing noise characteristics (elements might include planting, signage, signals, road marking, lighting, road geometry)4. deliberate absence of an element from a specified location on the road surface to avoid noise generated by vehicles passing over that element (such as transverse surface joints, vertical deflection devices, ribbed audio tactile pavement markings, service and drainage covers), and5. surface and cavity treatments for mechanical joints (for example bridge movement joints). <p>Additionally, noise mitigation includes the following measures that can contribute towards a reduction in noise effects perceived by people through means other than reducing the physical noise level or characteristics:</p> <ol style="list-style-type: none">6. elements providing visual screening of vehicles that are located to reduce perception of noise (such as planting)7. community engagement that provides understanding and forewarning of upcoming changes in road-traffic noise that people will hear.
Road design	<p>The three-dimensional (3D) design for the road corridor and its surrounds, including the road, terrain/earthworks, and structures. In the context of this specification, traffic projections, the geometric design speed, and road surface design are also elements of the road design.</p>
Road-traffic noise	<p>Noise arising from vehicles travelling on legally formed roads (that is, operational noise) generated by propulsion, tyre/road interaction, aerodynamics, braking systems, or mechanical interaction.</p>
Significant variation	<p>This has the meaning specified in section 4.3.1.</p>

2.2 Acronyms

Acronym	Definition
ATPM	Audio tactile pavement marking.
GIS	Geographic information system.
NMP	Noise mitigation plan prepared and approved in accordance with section 9 of this specification.
PPFs	Protected premises and facilities, as defined in NZS 6806.
SQEP	Suitably qualified and experienced professional, as defined in section 3.

3 Suitably qualified and experienced acoustics professionals

The minimum qualifications and experience for an acoustics SQEP include:

- at least five years of relevant experience in acoustics
- at least one year of New Zealand experience in road-traffic noise
- membership, chartered, or certified status with a relevant professional body that includes a requirement to provide evidence of continuing professional development.

The Contractor shall engage SQEPs to conduct the work required by this specification.

Peer reviews shall be conducted by a SQEP who also meets the requirements for independent peer reviews set out in *Z/19 Taumata Taiao – Environmental and Sustainability Standard*.

4 Mitigation design

4.1 Computer noise models

Computer noise modelling shall be conducted in accordance with the relevant provisions of the *Waka Kotahi Guide to state highway noise mapping*, using road surface corrections set out in the *Waka Kotahi Guide to assessing road-traffic noise*.

The Contractor shall submit a GIS dataset of all input and output files for computer noise models to the principal at the same time as the associated report or noise mitigation plan (NMP).

4.2 Tier 3 noise assessment

If required, the Contractor shall conduct a tier 3 road-traffic noise assessment and submit a technical assessment report (4.2.1) and peer review (4.2.2) (where required) to the Principal for acceptance, in accordance with the *Guide to assessing road-traffic noise*.

The tier 3 design shall be based on the geometric design speed.

4.2.1 Technical assessment report

The technical assessment report for road-traffic noise shall include:

1. details of the SQEP who conducted the acoustics work, and
2. the following statement signed and dated by that person:

I have conducted the road-traffic noise assessment documented in this report in accordance with the Waka Kotahi Guide to assessing road-traffic noise. In my opinion, with consideration of the evaluations by other project team members summarised in this report, the selected noise mitigation represents the best practicable option, and the residual noise effects of the project are accurately described in this report. I have submitted a set of electronic input and output files for the computer noise model with this report.

If a peer review has been conducted, the technical assessment report for road-traffic noise shall also include:

3. details of the SQEP who conducted the peer review
4. residual issues that have not been resolved by remedial actions and comments by the peer reviewer, and
5. the following statement signed and dated by the peer reviewer:

I have conducted a peer review of this road-traffic noise assessment in accordance with the Waka Kotahi P40 Specification for road-traffic noise mitigation. Subject to the above comments, in my opinion, with consideration of the evaluations by project team members summarised in this report, the selected noise mitigation set out in this report represents the best practicable option, and the residual noise effects of the project are satisfactorily described.

4.2.2 Peer review

If required, the Contractor shall engage a peer reviewer for the technical assessment report for road-traffic noise. A peer review is always required if there are more than 50 PPFs affected by the project. The peer review shall be a specific peer review in accordance with the Engineering New Zealand *Practice Note 2: Peer review*. The scope of the peer review shall be to:

1. review the draft report and confirm whether the assessment has been conducted in accordance with the *Guide to assessing road-traffic noise*, and whether computer noise modelling has been conducted in accordance with the *Guide to state highway noise mapping* using road surface corrections from the *Guide to assessing road-traffic noise*
2. with reference to current traffic flows on existing roads in the project area, check whether future traffic flows in the computer noise model relate to an appropriate design year and are within a plausible range
3. from current aerial photographs and details of building consent checks in the draft report, confirm that all relevant PPFs have been identified for assessment and check whether road-traffic noise levels predicted at PPFs are within an expected range, based on experience with other projects and point calculations for the selected mitigation option to be made by the reviewer for at least 5% of PPFs using the Waka Kotahi *Road-traffic noise calculator*
4. identify whether any additional mitigation options should have been evaluated
5. based on experience with other projects, check whether the evaluation of mitigation options has included consideration of all relevant factors, and that the options and evaluation have been clearly documented in the report
6. check whether the selected noise mitigation options have been determined on an appropriate basis and, based on the specialist evaluations summarised in the draft report, represent the best practicable option
7. based on experience with other projects, identify whether any additional road-traffic noise effects should have been assessed
8. check whether residual road-traffic noise effects with the selected mitigation are satisfactorily described by the report

9. liaise with the person conducting the acoustics work to discuss any issues identified in steps 1 to 8 above and recommend in writing remedial actions, and
10. following implementation of the remedial actions of step 9 above, record any residual issues and comments in a statement to be inserted in the technical assessment report for road-traffic noise as set out above.

The Contractor shall provide the Principal with documentation of the peer reviewer's comments and the remedial actions taken.

4.3 Tender mitigation design

The following requirements apply if the project is subject to a tender process including design of noise mitigation, and the contract documents include a previously prepared tier 3 technical assessment report including selected road-traffic noise mitigation options.

The tender noise mitigation design shall be based on the selected noise mitigation options from the tier 3 assessment. If the tender road design varies significantly from the road design used for the tier 3 assessment, the Contractor shall undertake noise modelling and adjust the noise mitigation options as required to satisfy the compliance requirements and any other criteria specified in the contract documents.

If only part of the tender road design varies significantly, such as a reconfigured intersection, then only that part shall be re-examined.

4.3.1 Significant variations

For the purposes of this specification, a significant variation between the tier 3 road design and the tender road design shall be considered:

- a change in horizontal alignment of a traffic lane moving it 15% or more closer to a PPF, or
- a change in alignment of a traffic lane resulting in the creation of a new PPF, or
- a change in alignment of a traffic lane that may result in the NZS 6806 category for a PPF to shift from category A to B or C, or category B to C, or
- a change in the vertical alignment of a traffic lane of 1 metre or more in the absence of a noise barrier, or
- a change in the relative height of a traffic lane compared to the top of a noise barrier (or vice versa) of ± 0.2 metres or more, or
- a change in forecast traffic volume that may result in the NZS 6806 category for a PPF to shift from category A to B or C, or category B to C, or
- a change to road surfacing where it would result in a higher surface noise correction value being applied in accordance with the *Guide to assessing road-traffic noise*.

The tender submission shall include details of significant variations between the designs, and results of updated noise modelling and mitigation.

4.3.2 Building-modification mitigation

The tender mitigation design shall include allowance for building-modification mitigation at PPFs when the road design results in the following changes from the tier 3 road design:

1. a PPF shifting from a more stringent to a less stringent NZS 6806 category (for example a shift from category A to category B), or
2. an increase in noise level of 3 decibels or more at a category B PPF, when comparing the do-nothing (for altered roads) or existing (for new roads) scenario with the scenario at the design year for the project including structural mitigation.

4.4 Construction mitigation design

The Contractor shall undertake computer noise modelling for the construction mitigation design and shall document the modelling and noise mitigation in a noise mitigation plan.

The construction mitigation design shall address noise from general traffic flows and from specific sources of vehicle noise that may have noticeable characteristics.

The construction mitigation design shall address visual screening that may affect the perception of noise.

5 Noise barriers

The Contractor shall design noise barriers following the guidance contained in the Waka Kotahi *State highway noise barrier design guide*.

Noise barriers shall be constructed as early as practicable in the construction programme.

5.1 Acoustics

Noise walls (including posts and panels) shall be designed and constructed of materials that have a surface mass of at least 15 kg/m².

Other than openings designed for stormwater, there shall be no gaps between noise walls and the ground, between adjoining panels or between panels and posts. Openings for stormwater shall only be included where acoustics analysis demonstrates that predicted noise levels at PPFs are not affected.

Noise walls that are more than 2 metres high above the adjacent ground level shall have a sound insulation rating that achieves either:

- category B3 in EN 1793-2, or
- category D3 in EN 1793-6.

Certification of the noise wall sound insulation rating shall be appended to the noise mitigation plan.

5.2 Durability

Noise barriers shall be designed and constructed to last for at least the first 50 years after handover with minimal maintenance, in accordance with the Waka Kotahi *Highway structures design guide*.

The design and construction of noise barriers shall ensure that:

- acoustic performance (noise attenuation) will not degrade, and
- panels can expand and contract without compromising acoustic performance, and
- the visual appearance will not significantly degrade.

5.3 Top edges

The top edges of noise barriers shall be horizontal. Changes in barrier height shall be in gradual, consistent, and regular incremental steps. The proportion of vertical rise (V) of each step to horizontal length (H) between steps shall be no steeper than 1V:12H.

5.4 Landscaping

Space shall be provided to allow planting incorporated in the noise barrier and/or landscape design to grow as intended without unreasonable restriction.

5.5 Drainage

Routes for natural drainage flow paths shall be provided through noise barriers. Penetrations in noise barriers shall be designed with screening as required to maintain the acoustic performance.

5.6 Road safety

Noise barriers integrated with roadside safety barriers shall not be used.

Noise and road safety barriers shall be appropriately designed and located to facilitate maintenance between barriers.

6 Road surfacing

If a vertical deflection device (such as a speed hump, table or raised safety platform) is intended to be installed within 200 metres of a PPF, a cross-disciplinary assessment shall determine whether the device will be installed, and what practicable mitigation is implemented, if any.

An acoustics SQEP shall identify areas where transverse surface joints can be located to minimise potential noise effects at PPFs. Transverse surface joints shall only occur in these areas.

A SQEP shall identify areas where use of ribbed ATPM might result in frequent noise disturbance at PPFs. If ribbed ATPM are intended to be installed in any of those areas an assessment of the noise and road safety implications shall determine whether the ATPM are installed, and what practicable noise mitigation is implemented, if any.

Mechanical joint types shall be selected to minimise noise disturbance at PPFs, as far as practicable.

Mechanical joints within 200 metres of a PPF shall be installed with:

- minimised changes in finished road surface height along vehicle wheel paths approaching, passing over and leaving the joint
- sound absorbing linings in the cavity below the joint
- a solid barrier enclosing the cavity below the joint, and
- noise reducing surface plates for modular joints.

7 Road environment

7.1 Vehicles braking and accelerating

The road environment within 200 metres of a PPF in the following areas shall be designed to encourage gradual deceleration and acceleration by vehicles, including using planting and landscaping where practicable:

- signposted speed changes
- intersections or road crossings, or
- gradients greater than 4%.

The noise mitigation plan shall include plans showing details of the design elements used to encourage gradual braking and acceleration.

7.2 Visual screening

If required, planting shall be implemented to provide visual screening of vehicles on the road from PPFs, to reduce perceived noise. As a minimum, such planting shall be in locations identified as benefiting from visual screening in the tier 3 technical assessment report for road-traffic noise.

Planting for visual screening shall be implemented as early as practicable in the construction programme.

8 Public engagement

Public engagement relating to noise mitigation shall follow the guidance in the *Waka Kotahi Public engagement guidelines*. The Contractor shall incorporate the following requirements within any broader public engagement strategy and plans for the project.

The Contractor shall identify in a schedule and on plans, all noise-sensitive locations (such as houses and schools) within 2 km of the project that may experience an increase in road-traffic noise level of 1 dB or more, or a change in road-traffic noise characteristics as a result of the project, either during construction (for example due to re-routed road traffic), in an interim period before noise mitigation (such as a low-noise surface) is completed, or following completion of the project.

The Contractor shall prepare a package of noise information for all identified noise-sensitive locations regarding the change in road-traffic noise that will be experienced. This information shall include:

- links to general background information on sound, road-traffic noise, noise effects, mitigation, and frequently asked questions (information on the Waka Kotahi website can be referenced)
- a summary of project designation condition requirements with respect to noise criteria and mitigation
- a summary of noise mitigation options that were evaluated and reasons why the selected options were chosen
- details of who evaluated and selected the mitigation (such as independent experts), who approved the mitigation (for example Resource Management Act 1991 decision maker), and the role of the road controlling authority in the selection (for example accepting recommendations)
- details of the noise mitigation to be implemented
- details of when the noise mitigation will be implemented and reasons for delayed implementation of any elements such as low-noise surfaces
- a lay person's description, tailored to specific locations, of what change people should expect to hear at their houses during and after construction, without reference to decibel noise levels or criteria
- details of the post-construction review of noise mitigation that will be conducted, and reasons why reliance is not placed on noise measurements, and
- processes and contact details for raising concerns about noise, beyond the changes expected, including documenting details of specific noise disturbance.

The Contractor shall provide the package of noise information to all identified PPFs and other noise-sensitive locations within three months prior to construction, and again within one month prior to the road opening to traffic.

9 Noise mitigation plan

9.1 Contents

The Contractor shall engage a SQEP to prepare a noise mitigation plan (NMP) to demonstrate compliance with this specification, using the template available on the [Noise and vibration](#) page on the Waka Kotahi website. The NMP shall include details of:

- the author and peer reviewer, including certification statements of the NMP
- noise criteria
- noise modelling
- noise barriers, including plans showing locations, construction details, copies of statutory approvals, certification of acoustics performance, details of anti-graffiti coatings, urban and landscape design
- road surfaces, including plans showing locations and types of low-noise surfaces, plans showing areas where transverse joints are permitted, plans showing where ribbed ATPM will and will not be installed, plans showing locations and treatment of mechanical joints
- building-modification mitigation, including resources and process to investigate, manage and implement treatment, PPFs to be investigated for treatment, schedule of progress including investigation results, selected treatment and property agreements
- road environment, including elements to promote steady speed or gradual acceleration and deceleration of vehicles, and visual screening for reducing noise perception
- locations where changes in road-traffic noise may be heard, explanatory information for the public, and details of engagement with respect to noise mitigation, and
- arrangements for post-construction review.

9.2 Submission

The Contractor shall submit the NMP to the Principal for acceptance. Physical works (excluding enabling works) shall not commence until the NMP has been accepted by the Principal.

If an outline plan is required, the accepted NMP shall be submitted as part of the outline plan.

Once noise barriers have been constructed, the NMP shall be updated to reflect the as-built noise mitigation. The updated version of the NMP shall be submitted to the Principal within six months of the road opening. The Contractor shall also submit:

- an electronic copy of the final version of the NMP
- a copy of any recommendations by the peer reviewer for remedial actions to the draft NMP,
- noise mitigation GIS data and computer noise model files (as attachments or through a link to a file sharing location) to environment@nzta.govt.nz, and
- a copy of the final noise information package provided to persons identified following section 8.

9.3 Peer review

If required, the Contractor shall engage a peer reviewer for the NMP. A peer review is always required if there are more than 50 PPFs affected by the project. The peer review shall be a specific peer review in accordance with the Engineering New Zealand *Practice Note 2: Peer Review*. The scope of the peer review shall be to:

1. from review of a draft NMP, check whether the noise mitigation design and documentation has been conducted in accordance with this specification and the contract documents, and is consistent with the relevant tier 3 technical assessment report for road-traffic noise
2. from review of a draft NMP, check whether computer noise modelling has been conducted in accordance with the Waka Kotahi *Guide to state highway noise mapping* using road surface corrections from the Waka Kotahi *Guide to assessing road-traffic noise*
3. check whether road-traffic noise levels predicted at PPFs are within an expected range, based on experience with other projects and point calculations to be made by the reviewer for at least 5% of PPFs using the Waka Kotahi *Road-traffic noise calculator*
4. based on experience with other projects, identify whether any additional road-traffic noise mitigation should have been considered
5. check whether information prepared for the community in a draft NMP accurately describes in lay person's terms the change in noise that should be heard at different locations, including changes in noise character
6. liaise with the person conducting the acoustics work to discuss any issues identified in steps 1 to 5 and recommend in writing remedial actions, and
7. following implementation of the remedial actions of step 6 above, record any residual issues and comments in a statement to be inserted in the NMP.

9.4 Certification statements

Each submitted version of the NMP shall include:

1. details of the SQEP who conducted the acoustics work, and
2. the following statement signed and dated by the person conducting the acoustics work:

I have overseen the road-traffic noise mitigation design in accordance with the Waka Kotahi P40: Specification for road-traffic noise mitigation. In my opinion the noise mitigation documented in this noise mitigation plan complies with all project requirements, adequately addresses both average road-traffic noise levels and specific noises from individual vehicles, and represents the best practicable option. I have submitted a set of electronic input and output files for the computer noise model with this noise mitigation plan.

If an acoustics peer review has been conducted, the NMP shall further include:

3. details of the SQEP who conducted the acoustics peer review, and
4. residual issues and comments by the peer reviewer, and
5. the following statement signed and dated by the peer reviewer:

I have conducted a peer review of this road-traffic noise mitigation plan in accordance with the Waka Kotahi P40: Specification for road-traffic noise mitigation. Subject to the above comments, in my opinion the noise mitigation documented in this noise mitigation plan complies with all project requirements, adequately addresses both average road-traffic noise levels and specific noises from individual vehicles, and represents the best practicable option.

9.5 GIS data

A GIS dataset of as-built noise barriers, concrete safety barriers, and PPFs that have received building-modification mitigation shall be submitted with the final version of the NMP. The GIS dataset shall be supplied in ESRI shapefile format projected in NZ Transverse Mercator 2000 (NZTM2000).

9.5.1 Barriers

For barriers the data shall include a polyline for each barrier, with the height of the line being the top road-side edge of the barrier. Each polyline shall have attributes that record:

- unique identifier
- start and end X/Y coordinates
- installation date
- nominal/predominant height of top of barrier relative to ground level (to nearest 0.1 metre)
- length (metres)
- barrier panel predominant material type
- barrier manufacturer and product name
- graffiti coatings, and
- paint colour.

9.5.2 PPFs

For PPFs that have received or been offered building-modification mitigation the data shall include a polygon for each PPF. Each polygon shall have attributes that record:

- LINZ property address
- highest external predicted road-traffic noise level
- type of mitigation offered (for example ventilation and/or sound insulation)
- date of mitigation offer
- mitigation offer accepted (yes/no), and
- date mitigation completed.

10 Post-construction review

The Contractor shall conduct a post-construction review if:

- there are more than 50 PPFs affected by the project, or
- noise mitigation includes more than 100 metres of noise barrier or more than 2 lane-km of low-noise road surface.

The post-construction review shall be undertaken during the defects liability period after the final road surface has been implemented.

10.1 Purpose

The purpose of the post-construction review is to confirm the best practicable option (BPO) for noise mitigation has been implemented in accordance with the NMP. The post-construction review shall:

- verify that the noise model used to design noise mitigation, as detailed in the NMP, appropriately represents the as-built road geometry, earthworks and PPFs, and
- confirm the as-built noise mitigation has been constructed as specified in the NMP.

The post-construction review shall not be based on measurements of noise levels, as these will fluctuate from the design conditions and small changes in noise levels should not alter the BPO for noise mitigation. Where designation conditions require noise measurements to be conducted, despite these limitations, they shall be used to verify the general accuracy of the noise model.

10.2 Scope

The post-construction review shall comprise:

- noise modelling of the as-built road and mitigation
- site inspection of noise barriers
- site inspection of any road environmental treatments for noise mitigation
- site inspection of road surfaces, and
- noise measurements if required by designation conditions.

10.3 Report

The Contractor shall submit a report to the Principal for acceptance detailing the findings of the post-construction review within three months of all mitigation being implemented and no later than 18 months after the road opens.

The post-construction review report shall include:

- details of the people conducting the acoustics, traffic and road surfaces engineering work, including their qualifications and experience, and
- the following statement signed and dated by the SQEP conducting the acoustics work:

I have undertaken a post-construction review in accordance with the Waka Kotahi P40: Specification for road-traffic noise mitigation. In my opinion all noise mitigation for the project has been completed in accordance with the noise mitigation plan.

10.4 Noise modelling

The as-built geometrics, ground levels/earthworks, barriers and traffic data shall be surveyed and reviewed against the construction design.

The surveyed earthworks, road and noise barrier alignments from the as-built drawings shall be re-imported into the noise model to confirm there are no significant changes from the earthworks and road alignment used to design the noise mitigation, and from the barriers detailed in the NMP.

Traffic monitoring shall be conducted to establish traffic volumes, mix of heavy and light vehicles, and traffic speeds three to nine months after the road opening. A traffic modelling specialist shall confirm whether these data are consistent with the projected design year traffic conditions used in the noise model.

If there are changes between the as-built and construction mitigation design noise models that result in increased noise levels that change the NZS 6806 category of any PPFs, then the Contractor shall either modify the as-built noise mitigation to reduce noise levels to maintain the same NZS 6806 categories, or shall obtain written approval from the Principal for the as-built noise mitigation.

10.5 Noise barrier inspection

A site inspection shall be performed by a SQEP to confirm that noise barriers have been installed as documented in the final NMP.

An inspection shall be made from the road corridor at the closest point to each PPF or cluster of PPFs as follows:

1. the reviewer shall stand at the far edge of the far-side traffic lane, and shall have a print-out or electronic display from the noise model showing a 3D view from the inspection point looking towards the PPF(s)

2. a visual comparison shall be made of the PPF(s) as viewed on site to confirm if the visibility/screening of the PPF(s) from the road is approximately as modelled
3. a photograph shall be taken looking towards the PPF(s), and
4. if discrepancies are noted in this visual check then more detailed investigation of ground levels and barriers shall be undertaken.

The reviewer shall walk along the full length of each noise barrier and:

5. the height above local ground level of each noise wall shall be physically measured every 100 metres or each time the design height changes by 0.5 metres or more. The height shall be measured at a minimum of three locations for each wall
6. the measured wall heights shall be compared to the data in the final NMP
7. for noise bunds, a visual inspection shall be made to confirm the heights are approximately as designed, and survey data shall be reviewed to confirm the actual heights
8. a visual inspection shall be made to ensure that all noise barriers are in the positions and of the lengths shown in final NMP
9. the noise barrier constructions shall be inspected to check for any gaps, and to confirm that the materials are in accordance with the design, and
10. any drainage or maintenance openings in noise walls shall be inspected to check there is no line-of-sight from road-traffic through the openings.

Note that road safety and structural inspections/audits for barriers shall be undertaken separately in accordance with the respective requirements for those disciplines.

10.6 Road environment treatments inspection

A site inspection shall be performed by a SQEP to confirm that road environment treatments for noise mitigation have been installed as documented in the final NMP.

10.7 Road surface inspection

A site inspection shall be performed by a road surfacing professional to confirm that noise mitigation has been installed as documented in the final NMP. The inspection shall include:

1. visual inspection of low-noise road surfaces to confirm they are of the types and in the locations detailed in the final NMP
2. visual inspection of road surfaces to confirm there are no defects or features (such as service covers) likely to cause unreasonable noise from vehicles
3. visual inspection of transverse surface joints to confirm they are only in the areas identified in the final NMP
4. visual inspection of ribbed ATPM to confirm it is only in the areas identified in the final NMP
5. visual inspection of mechanical joints (for example on a bridge or flyover) to confirm they are of the types and have the surface and cavity treatments detailed in the final NMP, and
6. for any mechanical joints within 200 metres of PPFs, inspection of the longitudinal surface profile (for example relative to a straight edge or from survey data) in each vehicle wheel path across each joint extending 10 metres either side of the joint, to identify any excessive height variations or abrupt changes in angle.

10.8 Noise measurements

Road-traffic noise measurements are generally not required or preferred.

When required by designation conditions, road-traffic noise measurements shall be conducted by a SQEP in accordance with the Waka Kotahi *Noise monitoring requirements*. The reporting and data in accordance with those requirements shall include the following parameters identified as optional:

- monitoring location address
- traffic counts and heavy vehicle counts during survey
- road surface type
- screening, and
- weather parameters.

Measured noise levels shall be used to verify the general accuracy of the noise model. This model verification shall be described in the post-construction review report.

11 References

When using this specification, refer to the most recent published version of each referenced document.

Waka Kotahi NZ Transport Agency. [Z/19 Taumata Taiao – Environmental and Sustainability Standard](#).

Waka Kotahi NZ Transport Agency. [Guide to assessing road-traffic noise](#).

Waka Kotahi NZ Transport Agency. [Guide to state highway noise mapping](#).

Waka Kotahi NZ Transport Agency. [State highway noise barrier design guide](#).

Waka Kotahi NZ Transport Agency. [State highway guide to acoustic treatment of buildings](#).

Waka Kotahi NZ Transport Agency. [Road-traffic noise calculator](#).

Waka Kotahi NZ Transport Agency. [Noise monitoring requirements](#).

Waka Kotahi NZ Transport Agency. [Highway structures design guide](#).

Waka Kotahi NZ Transport Agency. [Public engagement guidelines](#).

Engineering New Zealand. *Practice Note 2: Peer review*.

New Zealand Standard. NZS 6806 Acoustics – road-traffic noise – new and altered roads.

European Standard. EN 1793-2 Road traffic noise reducing devices. Test method for determining the acoustic performance. Part 2: Intrinsic characteristics of airborne sound insulation under diffuse sound field conditions.

European Standard. EN 1793-6 *Road traffic noise reducing devices. Test method for determining the acoustic performance. Part 6: Intrinsic characteristics – In situ values of airborne sound insulation under direct sound field conditions*.