



Noise and Vibration Control and Monitoring during Construction

Transport Scotland is committed to employing best practicable means during construction works to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors arising from construction activities.

The contractors have to undertake construction works so that, in compliance with the Forth Crossing Act 2011, the noise and vibration effects of the construction of the scheme are not worse than the residual effects identified in the Environmental Statement (ES) and the Reports to Inform an Appropriate Assessment (RIAs - that protect internationally recognised ecological habitats). The Forth Replacement Crossing Code of Construction Practice sets out controls, processes and methods to be followed to comply with the obligations. Chapter 1 of the Code of Construction Practice includes an explanation of general measures such as management plans which are necessary parts of the controls the Contractor will put in place during construction; Chapter 2 sets out the community engagement to be undertaken and Chapter 3 includes provisions relating to working hours. Together with Chapter 5 which covers control of construction noise and vibration, these sections of the Code of Construction Practice cover the main protective measures relating to the control of noise and vibration during construction of the project. The Code of Construction Practice is available on the project website at http://www.transportscotland.gov.uk/files/documents/projects/forth-replacement/FRC_CoCP_Rev5_Dec_2010.pdf.

The measures set out in the Code of Construction Practice resulted from dialogue with stakeholders and it contains additional controls, processes and methods agreed during the Scottish Parliament's consideration of the Forth Crossing Bill before it was enacted.

A Noise Liaison Group has been formed which includes the Employer's Representative (Transport Scotland's lead representative on the project), representatives from local authorities, Scottish Natural Heritage and Marine Scotland. The Noise Liaison Group provides oversight of all aspects of noise planning, control during construction and monitoring to provide assurance that construction works are being undertaken in accordance with the Environmental Statement, RIAs and the Code of Construction Practice.

In accordance with the Code of Construction Practice each contractor has provided a Noise and Vibration Management Plan (NVMP) that describes the measures to be implemented to control and mitigate noise and vibration during construction together with details regarding monitoring systems to be employed during construction. The NVMPs for the three main contractors have been reviewed by the Noise Liaison Group and have been approved. The NVMPs are available on the project website (<http://www.transportscotland.gov.uk/road/projects/forth-replacement-crossing/information/construction-docs>).

In summary, compliance with the Project's noise commitments is ensured by:

- Planning construction activities before they are undertaken; and then
- Monitoring the activities once they are being undertaken.

Planning Construction Activities

In accordance with the Code of Construction Practice, each contractor must undertake an assessment of the likely noise and vibration levels associated with construction of the project as part of planning its works and assuring the implementation of best practicable means to minimise noise (including vibration) and demonstrating that construction works will be carried out in accordance with the project's commitments. These assessments are being prepared by each contractor either on an activity-by-activity basis or for fixed periods of time (e.g. 3 months). Each assessment is submitted to the Employer's Representative and the Noise Liaison Group for review and approval. Works cannot start until written approval is in place.

Monitoring Construction Activities

A range of monitoring is undertaken to ensure compliance with the noise commitments. This includes monitoring: working hours, construction method, equipment, and site access as well as monitoring of noise and vibration levels.

Monitoring locations are set out in the contractors' approved Noise and Vibration Management Plans. The locations include a number of continuous monitoring stations at locations agreed during Scottish Parliament's consideration of the Forth Crossing Bill before it was enacted.

Reporting Construction Noise

A principle of the noise commitments that the noise effects due to construction of the works are not worse than those identified reported in the Environmental Statement. Consistent with best practice, the Environmental Statement assessed noise from the main construction activities; it therefore considered noise on a month-by-month basis, noting that day-to-day noise would be sometime higher and sometimes lower than the monthly levels.

Demonstrating compliance with the commitments therefore means that monitored noise levels need to be presented on a monthly basis. Reports from each contractor will be available on the project website. These reports will show noise levels for the previous month and will be available on the website once they have been reviewed and approved by the Noise Liaison Group.

In accordance with the Code of Construction Practice maximum noise levels are being monitored as well as ambient construction noise levels (a description of acoustic terms is presented at the end of this note).

The construction noise levels being reported each day (and, as required, evening, night-time and weekends) for each monitoring location use a standardised format that has been developed with and agreed by the Noise Liaison Group. The standardised format is shown at the end of this note. Separate charts will be produced for each relevant time period during which construction works were undertaken. In addition to monitored noise levels, the relevant thresholds from the Code of Construction Practice will be shown to allow the contractors' performance in complying with the Code of Construction Practice and Environmental Statement to be illustrated.

As noted in the Code of Construction Practice, the maximum noise from day-to-day sources that are not connected in any way with construction of the project may exceed the thresholds set in the Code of Construction Practice (e.g. aircraft, lorries, dogs barking etc). The thresholds are determined based on the pre-construction ambient noise levels, as explained in the Code of Construction Practice. Therefore when the measured noise exceeds these thresholds, an investigation is triggered and an investigation report produced by the contractor concerned. Each investigation report identifies the noise source involved and, if the source is construction works associated with the project, whether additional noise reduction measures can be applied. These reports are generated as soon as possible and before the next shift in the case of night-time works.

The contractors' performance in relation to control of noise and vibration and compliance with the Code of Construction Practice, Environmental Statement, Appropriate Assessments and their noise and vibration assessments are monitored by the Noise Liaison Group as part of the procedures to ensure compliance and implementation of any improvements necessary.

Investigation reports are reviewed by the Noise Liaison Group and will be included as appendices to the noise monitoring reports. Any specific reviews carried out by the Noise Liaison Group will be described in the monitoring reports.

Questions

Any questions about noise and vibration can be raised with Transport Scotland or the contractors.

A dedicated project hotline and email have been set up for all enquiries for the Forth Replacement Crossing project.

Project hotline: 08000786910
email: enquiries@forthreplacementcrossing.info

You can also visit our Contact and Education Centre and speak directly to the contractors' Community Liaison Team representatives from Transport Scotland:

Forth Replacement Crossing Contact Centre
Ferry Muir Gait
South Queensferry
West Lothian
EH30 9SF

Normal Opening Hours:

Monday 0900 - 1730
Tuesday 0900 - 1730
Wednesday 0900 - 1730
Thursday 0900 - 1730
Friday 0900 - 1730
Saturday 1000 - 1600

Further information regarding the Contact and Education Centre is available on the project website at <http://www.transportscotland.gov.uk/road/projects/forth-replacement-crossing/community-engagement/Contact-and-Education-Centre>.

Terminology

Decibel (dB)

The ratio of sound pressures which we can hear is a ratio of $10^6:1$ (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' and the associated measurement unit is the decibel (dB).

dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The (A) denotes 'A' weighting. This mimics the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

The 'A' weighting can also form part of a subscript for a noise indicator, such as L_{Aeq} for the 'A' weighted equivalent continuous noise level.

Equivalent Continuous Sound Level (L_{eq}) or 'Total' Noise Level or 'Ambient' Noise Level

An index for assessment for overall noise exposure is the equivalent continuous sound level, L_{eq} . This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

For example the $L_{Aeq,T}$ value represents the A-weighted equivalent continuous sound level as measured over time period T (For FRC, this may be a 10 hour working day (Saturday) or 11 hour working day (Weekday) period or over any single one hour period during an evening, at night time or on a Sunday).

The total daily noise level is the overall measured noise level ($L_{Aeq,T}$ value) at each receptor for the relevant time period. It includes a contribution from background non-construction related noise levels which has been established through the monitoring undertaken for the Environmental Statement and subsequent baseline monitoring undertaken by the contractor and a contribution from noise due to construction activities. The contribution to the overall noise level from construction activities is shown as the total daily construction noise level.

The L_{Aeq} (monthly) value represents the average overall noise levels for each month, on a calendar month basis for each of the times periods and days defined in the Code of Construction Practice.

Maximum Noise Level (L_{max})

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response.

The A-weighted maximum level measured with fast time weighting is denoted as $L_{Amax, F}$.

Maximum noise levels are generally reported either as the maximum noise level for an sound 'event' (e.g. a car passing) or the maximum noise level over a period of time (For FRC, this may be a 10 hour working day (Saturday) or 11 hour working day (Weekday) period or over any single one hour period during an evening, at night time or on a Sunday).

Daytime, Evening and Night Time Periods

Normal working hours are defined in Section 3.4 of the Code of Construction Practice as follows:

Main crossing: Monday to Saturday 0700 to 1900 hours with a 30 minutes start-up time between 0700 and 0730 on each day.

Road Sections: Monday to Friday 0800 to 1900 hours and Saturday 0800 to 1800 hours with a 30 minutes start-up time prior to 0800 hours on weekdays.

The daytime, evening and night-time periods for reporting construction noise are as follows:

Main Crossing:

Daytime: 0700 – 1900
Evening: 1900 – 2200
Night: 2200 – 0700

Road Sections:

Daytime: 0800 – 1900 (1800 on Sat/Sun)
Evening: 1900 – 2200 (1800 on Sat/Sun)
Night: 2200 – 0800

Standardised Format for Presentation of Construction Noise Monitoring Results

