



# CENTRAL SECTION PROJECT

## Noise from Fixed Installations for Deep-Level Stations (Crossrail Information Paper D25)

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Learning Legacy Document



## 1 General

The purpose of these requirements is to specify the limits of noise and vibration for fixed installations in deep-level stations as required by assurances 461 to 465 (inclusive) and 517 to 518 on the Register of Undertakings and Assurances. See also Crossrail Information Paper D25.

The *Contractor* shall design, procure, install and commission equipment and measures to control the effects of noise and vibration from the operation of fixed installations as required by Undertaking and Assurance number 517 given in Volume 2A of the Works Information (WI).

The term "fixed installations" shall mean all mechanical plant and equipment, including:

- power supply facilities e.g. transformers; and
- mechanical ventilation and air conditioning equipment associated with Crossrail buildings including those located at control rooms and stations.

The *Contractor* shall work in a collaborative manner with the *Project Manager* and the Systemwide Contractors to ensure that all parties can meet their obligations regarding noise from fixed installations.

The *Contractor's* noise and vibration specialist shall be involved throughout the design, procurement, installation and commissioning of fixed installations and shall attend regular meetings with the *Project Manager*.

The *Contractor* shall attend regular meetings with the *Project Manager*, Systemwide Contractors, the local authority and any other necessary stakeholders throughout the design, procurement, installation and commissioning of fixed installations to support the *Project Manager's* consultation with the local authority and any other necessary stakeholders.

These requirements apply to environmental noise and are in addition to any noise requirements for occupational health reasons that have been included in specifications for items of fixed installations given in Volume 2C of the WI.

The vibration requirements of fixed installations in deep-level stations are covered by the mechanical specifications given in Volume 2C of the WI.

## 2 Assessment Method

The *Contractor* shall adopt BS 4142:1997 (Method for Rating industrial noise affecting mixed residential and industrial areas) for the assessment of noise from fixed installations. The *Contractor* shall use the criteria specified below for fixed installations that is founded upon the difference between the noise from the fixed installations (expressed in terms of the rating level) and the background noise (expressed in terms of the  $L_{A90,T}$  noise level). In all cases, a +5dB acoustic features correction shall be added to the Specific Noise Level so as to obtain the Rating Level as per Section 8 of BS4142:1997, to account for the fixed installations' distinguishing characteristics.



### 3 Background Noise Levels

The background noise levels used in the assessment shall be the levels agreed with the local authority. These are specified in the background noise report (D25) given in Volume 2C of the WI.

### 4 Noise Design Criteria

The *Contractor* shall design, procure, install and commission fixed installations to meet the design criteria for residential and community buildings specified below. In meeting these criteria the *Contractor* shall:

- exclude any surrounding fixed installations not associated with the *Contractor*, such as forced ventilation shafts;
- exclude public address systems and audible warning systems;
- include all forms of mitigation;
- include an allowance for calculation uncertainty;
- assess for the worst-case scenario for the operation of the fixed installations during both Crossrail operational hours, and Crossrail non-operational hours. All assumptions shall be submitted to and accepted by the *Project Manager* prior to proceeding with the assessment;

#### **Residential buildings**

For residential buildings, the *Contractor* shall design, procure, install and commission fixed installations to meet a noise rating of 10dB below the background noise level.

The *Contractor* shall assess noise levels at all residential buildings likely to be affected by noise from fixed installations.

The *Project Manager* must be notified at least 7 months prior to procurement if the *Contractor* is of the opinion that it may not be practicable to meet a noise rating of 10dB below the background noise level at any of the noise sensitive receptors. Where such a situation arises, the *Contractor* shall submit proposals for alternative noise design criteria to the *Project Manager* for acceptance. The proposals must be accompanied by a Noise Justification Report, which demonstrates that all reasonable endeavours will be used to minimise noise from fixed installations. The Noise Justification Report shall include, but not limited to:

- consideration of reasonable alternatives for plant and/or noise attenuation equipment.
- relative impacts, as a minimum: cost, space, technical feasibility, appearance if external to the station, and any planning consent requirements and implications.

#### **Community Buildings**

The *Contractor* shall design, procure, install and commission fixed installations to meet the design criteria given in BS 8233:1999 (Sound insulation and noise reduction for buildings - Code of practice) and as accepted with the *Project Manager*.

The *Contractor* shall assess noise levels at any community buildings impacted by the station. Community buildings shall include, but not be limited to, schools, hospitals, libraries, doctor's surgeries.

## 5 Demonstration of Compliance with Design Criteria

Not later than 4 months prior to the commencement of procurement of fixed installation equipment by the *Contractor* or by C610 (whichever is sooner), the *Contractor* shall produce and submit a fixed installations noise demonstration report to the *Project Manager* for acceptance. The report shall include:

- a description of the fixed installations and operating modes;
- the assumptions for the assessment as previously agreed with the *Project Manager* including the worst-case scenario for the operation of the fixed installations;
- the calculated rating and assessment levels at the most sensitive receptors under the range of operational modes anticipated, including noise from mechanical fan operation (if applicable);
- details of the performance of noise mitigation incorporated into the design of the station, and headhouse structures;
- further to the methodology of BS4142, rating noise levels shall be reported as façade levels, in octave bands ranging from 63Hz to 8kHz.
- a description of the limitations to any further mitigation being practicable;
- Noise Justification Report if one has been prepared, and
- details of the proposed methods for commissioning and acceptance testing;

Not later than 3 months prior to the commencement of procurement of fixed installation equipment by the *Contractor*, the *Contractor* shall submit the accepted fixed installations report to the C610 Contractor the inclusion in their demonstration report to the local authority for comment.

The *Contractor* shall consider the local authority's comments relating to their works and shall prepare a formal response to the local authority stating which comments have been incorporated and which have not including a justification and submit it to the *Project Manager* for acceptance. Once the *Project Manager* has accepted the revised report, the *Project Manager* shall submit the accepted report and formal response to the local authority's comments to the local authority.

## 6 Commissioning and Compliance with Design Criteria

The *Contractor* shall undertake a full suite of commissioning and acceptance testing as specified in the final fixed installations noise demonstration report. The *Contractor* shall submit a test report to the *Project Manager* for acceptance. The test report shall present the results of the commissioning and acceptance testing and demonstrate compliance with the agreed design criteria, including the reasonable endeavours taken to reduce the noise below the design criteria. The content and format of the test report shall be agreed with the *Project Manager* prior to the *Contractor* producing and submitting it to the *Project Manager*. If the test report does not



demonstrate compliance with the agreed design criteria, the *Contractor* shall agree corrective measures with the *Project Manager* to achieve compliance. The corrective measures shall be implemented and the *Contractor* shall undertake another full suite of commissioning and acceptance testing as specified in the final fixed installations noise demonstration report, and re-submit the test report to the *Project Manager* until it is accepted.

## 7 Interfaces with other parties, including third parties

The *Contractor* shall work in a collaborative manner with the *Project Manager* and the Systemwide Contractors to ensure that all parties can meet their obligations regarding noise from fixed installations. This will include, but not be limited to:

- attendance of interface meetings, and
- provision of information and briefing materials relating to noise from fixed installations.

The *Contractor* shall attend regular meetings with the *Project Manager*, Systemwide Contractors, the local authority and any other necessary stakeholders throughout the design, procurement, installation and commissioning of fixed installations to support the *Project Manager's* consultation with the local authority and any other necessary stakeholders. The *Project Manager* shall be notified immediately if any change in the design or construction of the station may impede or otherwise hinder the ability of C&L to achieve their requirements for fixed installations. Such changes may include reductions or conflicts in space for equipment and noise control measures. All such changes must be submitted to the *Project Manager* for acceptance.