



# METHOD FOR ESTABLISHING BACKGROUND NOISE LEVELS FOR FIXED INSTALLATION ASSESSMENTS

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Learning Legacy document

## 1 Purpose

To provide approved guidance to contractors in relation to undertaking background noise surveys and processing the subsequently acquired data.

## 2 Scope

This concerns surveys undertaken for the purposes of establishing the background noise levels in relation to 'Crossrail Information Paper D25 – Noise from Fixed Installations' (Approved Version 3 – 23/04/08).

## 3 Definitions

The definitions and symbols are provided in British Standard BS4142:1997 'Method for Rating industrial noise affecting mixed residential and industrial areas'.

## 4 Context

This document was developed in consultation with the relevant local authorities through the Crossrail Environment Health Sub-Group and the Fixed Noise Source Working Group. Advice of external noise experts was sought and taken into account.

## 5 Reference Documents

'Establishing the Background Noise for Fixed Noise Sources'  
Crossrail EHO Sub-group – Fixed Noise Source Work Group  
05/09/2011

## Establishing the Background Noise for Fixed Noise Sources

### 1. Introduction

Assurances 461 to 465 and 517 to 518 in the Crossrail Register of Undertakings & Assurances set out the requirements for the treatment of fixed noise sources for Crossrail. Assurance 464 in particular addresses the issue of background noise as defined in BS 4142:1997:

*“Determine the relevant  $LA_{90,T}$  levels, to be jointly established with the relevant local authorities.”*

Notwithstanding that these levels have been established with the relevant local authority at some locations, the local authorities through the auspices of the Planning Forum and the Environmental Health Officers Sub-group have requested that a common guidance be developed that can be applied to all the local authorities where there are fixed noise sources where the background has not yet been established. In response to this request a Fixed Noise Sub-group to the main EHO Sub-group has been constituted to address this specific issue. The purpose of this paper to the Fixed Noise Source Sub-group is to set out the outcome of the group's consideration of the issues and resolution of the matters discussed.

The Sub-group noted that:

- There is no standardised approach how to determine  $LA_{90,T}$ ;
- There are no common standards for Local Authorities London wide;
- BS4142 gives guidance and PPG makes reference to BS4142 on how to determine  $LA_{90,T}$ ;
- Background noise level can vary quite substantially throughout day, between days and, importantly often between weekdays and weekends;
- $LA_{90,T}$  that needs to be jointly established between Crossrail and the LA's should be **typical** of the quiet period when the fixed plant would be operating and assessed over a sufficient period of time to be **representative**.

### 2. Crossrail Information Paper (IP) D25

During the parliamentary phase of the Crossrail Bill, discussions took place on noise from fixed sources and the position reached was set out in IP D25. The primary focus was on the application of the rating procedure of BS 4142 rather than on the technical detail of how to determine the background noise level.

The principal objective of IPD25 was therefore to introduce precision into the interpretation of the rating process of BS 4142. It did not address matters relating to noise measurement, and relied on the guidance in the Standard.

### 3. British Standard 4142

BS 4142:1997 provides a rating procedure which requires knowledge of (1) the specific noise level; (2) the necessity to apply an acoustic feature correction (e.g. +5dB for tonal character); and (3) the background noise level. The determination of the background level is the principal topic addressed in this paper. It is defined in BS 4142 as *“background noise level,  $LA_{90, T}$ , The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number of decibels”*.

#### 4. Explanation of L<sub>A90</sub>.

In the definition of L<sub>A90</sub> quoted from paragraph 3.10 of the Standard in section 3 above, the value of T, the time interval, is not specified numerically. In section 7.1.2 the advice is *“Ensure that the measurement time interval is sufficient to obtain a representative value of the background noise level. NOTE. The background noise level can often be significantly affected by meteorological conditions, particularly where the main background noise sources are remote from the assessment location. In such cases, it may be necessary to repeat the background noise measurements on a number of occasions to obtain a representative measurement sample. More than one assessment may be appropriate.”*

Further advice is given in 7.1.2 to 7.1.4 as follows:

*“7.1.3 Make measurements during periods when the background noise level is typical of the background noise when the specific noise source is or will be operating, but is not actually operating at the time of measurement.*

*7.1.4 Measure the background noise level during periods when weather conditions are appropriate to the assessment similar to those which prevail when the specific noise level is determined, or are likely to be similar to those during the operation of a new or modified noise source.”*

and 7.2 advises:

*“7.2 New or modified specific noise source*

*Measure the background noise on days of the week and at times of the day when the specific noise source will be operating.”*

Informative (rather than normative) examples are given in Appendix A - *“Examples of how to use the standard to obtain noise ratings”* - which variously use L<sub>A90, 15 minutes</sub>, L<sub>A90, 30 minutes</sub> and L<sub>A90, 60 minutes</sub>. However, a cautionary note is added: *“These examples are merely meant to illustrate how the standard could be applied and are not to be taken as a definitive interpretation of how it should be used”*

In example 3, the first to use L<sub>A90, 60 minutes</sub>, a comment is given in parentheses *“(a relatively long measurement was used because of the fluctuating level – the background level can be measured over a longer time than the reference time period).”*

This is important as it indicates that one way to address a fluctuating background is to extend the measurement period.

Additional guidance appears in Planning Policy Guidance 24: Planning and Noise published by the Department for Communities and Local Government:

*“Since background noise levels vary throughout a 24 hour period it will usually be necessary to assess the acceptability of noise levels for separate periods (eg day and night) chosen to suit the hours of operation of the proposed development. Similar considerations apply to developments that will emit significant noise at the weekend as well as during the week”, and*

*“Because background noise varies during the day, the background noise level determined should be representative of a typical quiet period during the working day.”*

### 5. The EHO Sub-group's Agreed Approach

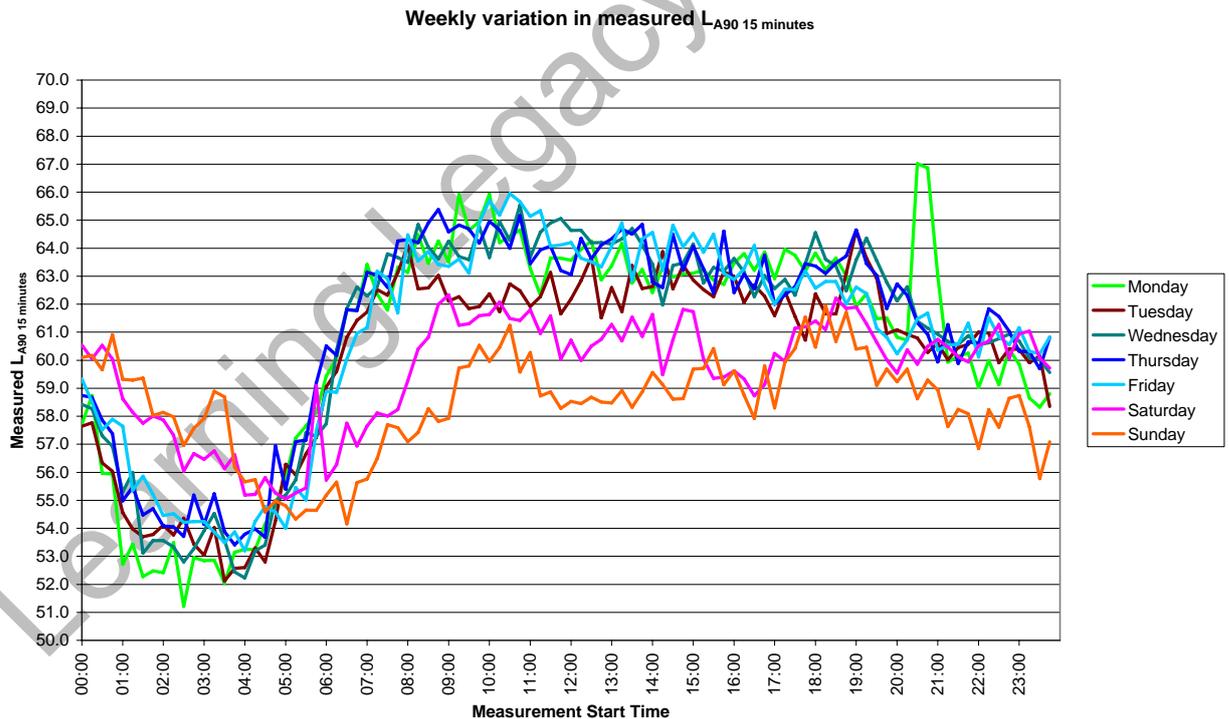
The approach agreed in the Sub-group is to:

- Where background noise levels have already been agreed there will be no change.
- For locations where noise monitoring to determine the background for fixed noise sources has not yet been undertaken the hourly  $L_{A90}$  values will be determined by measurement. Monitoring positions will be agreed with the relevant local authority. Where practicable the microphone shall be placed in accordance with clause 5.3 of BS4142.
- In the case of completed surveys which measured only shorter periods with the measurement normally starting on the hour, Crossrail and the relevant local authority will negotiate the appropriate representative values on a case by case basis.

The hourly figure will be selected as the background, corresponding to the times when the fixed plant will be operating, determined separately for weekdays and weekends using the weekday and weekend averages. In selecting the appropriate figures, the detailed survey results would be inspected, and spurious data (untypical high or low) discarded, using professional judgement.

An example of the application of this process is as follows:

#### Example to Show Hourly & Daily variations in Measured $L_{A90}$ , 15 minutes



#### Example Hourly Dataset

Time	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Monday	56.9	52.7	52.5	52.7	53.7	57.1	60.7	62.7	63.7	64.7	64.7	63.2	63.6	63.4	63.0	63.0	63.7	63.3	63.4	61.8	62.0	60.6	59.5	58.9
Tuesday	56.9	54.0	53.9	52.8	53.1	56.4	60.0	62.4	62.9	62.0	62.3	62.1	62.5	62.5	63.1	62.7	62.5	61.5	62.1	62.7	60.8	60.4	60.6	59.7
Wednesday	57.6	54.3	53.2	53.6	53.3	56.3	60.5	63.0	63.9	64.1	64.5	64.6	64.4	64.3	63.1	63.3	62.9	62.8	63.4	63.5	61.8	60.8	60.7	60.1
Thursday	58.1	54.8	54.2	54.1	54.1	56.8	61.0	63.2	64.7	64.5	64.7	63.7	63.7	64.6	63.1	63.4	63.0	62.6	63.4	63.1	61.8	60.4	61.2	60.2
Friday	58.2	56.0	54.4	54.3	54.4	56.7	59.2	62.9	64.0	64.0	64.4	63.8	63.8	64.5	63.6	63.2	63.7	63.5	63.6	62.9	61.9	61.0	60.9	60.8
Saturday	60.3	58.1	57.0	56.5	55.3	55.8	56.5	58.0	60.4	61.5	61.7	61.1	60.5	61.1	60.8	59.9	59.2	60.6	61.6	61.0	60.1	60.3	60.6	60.4
Sunday	60.2	59.1	57.7	57.8	55.2	54.6	55.2	56.9	57.7	59.5	60.3	58.8	58.5	58.7	59.0	59.8	58.9	59.8	61.2	60.0	59.2	58.3	57.7	57.3

