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FANUC HOUSE, 1 STATION APPROACH, RUISLIP

NOISE AND VIBRATION IMPACT ASSESSMENT REPORT

Report 13472.NVIA.01.RevA

For:

RS Station Approach Ltd (RSSA)

The Michelin Building

81 Fulham Road

London

SW3 6RD

Site Address	Report Date	Revision History
Fanuc house, 1 Station Approach, Ruislip, HA4 8LF	28/01/2016	Original: 04/01/2016 Revision A:28/01/2016

Contents

List of Attachments

1.0 INTRODUCTION

KP Acoustics Ltd, Britannia House, 11 Glenthorne Road, London, W6 0LH, has been commissioned by RS Station Approach Ltd (RSSA), The Michelin Building, 81 Fulham Road, London, SW3 6RD, to undertake an environmental noise and vibration assessment at Fanuc house, 1 Station Approach, Ruislip, HA4 8LF, and assess the suitability of the site for a new residential building in accordance with the provisions of the National Planning Policy Framework and the Noise Policy Statement for England (NPSE).

This report presents the results of the environmental survey undertaken in order to measure prevailing background noise levels and outlines any necessary mitigation measures.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 Procedure

A noise survey was undertaken at the proposed site as shown in Figure 13472.SP1. The locations were chosen based on accessibility and collecting data representative of the worst-case levels expected on the site due to all nearby sources.

Continuous automated monitoring was undertaken for the duration of the survey between 11:30 on 03/12/2015 and 10:30 on 04/12/2015.

Weather conditions were generally dry with light winds and therefore suitable for the measurement of environmental noise. The measurement procedure fully complied with ISO 1996-2:2007 Acoustics "Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels".

In addition to the noise survey, an assessment of vibration was carried out. This survey addressed rail and road traffic from the adjacent railway line and bus stations. Background and local sources vibration measurements were conducted between 11:15 and 11:30 on 03/12/2015.

The manual vibration measurements position was located at ground floor level inside the existing building at 1 Station Approach, Ruislip to the South side of the same. Measurements were made of vertical (z-axis) and horizontal (x - y axes) vibration levels from a number of vibration events.

2.2 Equipment

The equipment calibration was verified before and after use and no abnormalities were observed.

The equipment used was as follows.

- Svantek Type 957 Class 1 Sound Level Meter
- Svantek Type 958 Class 1 Sound Level Meter
- Dytran accelerometer, Model 3100D24
- B&K Type 4231 Class 1 Calibrator

3.0 RESULTS

3.1 Noise Survey

The $L_{Aeq: 5min}$, $L_{Amax: 5min}$, $L_{A10: 5min}$ and $L_{A90: 5min}$ acoustic parameters were measured throughout the duration of the survey. Measured levels are shown as time history in Figure 13472.TH1 and 13472.TH2. Average daytime and night time noise levels are shown in Table 4.1.

3.2 Vibration Survey

The results of the background and vibration measurements are shown in Figures 13472.VS1-3 as acceleration levels over the 1Hz to 80Hz frequency range.

4.0 DISCUSSION

The site is bounded by Pembroke Road to the North, Station Approach to the West and South, and existing residential apartments to the East. At the time of the survey, the background noise climate was solely dominated by road traffic noise from the surrounding roads.

Table 4.1 shows the average noise levels ($L_{Aeq,}$ 5 minutes) measured for the duration of the survey throughout both daytime and night-time.

	West Façade. Level dB(A)	East Façade. Level dB(A)
Daytime $L_{Aeq,16hour}$	67	62
Night-time $L_{Aeq,8hour}$	63	56

Table 4.1 Site average noise levels for daytime and night time

5.0 NOISE IMPACT ASSESSMENT

5.1 Noise Assessment

Internal noise requirements are normally based on BS8233:2014 *'Guidance on sound insulation and noise reduction for buildings'*. This standard recommends internal noise levels for good or reasonable resting conditions during daytime (07:00-23:00 hours) and night-time (23:00-07:00). These levels are shown in Table 5.1.

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Rooms	35 dB(A)	-
Dining	Dining Room/area	40 dB(A)	-
Sleeping (daytime resting)	Bedrooms	35 dB(A)	30 dB(A)

Table 5.1 BS8233 recommended internal background noise levels

The external building fabric would need to be carefully designed to achieve these recommended internal levels. It is currently assumed that the non-glazed external building fabric elements of the proposed development would be comprised of a composite brickwork and metsec build up as described in Table 6.1. This would contribute towards a significant reduction of ambient noise levels in combination with a good quality double-glazed window configuration, as shown in Section 6.

5.2 Vibration Assessment

BS6472-1:2008 '*Guide to evaluation of human exposure to vibration in buildings*' defines the vibration magnitudes at which complaints are likely to occur. These are defined by a series of standardised curves against which measured vibration values are compared.

Curve 1 may be considered as the threshold of human perception of vibration, so any levels below Curve 1 would not be tactile. In dwellings, the minimum vibration thresholds equating to a "low probability of complaints" is Curve 1.4 during night-time and Curve 2 for daytime.

Figures 13472.VS1-3 compare vibration acceleration magnitudes for rail and road traffic pass-bys to the BS6472 curve family. The z-axis vibration level, which is the most important when annoyance is considered, is below the threshold of perception and would, consequently, not constitute a significant concern for this development.

With regards to structural or cosmetic damage to the building, this is considered significant in the frequency range above 4Hz. The small increase around 12Hz, which is seen in the attached Figure 13472.VS3, would not be considered to present any danger to the shell of the building.

6.0 EXTERNAL BUILDING FABRIC SPECIFICATION

Sound reduction performance calculations have been undertaken in order to specify the minimum performance required from glazed and non-glazed elements in order to achieve the internal noise levels shown in Table 5.1, taking into account average and maximum noise levels monitored during the environmental noise survey.

As a more robust assessment, L_{Amax} spectrum values of night-time peaks have also been considered and incorporated into the glazing calculation in order to cater for the interior limit of 45 dB L_{Amax} for individual events, as specified in BS8233:1999.

6.1 Non-Glazed Elements

It is assumed that the non-glazed building façade would be comprised of a metal frame system described in Table 6.1. This construction would be anticipated to provide a sound reduction performance of at least the figures shown in Table 6.1 when tested in accordance with BS EN ISO, 140-3:1995.

Element	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
Brickwork and Metsec(1 x 18.0 mm cement particle board + Steel stud (1.0-1.6 mm) + 100.0 mm mineral wool (48kg/m3) + 2 x 15.0 mm SoundBloc 15mm)	36	47	53	58	52	54

Table 6.1 Non-glazed elements assumed sound reduction performance

6.2 Glazed Elements

Minimum octave band sound reduction index (SRI) values required for all glazed elements to be installed are shown in Table 6.2. The performance is specified for the whole window unit, including the frame and other design features such as the inclusion of trickle vents. Sole glass performance data would not demonstrate compliance with this specification.

Glazing performance calculations have been based on average measured night-time noise levels as recommended by BS8233:1996. The combined most robust results of these calculations are shown in Table 6.2.

Glazing Type	Octave band centre frequency SRI, dB					
	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
North, South and West Elevations	26	36	45	45	45	45
East Elevation	27	26	33	39	39	47

Table 6.2 Minimum required glazing performance

With regards to the introduction of acoustic trickle vents, we would recommend any system with a minimum rated acoustic performance of 44 dB, $D_{n,e,w}$, should natural ventilation be required.

All major building elements should be tested in accordance with BS EN ISO 140-3:1995.

Independent testing at a UKAS accredited laboratory will be required in order to confirm the performance of the chosen system for an "actual" configuration.

No further mitigation measures would be required to achieve good internal noise levels.

7.0 CONCLUSION

An environmental noise assessment has been undertaken at Fanuc house, 1 Station Approach, Ruislip, HA4 8LF. Measured noise levels have allowed the proposal of a robust glazing specification, which would provide internal noise levels for all residential environments of the development in the design range of BS8233:2014.

The mitigation measures described would be sufficient to protect the proposed residential properties from external noise and vibration intrusion, and to achieve internal noise and vibration conditions for the residents which would be commensurate to all current Standards.

Report by

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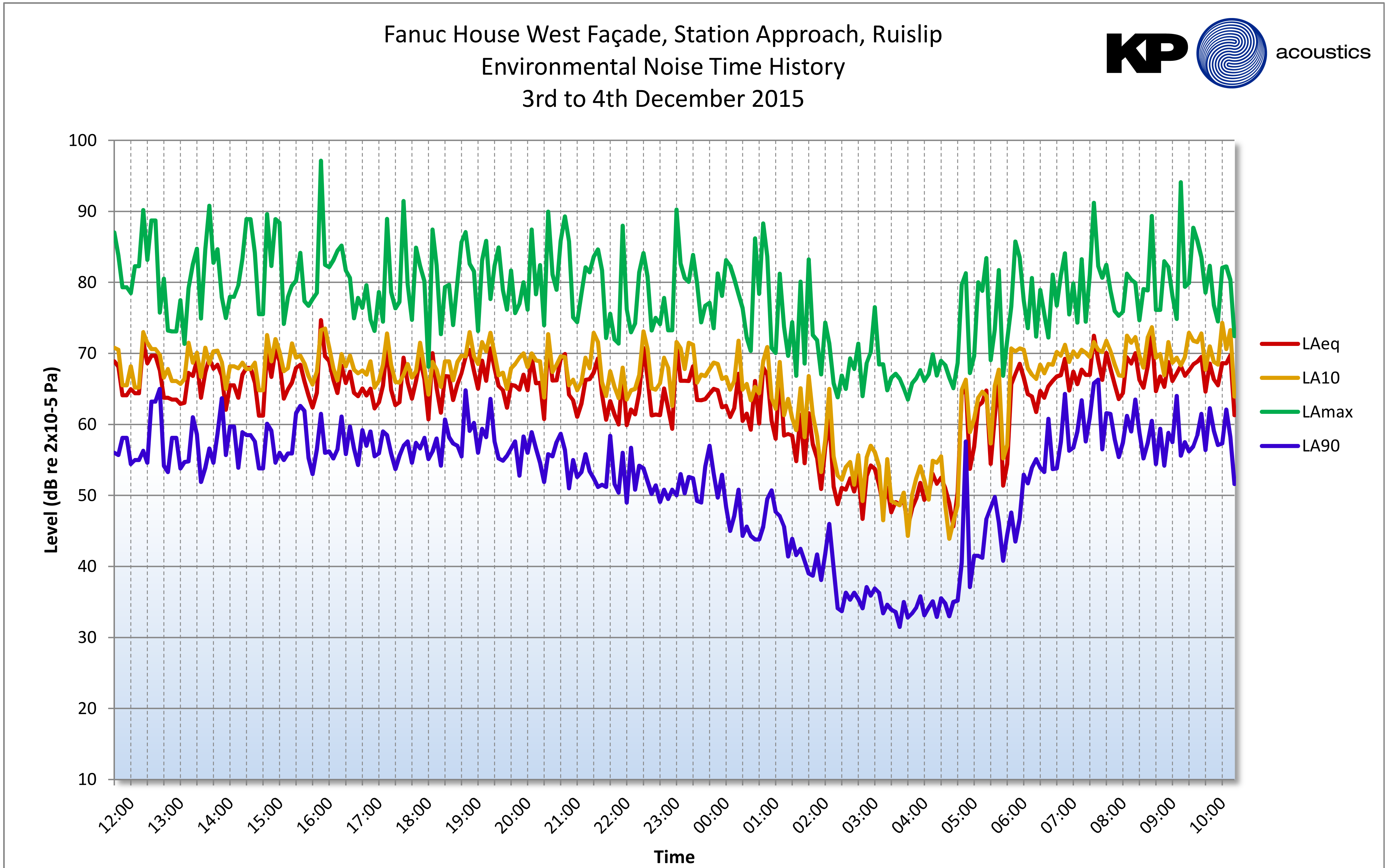


Figure 13472.TH1

Fanuc House West Façade, Station Approach, Ruislip
Environmental Noise Time History
3rd to 4th December 2015

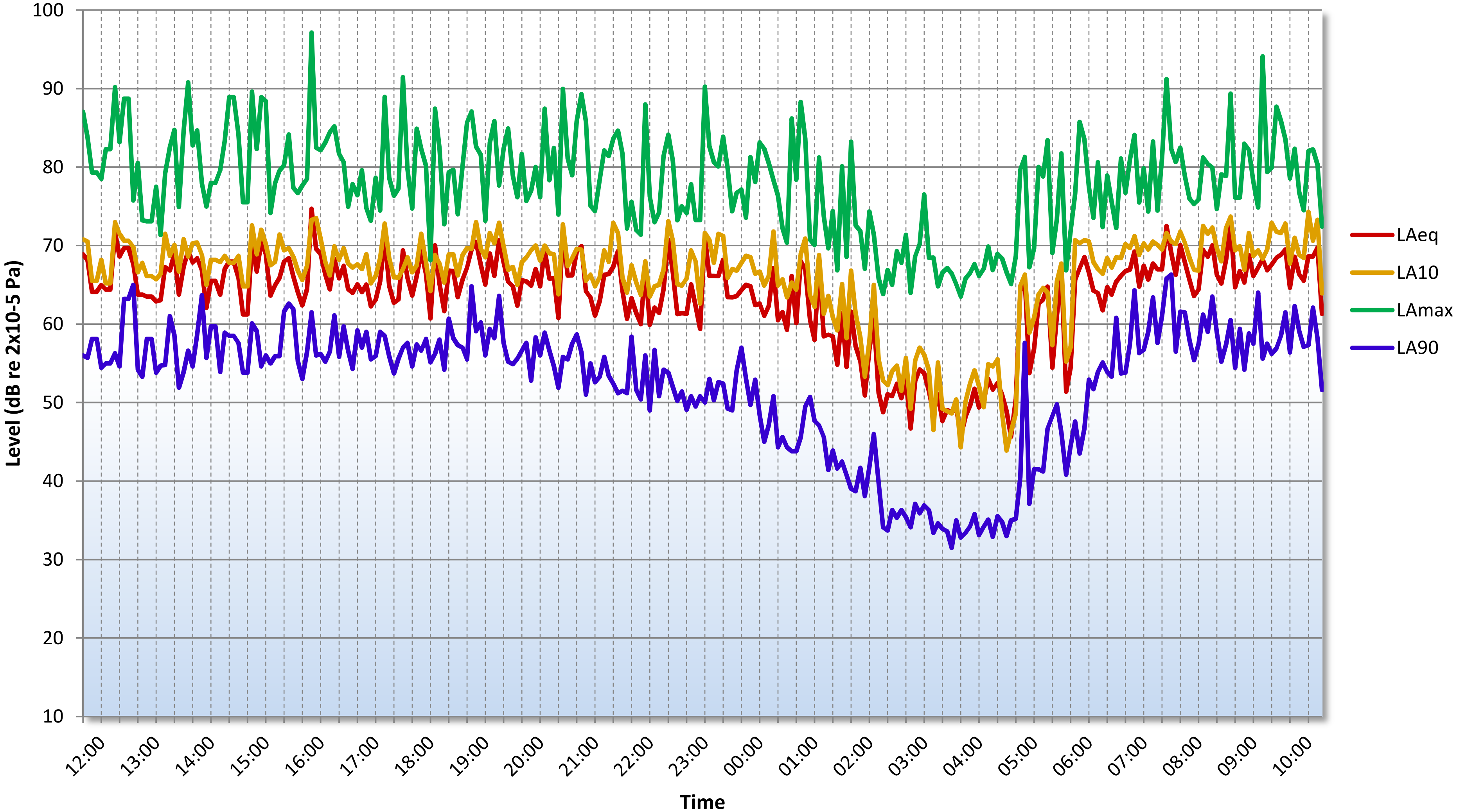
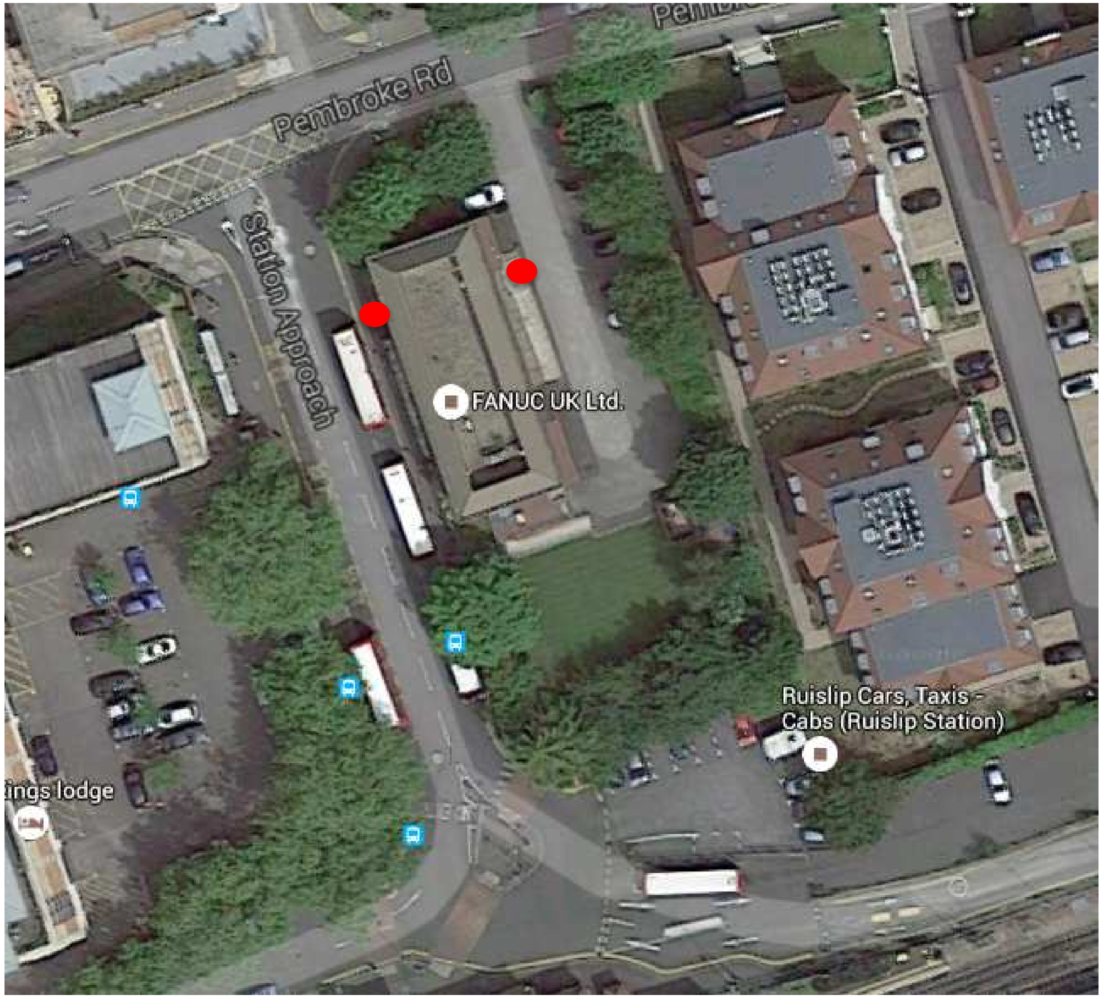


Figure 13472.TH1



Noise monitoring positions

Title:

Indicative site picture showing unattended noise monitoring location.

Source: Google maps

Date: 4 January 2016

FIGURE 13472.SP1

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MAXIMUM HORIZONTAL VIBRATION LEVELS

X-AXIS

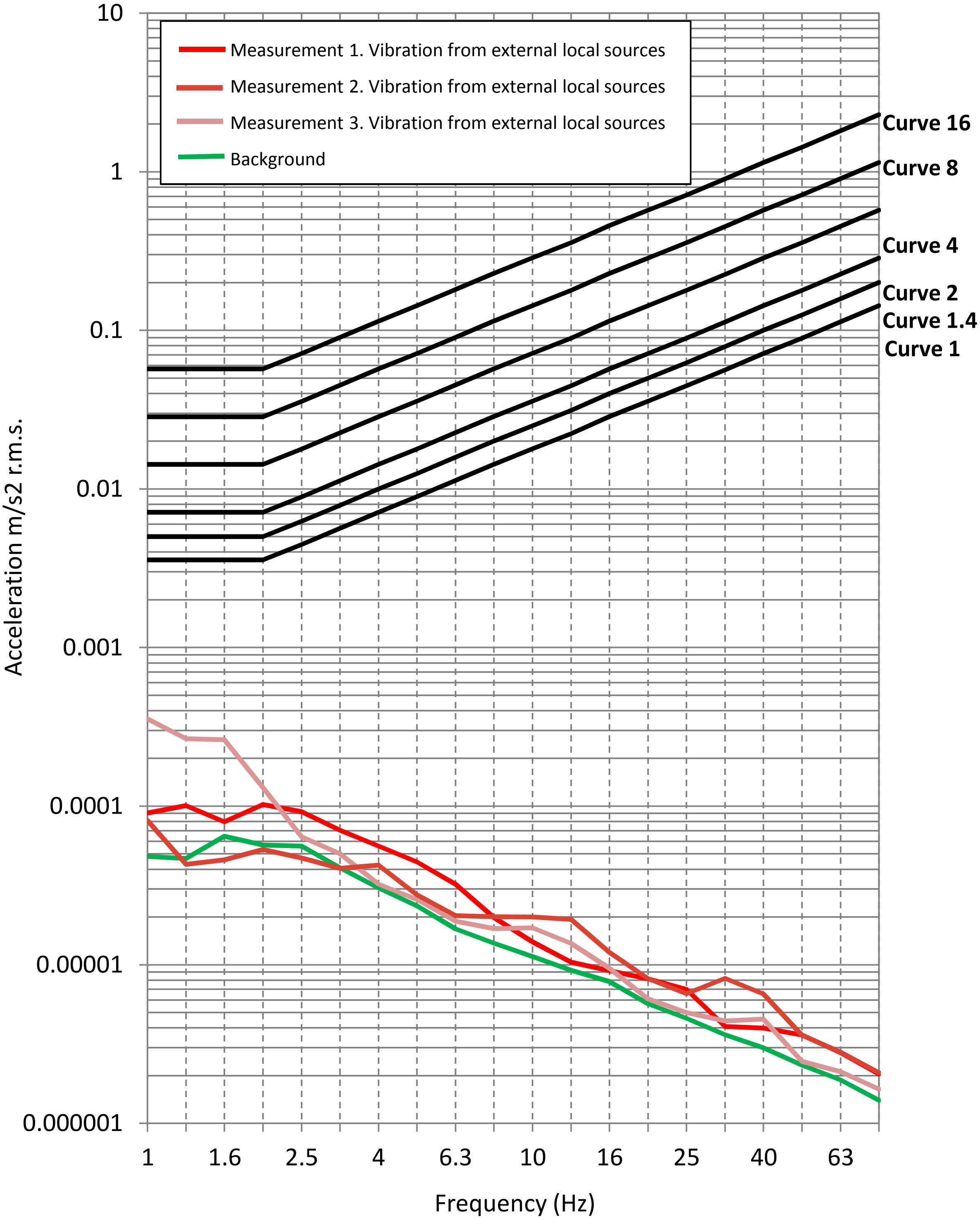

Figure 12523.VS1

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MAXIMUM HORIZONTAL VIBRATION LEVELS

Y-AXIS

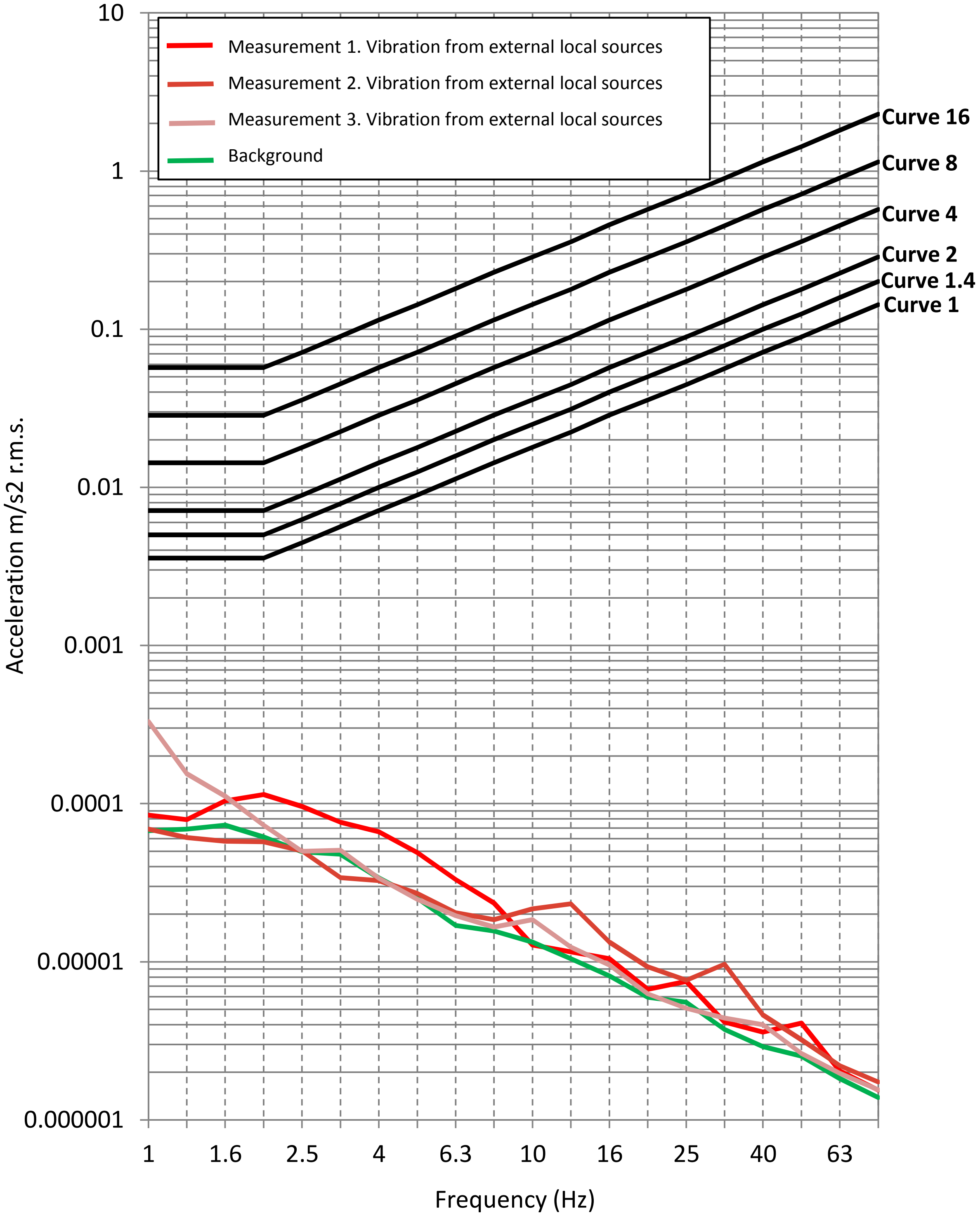

Figure 12523.VS2

FANUC HOUSE, 1 STATION APPROACH, RUISLIP

MAXIMUM VERTICAL VIBRATION LEVELS

Z-AXIS

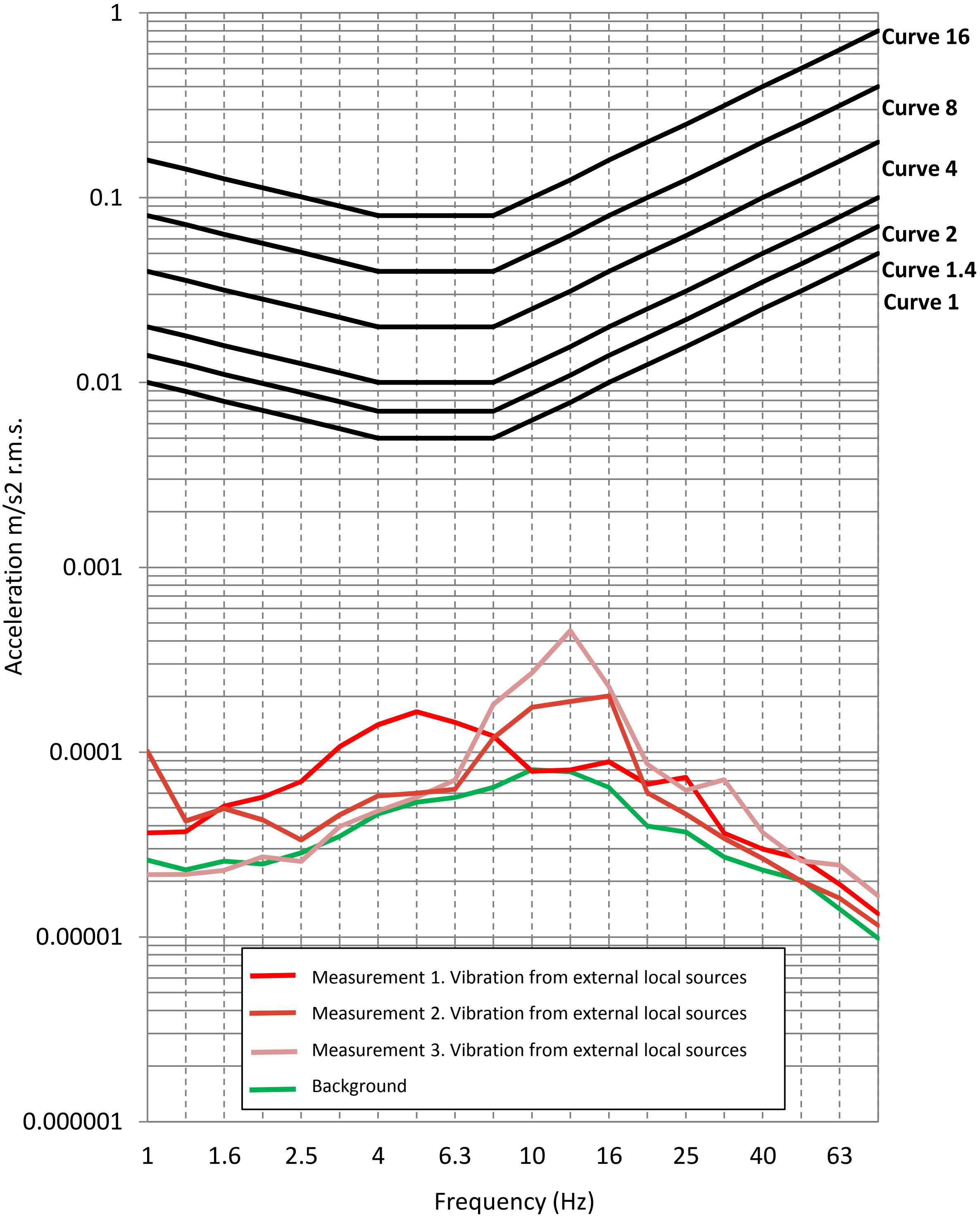

Figure 12523.VS3

APPENDIX A

GENERAL ACOUSTIC TERMINOLOGY

Decibel scale - dB

In practice, when sound intensity or sound pressure is measured, a logarithmic scale is used in which the unit is the 'decibel', dB. This is derived from the human auditory system, where the dynamic range of human hearing is so large, in the order of 10^{13} units, that only a logarithmic scale is the sensible solution for displaying such a range.

Decibel scale, 'A' weighted - dB(A)

The human ear is less sensitive at frequency extremes, below 125Hz and above 16Khz. A sound level meter models the ears variable sensitivity to sound at different frequencies. This is achieved by building a filter into the Sound Level Meter with a similar frequency response to that of the ear, an A-weighted filter where the unit is dB(A).

L_{eq}

The sound from noise sources often fluctuates widely during a given period of time. An average value can be measured, the equivalent sound pressure level L_{eq}. The L_{eq} is the equivalent sound level which would deliver the same sound energy as the actual fluctuating sound measured in the same time period.

L_{10}

This is the level exceeded for no more than 10% of the time. This parameter is often used as a "not to exceed" criterion for noise.

L_{90}

This is the level exceeded for no more than 90% of the time. This parameter is often used as a descriptor of "background noise" for environmental impact studies.

L_{max}

This is the maximum sound pressure level that has been measured over a period.

Octave Bands

In order to completely determine the composition of a sound it is necessary to determine the sound level at each frequency individually. Usually, values are stated in octave bands. The audible frequency region is divided into 11 such octave bands whose centre frequencies are defined in accordance with international standards. These centre frequencies are: 16, 31.5, 63, 125, 250, 500, 1000, 2000, 4000, 8000 and 16000 Hertz.

Environmental noise terms are defined in BS7445, *Description and Measurement of Environmental Noise*.

APPENDIX A

APPLIED ACOUSTIC TERMINOLOGY

Addition of noise from several sources

Noise from different sound sources combines to produce a sound level higher than that from any individual source. Two equally intense sound sources operating together produce a sound level which is 3dB higher than a single source and 4 sources produce a 6dB higher sound level.

Attenuation by distance

Sound which propagates from a point source in free air attenuates by 6dB for each doubling of distance from the noise source. Sound energy from line sources (e.g. stream of cars) drops off by 3dB for each doubling of distance.

Subjective impression of noise

Hearing perception is highly individualised. Sensitivity to noise also depends on frequency content, time of occurrence, duration of sound and psychological factors such as emotion and expectations. The following table is a guide to explain increases or decreases in sound levels for many scenarios.

Change in sound level (dB)	Change in perceived loudness
1	Imperceptible
3	Just barely perceptible
6	Clearly noticeable
10	About twice as loud

Transmission path(s)

The transmission path is the path the sound takes from the source to the receiver. Where multiple paths exist in parallel, the reduction in each path should be calculated and summed at the receiving point. Outdoor barriers can block transmission paths, for example traffic noise. The effectiveness of barriers is dependent on factors such as its distance from the noise source and the receiver, its height and construction.

Ground-borne vibration

In addition to airborne noise levels caused by transportation, construction, and industrial sources there is also the generation of ground-borne vibration to consider. This can lead to structure-borne noise, perceptible vibration, or in rare cases, building damage.

Sound insulation - Absorption within porous materials

Upon encountering a porous material, sound energy is absorbed. Porous materials which are intended to absorb sound are known as absorbents, and usually absorb 50 to 90% of the energy and are frequency dependent. Some are designed to absorb low frequencies, some for high frequencies and more exotic designs being able to absorb very wide ranges of frequencies. The energy is converted into both mechanical movement and heat within the material; both the stiffness and mass of panels affect the sound insulation performance.