Appendix 5.4D

Noise Level Calibration of Acoustic Modelling Software

1 INTRODUCTION

1.1 To validate the results obtained with the acoustic modelling software, Odeon, the simulated results should be calibrated against measurement results.

1.2 In this appendix, the procedures for the calibration are described. The simulation results were compared with the measurement results to demonstrate the accuracy of the software.

2 RELEVANT EVENTS AND MEASUREMENTS

2.1 On-site measurements were conducted at the Mong Kok Stadium to obtain data for the calibration. Details of the event are listed in **Table 2-1**. Noise levels were recorded at the following locations in the Mong Kok Stadium:

   A) on the platform of the south stand;
   B) on the western side of the roof of the ancillary facilities building behind the south stand (next to Flower Market Road);
   C) on the eastern side of the roof of the ancillary facilities building;
   D) at the ground level outside the stadium (near the western car park of the stadium).

   The locations of measurements are indicated in **Figure 3-2**.

Table 2-1 Measured Event in Mong Kok Stadium

Event	2018 FIFA World Cup Qualifier: Hong Kong vs Qatar
Measurement Date	8th September 2015
Measurement Time	21:15-21:45
Attendance	6396
Average Temperature and Relative Humidity at King's Park during the Event	27.0°C, 70.5%

2.2 The noise data collected were analysed and the Leq (30min) recorded are listed in **Table 2-2**. The background noise level was estimated to be 58.7 dB(A). The contribution due to background noise should be removed from the measured noise levels before comparing with the modelling results.

Table 2-2 Measured Noise Levels at different locations of Mong Kok Stadium

Location	A	B	C	D
Recorded SPL, dB(A)	83.0	71.7	71.3	62.7
SPL without background, dB(A)	83.0	71.5	71.0	60.4

2.3   The locations of measurement devices and the buildings of Mong Kok Stadium were photographed for record. This information served as a reference for modelling the noise propagation in the following section.

3   3D MODELLING

3.1   Acoustic modelling for the Mong Kok Stadium was performed, which took into account the building design. A 3D model of stadium and its surrounding was built according to photographic records of the stadium and information obtained from the Architectural Services Department. A view of the model is illustrated in **Figure 3-1**. Typical sound absorption and scattering properties for various building components were adopted in the model.

3.2   The spectators were represented by a number of point sources. 87 sources were distributed on the 4 spectator stands of Mong Kok Stadium in the model. As the event was a full-house event, the sources were evenly placed over the stands. They were configured to face towards the centre of the football field. Their sound power frequency spectrum and directivity profile were the same as in the models of MPSC in other sections of this EIA report.

3.3   The distribution of the sources and the location of the receivers (i.e. measurement points) can be found in **Figure 3-2** and **Figure 3-3** respectively. The sound power level per person was 85.4 dB(A), which was determined in **Appendix 5.4B**. The modelling results at the receivers are listed in **Table 3-2**.

Table 3-2 Modelling Results of the Event

| [in unit dB(A)]	Simulated SPL	Measured SPL	Difference
Location A	85.4	83.0	2.4
Location B	76.3	71.5	4.8
Location C	76.9	71.0	5.9
Location D	61.3	60.4	0.9

3.4   The simulated results of Location D agreed with the measurements very well. The results of the other locations indicated some overestimation.

4   FINDINGS

4.1   To demonstrate the validity of the results from the acoustic modelling software Odeon used in the noise impact assessment of the MPSC, a calibration exercise has been implemented.

4.2   Noise measurement was done in a real life sports event held in a stadium. A 3D model of the stadium was built for the simulation of noise with the software Odeon.

4.3 The software Odeon results were close to or higher than the measured results. This calibration exercise indicated that the results from Odeon simulations were conservative.

Figure 3-1   3D model of Mong Kok Stadium and its surroundings
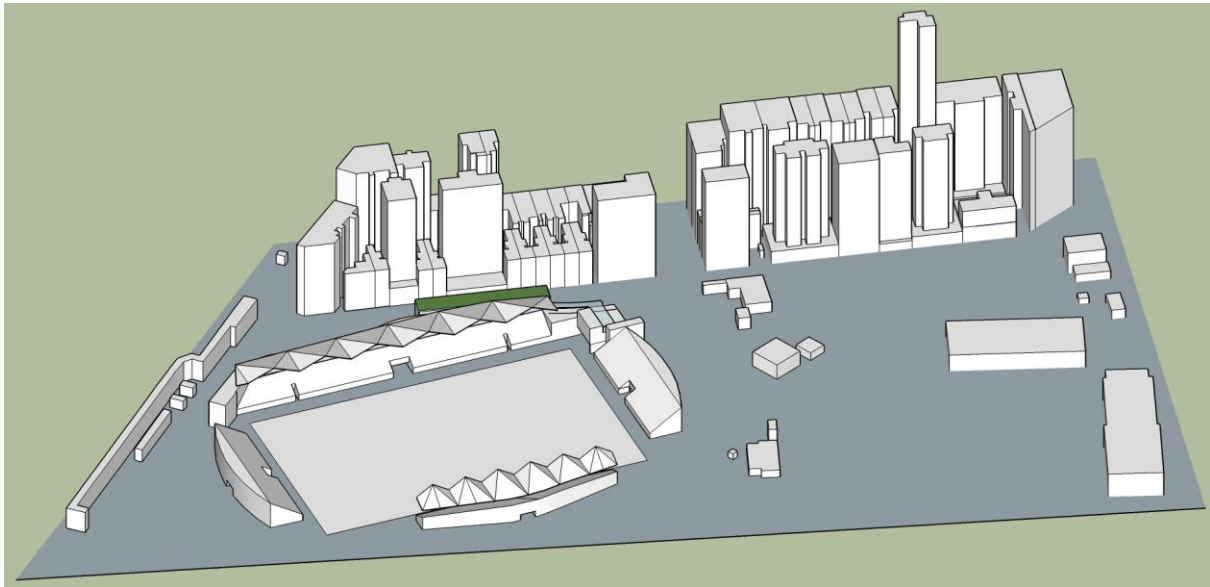
Figure 3-2   Location of measurement and corresponding receivers in the acoustic model

Blue points indicate the location of the modelled receivers corresponding to the measurement locations.
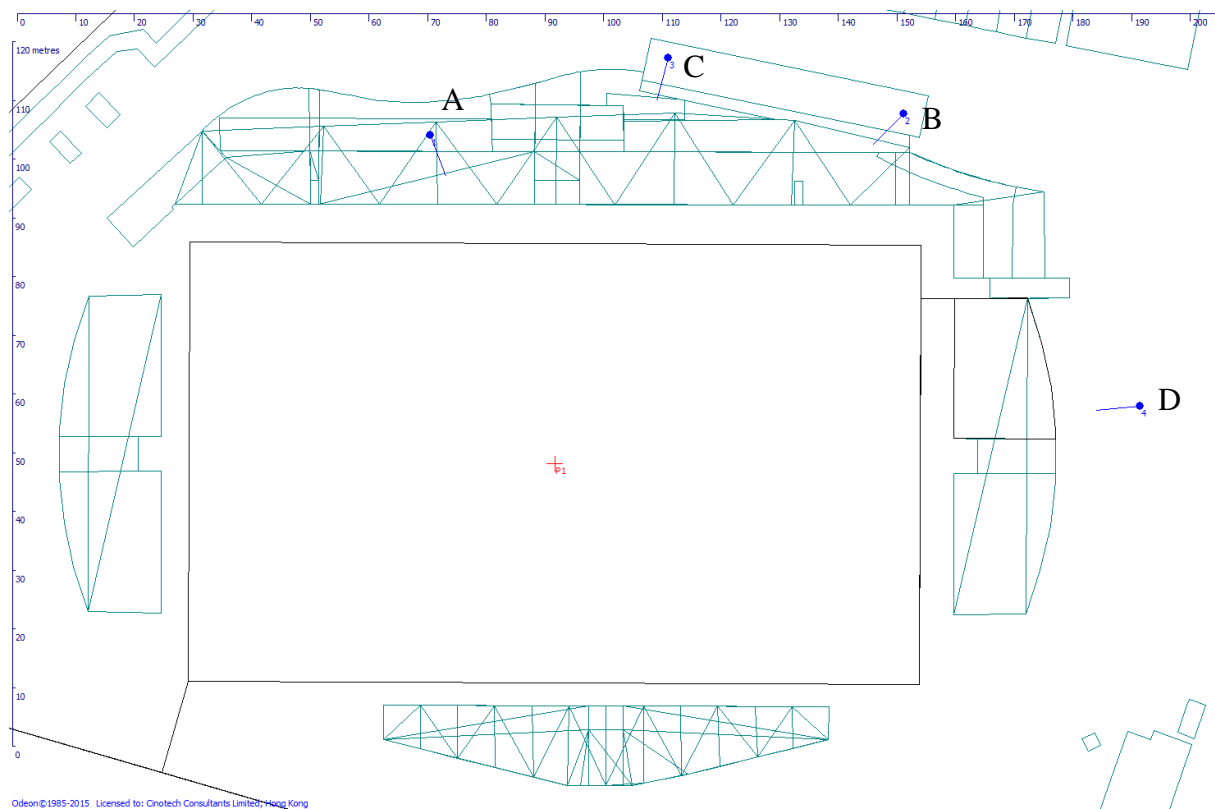
Figure 3-3   Location of the noise sources in the acoustic model

Red points indicate the location of the sources that represent spectators.