

## 2.1 CONSTRUCTION NOISE MONITORING

### 2.1.1 Noise Parameters

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30 \text{ min})}$  shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods,  $L_{eq(5 \text{ min})}$  shall be employed for comparison with the NCO criteria.

As supplementary information for data auditing, statistical results such as  $L_{10}$  and  $L_{90}$  shall also be obtained for reference. A sample data record sheet is shown in the *Annex* for reference.

### 2.1.2 Monitoring Equipment

As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0 dB.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding  $5 \text{ ms}^{-1}$  or wind with gusts exceeding  $10 \text{ ms}^{-1}$ . The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in  $\text{ms}^{-1}$ .

The ET Leader is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

### 2.1.3 Monitoring Locations

The noise monitoring locations are shown in *Figure 2.1a* and summarised in *Table 2.1a*. The status and locations of noise sensitive receivers may change after issuing of this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER and agreement from EPD of the proposal.

Table 2.1a *Noise Monitoring Stations*

Noise Monitoring Station	Noise Monitoring Location
NM1	Po Tong Ha
NM2	Village house, north of Tsz Tin Tsuen
NM3	Siu Hang Tsuen
NM4	Kei Lun Wai
NM6	Vertical Interim Housing in Area 29
NM7	Castle Peak Hospital
NM8	Siu Hong Court
NM9	Yau Tze Tin Memorial College
NM10	Village house, south of San Hing Tsuen

When alternative monitoring locations are proposed during the actual construction phase, the monitoring locations should be chosen based on the following criteria:

- (a) at locations close to the major site activities which are likely to have noise impacts;
- (b) close to the noise sensitive receivers (NB For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre should be considered as noise sensitive receiver); and
- (c) for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2 m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3 dB(A) shall be made to the free field measurements. The ET Leader shall agree with the ER on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

#### 2.1.4 *Baseline Monitoring*

The ET Leader shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks. A schedule on the baseline monitoring shall be submitted to the ER for approval before the monitoring starts.

There shall not be any construction activities in the vicinity of the stations during the baseline monitoring.



In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET Leader shall liaise with EPD to agree on an appropriate set of data to be used as a baseline reference and submit to the ER for approval.

### 2.1.5 *Impact Monitoring*

Noise monitoring shall be carried out at all the designated monitoring stations. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

- (a) one set of measurements between 0700-1900 hours on normal weekdays;
- (b) one set of measurements between 1900-2300 hours;
- (c) one set of measurements between 2300-0700 hours of next day; and
- (d) one set of measurements between 0700-1900 hours on holidays.

The measurements (b), (c) and (d) would need to be made only if construction activities are carried out during the relevant time periods. For these measurements, one set of measurements shall at least include 3 consecutive  $L_{eq(5\text{ min})}$  results.

If a school exists near the construction activity, noise monitoring shall be carried out at the monitoring stations for the schools during the school examination periods. The ET Leader shall liaise with the school's personnel and the Examination Authority to ascertain the exact dates and times of all examination periods during the course of the contract.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in *Section 2.6* shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

### 2.1.6 *Event and Action Plan for Noise*

The Action and Limit levels for construction noise are defined in *Table 2.1b*. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in *Table 2.1c*, shall be carried out.

**Table 2.1b** *Action and Limit Levels for Construction Noise*

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75 dB(A)*
0700-2300 hrs on holidays; and 1900-2300 hrs on all other days	When one documented complaint is received	60/65/70 dB(A)**
2300-0700 hrs of next day	When one documented complaint is received	45/50/55 dB(A)**

Notes:  
 \* reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods  
 \*\* to be selected based on Area Sensitivity Rating

Table 2.1c *Event/Action Plan for Construction Noise*

EVENT	ACTION	
	ET Leader or ER	Contractor
Action Level	<ol style="list-style-type: none"> <li>1. Notify Contractor</li> <li>2. Analyse investigation</li> <li>3. Require Contractor to propose measures for the analysed noise problem</li> <li>4. Increase monitoring frequency to check mitigation effectiveness</li> </ol>	<ol style="list-style-type: none"> <li>1. Submit noise mitigation proposals to Environmental Team Leader/Engineer's Representative</li> <li>2. Implement noise mitigation proposals</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1. Notify Contractor</li> <li>2. Notify EPD</li> <li>3. Require contractor to implement mitigation measures Increase monitoring frequency to check mitigation effectiveness</li> </ol>	<ol style="list-style-type: none"> <li>1. Implement mitigation measures</li> <li>2. Prove to Environmental Team Leader ER effectiveness of measures applied</li> </ol>

### 2.1.7 *Noise Mitigation Measures*

The EIA Study has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

Noise emissions from construction sites can be minimised through good site practice, selecting quiet plant, adopting quieter working methods, erection of barriers to screen out the noise source and pose restriction on the use of noisy equipment on site.

The Contractor may develop a different package of environmental control measures to meet the required noise standards, but the following illustrates a feasible approach to mitigate the predicted noise impacts during the construction phase.

#### *Good Site Practice*

Good site practice and noise management can considerably reduce the noise impact from construction site activities on nearby NSRs. The following package of measures should be followed during each phase of construction:

- only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction works;
- machines and plant that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum;
- plant known to emit noise strongly in one direction, should, where possible, be orientated to direct noise away from nearby NSRs;
- silencers or mufflers on construction equipment should be utilised and should be properly maintained during the construction works;

- mobile plant should be sited as far away from NSRs as possible; and
- material stockpiles and other structures should be effectively utilised, where practicable, to screen noise from on-site construction activities.

#### *Selecting Quieter Plant and Working Methods*

The Contractor may be able to obtain particular models of plant that are quieter than standard types given in the *Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM)*. The benefits achievable in this way will depend on the details of the Contractors' chosen methods of working, and it is considered too restrictive to specify that a Contractor has to use specific items of plant for the construction operations. It is therefore both preferable and practical to specify an overall plant noise performance specification to apply to the total SWL of all plant on the site so that the Contractor is allowed some flexibility to select plant to suit his needs.

Quiet plant is defined as Powered Mechanical Equipment (PME) whose actual Sound Power Level (SWL) is less than the value specified in GW-TM for the same piece of equipment. Examples of SWLs for specific silenced PME taken from a British Standard, namely *Noise Control on Construction and Open Sites, BS5228 : Part 1 : 1997*, which are known to be used are given below:

Bulldozer	110 dB(A) max
Breaker (hand held)	110 dB(A) max
Air compressor	98 dB(A) max
Mobile crane	106 dB(A) max
Concrete pump	106 dB(A) max
Dump truck	109 dB(A) max
Excavator (for trenching)	105 dB(A) max
Excavator (for ground excavation)	106 dB(A) max
Generator	100 dB(A) max
Lorry	105 dB(A) max
Loader	105 dB(A) max
Concrete lorry mixer	100 dB(A) max
Vibratory Roller	102 dB(A) max
Grader	111 dB(A) max
Road roller	104 dB(A) max
Poker vibrator	100 dB(A) max

#### *Use of Temporary and Movable Noise Barriers*

In general, noise barriers of 3 m to 5 m height located between noisy construction activities and NSRs could give a noise reduction of up to 5 dB(A) from screening (estimated in accordance with the GW-TM). It would be possible for the Contractor to provide purpose-built movable barriers located close to operating PME, in order to achieve this level of noise reduction. Certain types of PME, such as generators and compressors, can be completely screened giving a total noise reduction of 10 dB(A) or more.

It is anticipated that a movable noise barrier with a suitable footing and a small cantilevered upper portion can be located within a few metres of a stationary plant and within about 5 m of more mobile equipment such as excavator and mobile crane etc such that the line of sight could be blocked by the barriers viewed from the NSRs. The estimated noise reduction by means of screening,

provided that the barriers are carefully located, can provide at least 10 dB(A) noise attenuation for stationary plant and 5 dB(A) for mobile plant.

*Reducing the Number of Plant Operating in Critical Areas close to NSRs and Restriction of Plant Usage On-site During Critical Construction Stages*

In general, the number of plants operating on-site should be left to the choice of the Contractor. However, in some occasions it may be appropriate to restrict the number of particularly noisy equipment operating within certain parts of the site that are very close to the NSRs. The percentage of time that the noisy equipment is in operation may also need to be controlled so as to reduce the noise emissions during critical construction stages.

If the above measures are not sufficient to restore the construction noise quality to an acceptable levels upon the advice of ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to ER for approval, and carry out the mitigation measures.

## 2.2

### **OPERATIONAL PHASE NOISE MONITORING**

The Project Proponent shall deposit to the Director of Environmental Protection (DEP), at least 6 months before the operation of the project, a monitoring plan for the purpose of assessing the accuracy of traffic noise predictions by comparing the project noise impact predictions with the actual impacts. The monitoring plan shall contain monitoring locations, monitoring schedules, methodology of noise monitoring including noise measurement procedures, traffic counts and speed checks, and methodology of comparison with the predicted levels. At least three monitoring locations at the noise sensitive receivers shall be proposed. At least three sets of measurement for each monitoring location shall be conducted and the monitoring shall be done within the first year of operation of the project. Monitoring shall be conducted in accordance with the deposited monitoring plan unless with prior justification. Monitoring details and results including the comparison between the measured noise levels and the predicted levels shall be recorded in a report to be deposited with the DEP within one month of the completion of the monitoring. The report shall be certified by the Project Proponent before deposit with the DEP.

