3. NOISE

3.1 Introduction

As the noise sensitive receivers (NSR)s near the Route 10 (NLYLH) (Southern Section) working area will be subjected to daytime and restricted-hour construction noise, a noise monitoring programme shall be developed by the ER to include daytime and restricted-hour noise measurement at sensitive receivers. The programme shall be carried out by the ET to ensure that the noise level of construction works complies with the criteria of the Noise Control Ordinance (NCO) and/or noise criteria laid down by the contract.

3.2 Noise Parameters

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

3.3 Monitoring Equipment

As referred to in the Technical Memorandum (TM) issued under the NCO sound level metres in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out 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 shall not be made in the presence of fog, rain, wind with a steady speed exceeding 5 m/s or wind with gusts exceeding 10 m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

The ET Leader shall be responsible for the provision and maintenance 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.

3.4 Monitoring Locations

The noise monitoring locations are shown in *Figure 3.1-4* and summarised in *Table 3.1*. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER, and agreement from the IC(E) and EPD for the proposal.

Table 3.1 Noise Monitoring Stations

Noise Monitoring Station	Noise Monitoring Location
NM1	Tso Wan Village
NM2	Fa Peng Village
NM4	Hong Kong Garden
NM5	Tai Lam Chung Tsuen
NM6	Correctional Institution Clinic
NM7	So Kwun Wat Sun Tsuen
NM8	Scattered Houses at So Kwun Wat
NM9	So Kwun Wat Govt. School
NM10	Scattered House to the West of Poseidon Court
NM11	Siu Lam Hospital

When alternative monitoring locations are proposed, the monitoring locations shall 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 (N.B. 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 shall be considered as a noise sensitive receiver); and

c) for monitoring locations located in the vicinity of the sensitive receivers, care shall 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 receiver's building facade and be at a position 1.2m above the ground. If there is a 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 +3dB(A) shall be made to the free field measurements. The ET Leader shall agree with the IC(E) 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.

3.5 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 of 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. Baseline monitoring measurements shall be evenly spread throughout the assessment period and shall be conducted at the some frequency and duration throughout all periods of the day for which works are anticipated to be constructed (eg. daytime, evening and nighttime).

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 this to the ER for approval.

3.6 Impact Monitoring

Noise monitoring shall be carried out by the ET Leader 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.

For the measurements (b), (c) and (d) above, at least one set of measurements shall include 3 consecutive $L_{eq(5\ min)}$ results.

Schools exist near the construction activity, such as the So Kwun Wat Government School and noise monitoring shall be carried out 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 3.7* 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.

3.7 Event and Action Plan for Noise

The AL Levels for construction noise are defined in *Table 3.2*. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in *Table 3.3*, shall be carried out.

Table 3.2 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		60/65/70** dB(A)
2300-0700 hrs of next day		45/50/55** dB(A)

* Reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.
** To be selected based on Area Sensitivity Rating.

Table 3.3 Event/Action Plan for Construction Noise

EVENT	ACTION			
	ET Leader	IC(E)	ER	Contractor
Action Level	1. Notify IC(E) and contractor 2. Carry out investigation 3. Report the results of investigation to the IC(E) and contractor 4. Discuss with the contractor and formulate remedial measures 5. Increase monitoring frequency to check mitigation effectiveness	1. Review the analysed results submitted by the ET 2. Review the proposed remedial measures by the contractor and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify contractor 3. Require contractor to propose remedial measures for the analysed noise problem 4. Ensure remedial measures are properly implemented	1. Submit noise mitigation proposals to IC(E) 2. Implement noise mitigation proposals
Limit Level	1. Notify IC(E), ER, EPD and contractor 2. Identify source 3. Repeat measurement to confirm findings 4. Increase monitoring frequency 5. Carry out analysis of contractor's working procedures to determine possible mitigation to be implemented 6. Inform IC(E), ER and EPD the causes & actions taken for the exceedances 7. Assess effectiveness of contractor's remedial actions and keep IC(E), EPD and ER informed of the results 8. If exceedance stops, cease additional monitoring	1. Discuss amongst ER, ET, and contractor on the potential remedial actions 2. Review contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly 3. Supervise the implementation of remedial measures	1. Confirm receipt of notification of failure in writing 2. Notify contractor 3. Require contractor to propose remedial measures for the analysed noise problem 4. Ensure remedial measures are properly implemented 5. If exceedance continues, consider what portion of the work is responsible and instruct the contractor to stop that portion of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IC(E) within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant portion of works as determined by the ER until the exceedance is abated

3.8 Noise Mitigation Measures

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

Noise emissions from construction sites can be minimised through good site practice and selecting quiet plant. These methods are discussed in the following paragraphs.

Good Site Practice

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

- only well-maintained plant shall be operated on-site and plant shall be serviced regularly during the construction works;
- machines and plant that may be in intermittent use shall be shut down between work periods or shall be throttled down to a minimum;
- plant known to emit noise strongly in one direction, shall, where possible, be orientated to direct noise away from nearby NSRs;
- mobile plant shall be sited as far away from NSRs as possible; and
- material stockpiles and other structures shall 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 GW-TM. The benefits achievable for each of the measures proposed will depend on the details of the contractors' chosen methods of working, and it is considered too restrictive to specify items of plant that a contractor has to use during construction activities. 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.

Use of Temporary and Movable Noise Barriers

Movable barriers can be very effective in providing noise screening from particular plant. It is anticipated that a 3m high movable noise barrier with a skid footing and a small cantilevered upper portion can be located within a few metres of an item of plant. It is estimated that movable noise barrier of this type, if carefully located, can produce at least 10 dB(A) screening for stationary plant and 5 dB(A) for mobile plant.

Reducing the Number of Plant Operating On-site Close to NSRs.

It shall be noted that various types of silenced equipment can be found in Hong Kong. However, when EPD is processing a CNP application, they will apply the noise levels contained in the relevant statutory TM, unless the noise emission of a particular piece of equipment can be validated by certificate or demonstration.

Reduce the Number of Plant Operating in Critical Area Close to NSRs

In combination with the selection of quiet plant and portable barriers, further reduction in the total SWL can be achieved through restrictions in the number of items of plant in operation at any one time.

Limit the Percentage On-time of Equipment

The predicted noise level can be further reduced by limiting the period of use of noisy plant on site.

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 to identify further mitigation measures. These shall be proposed to ER for approval, and the contractor shall then implement these additional mitigation measures.