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NOISE CONTROLS ON CONSTRUCTION WORKS - GOVERNMENT'S EFFORTS IN HONG KONG

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1. INTRODUCTION

Hong Kong has experienced a blooming economy in the past two decades. In tandem with the economic developments, construction activities are conducted almost non-stop to deliver the many required infra-structural projects - new airport, various strategic road and rail links, and major reclamation works, and the much needed accelerated public housing programme. As Hong Kong is densely populated with limited developable land, it will not be too surprising to find that construction noise has become one of the major environmental problems behind these success stories.

No doubt, the construction industry has contributed significantly towards the economic success of Hong Kong. However, their activities have also caused considerable noise disturbances to tens of thousands of people. As the situation is not expected to improve in at least the few years to come, and there is a need to balance between a viable construction industry and the quality of life of the people, appropriate intervention by the government in the control of construction noise is therefore considered necessary. This paper describes Hong Kong Government's effort to prevent people from being exposed to excessive or unnecessary construction noise while allowing the various construction activities to continue, which are essential in maintaining the growth of the economy.

2. CONTROL STRATEGY

Strategically, construction noise control is implemented through a three prong approach - (i) the development and enforcement of legislation, (ii) the promulgation of guidelines on recommended practices and (iii) forward planning in major construction projects. If noise control on a voluntary basis is not forthcoming, or is ineffective, legislative control will be put in place to ensure the desired outcome is achieved. Guidelines on recommended practices are particularly useful in disseminating good construction practices to reduce noise disturbance and practical noise control tips that do not have a place in

legislation. In order to avoid late focus of problems, proponents of major projects are required at the planning stage to assess the noise impact of their project and to propose measures, if necessary, to ensure that the neighbouring noise sensitive receivers will not be exposed to an excessive level of construction noise.

Unlike the noise from transportation and commercial or industrial activities, noise from construction site affects the neighbouring residents only for a finite period of time. Pragmatic control measures that the government has taken to combat construction noise include the application of time restrictions on the carrying out particularly noisy works, the application of noise limit to works carried out during the sensitive hours to limit the noise disturbance to affected residents and the provision of various incentives to encourage the project proponent to incorporate appropriate noise control measures, such as noise barriers and enclosures, in their works. These measures are applicable to both the initial planning stage of the project and the actual construction stage of the work.

The amount of noise produced by construction work, depends very much on the construction method and equipment used. It is evident that the reduction of noise at source is one of the most effective means of control. With the advent of quieter construction technology and equipment, the Environmental Protection Department (EPD) has been constantly exploring the practicality of replacing the conventional noisier construction method or equipment with new quieter ones in Hong Kong. Once the feasibility of using less noisy construction method or equipment to replace the conventional ones is established, it will either be promulgated through the introduction of legislation or provision of guidelines to the relevant trade or professionals, where appropriate.

3. LEGISLATION

Construction noise is, at present, controlled under the Noise Control Ordinance (NCO) through a "construction noise permit" system. The control is divided into two broad categories depending on whether the work involves the carrying out of percussive piling or general construction work. For the purpose of this paper, general construction works means construction works other than percussive piling. Percussive piling noise is controlled by restricting the work to daytime on normal working days and by limiting its hours of operation. While control on noise from general construction works is to limit the noise generated during sensitive hours and holidays. The latter control is further sub-divided into works that are carried out in densely populated areas and those that are not. In addition, noisy construction equipment such as hand held breakers and air compressors are also controlled through a "green label" system to limit their noise emission.

Control of Percussive Piling Noise

Due to the intense level of noise from percussive piling, it is almost impossible to limit is noise level at the noise sensitive receiver (NSR) if the piling site happens to be very close to the NSR. Hence, noise from percussive piling is not controlled by limiting its level of noise emission. Instead, the allowable operational time period is used to limit the noise effect on the NSR.

Percussive piling is prohibited under the NCO between the sensitive hours of

1900 and 0700 and at any time on general holidays. For other times (i.e. from 0700 to 1900 on any normal working day), a Construction Noise Permit (CNP) issued by the Noise Control Authority (i.e. Director of Environmental Protection) is required for the carrying out of any percussive piling work. The CNP will set out both the permitted hours of operation and permissible piling methods. It is an offence under the NCO for the carrying out of percussive piling work without a valid CNP or the carrying out of work not in accordance with the permit conditions.

The permitted hours of operation is determined in accordance with the assessment procedure contained in a technical memorandum [1]. Depending on the overall piling noise level at the NSR, the permitted hours of operation on any working day would either be restricted to 3 (0800 - 0900, 1230 - 1330 & 1700 - 1800) or 5 hours (0800 - 0930, 1200 - 1400 & 1630 - 1800) or not restricted at all (i.e. full 12 hours 0700 - 1800). The hours of operation would also be determined by the type of building the NSR is situated in such as a building with a blank facade facing the work, one with central A/C, or one with normal openable windows for ventilation.

Control on Noise from General Construction Works

All Areas. The carrying out of construction work involving the use of powered mechanical equipment between the hours of 1900 and 0700 or at any time on general holidays is controlled through another permit system under the NCO. It is an offence to operate powered mechanical equipment for carrying out general construction work during sensitive hours without a valid CNP in force or not in accordance with the permit conditions.

In considering CNP applications, the Authority will assess the overall noise generated by the powered mechanical equipment at the most affected NSRs in accordance with a relevant technical memorandum [2]. A permit will be granted if the overall noise level does not exceed the specified acceptable noise levels, which has taken into account the type of area that the NSR is situated in.

Densely Populated Areas. From 1 November 1996, noise from construction sites within densely populated areas, known as Designated Areas (DAs), will be subject to a more stringent control. The new control is targeted at some manual work, known as Prescribed Construction Work (PCW), such as the erection and dismantling of formwork or scaffolding, rubble disposal through metal chutes and hammering. Control on the use of five most commonly used noisy powered mechanical equipment, known as Specified Powered Mechanical Equipment (SPME), is also tightened. The five SPME are hand-held percussive breaker, vibratory poker, bulldozer, concrete mixer lorry and dump truck.

This additional control is amalgamated into the current permit system for general construction works. A new technical memorandum [3] has been issued for the new control in DAs. The assessment procedure for the issuing of CNP for the use of SPME is the same as that for the use of other powered mechanical equipment described above except that the acceptable noise levels have been lowered by 15 dB(A). As a result, the overall noise level of these SPME must be at least 15 dB(A) down from its usual limit before a CNP could be issued. Unlike the noise from plant and equipment, which tends to be more regular and steady, the noise from PCW is highly variable both in its level and characteristics. A technical assessment approach cannot therefore be adopted for assessing permits for PCW. Due to the potential noise disturbance that PCW can cause during the

sensitive hours, permits will not generally be granted for the carrying out of PCW unless quiet working methods as specified in [3] are adopted for the execution of the PCW or the location of the work area is shielded from the NSRs by substantial barriers. Disposal of rubbles through plastic chutes has been identified as one of the quiet working methods.

Unavoidable Constraints on Working Hours. The technical assessment may, however, create difficulties for some essential works that exceed the relevant acceptable noise levels but would need to be conducted during the sensitive hours. Typical examples are maintenance works for roads, rails and underground utilities. Special provisions have therefore been made in the technical memoranda [2] and [3] to allow the Authority to grant a CNP even if the acceptable noise level is exceeded. However, the applicant has to demonstrate to the satisfaction of the Authority that the carrying out of the concerned construction work during sensitive hours would cause less public annoyance or inconvenience than would be caused by carrying out the work outside the sensitive hours. When a CNP is issued under such exceptional circumstances, the Authority will impose special permit conditions to make sure that only the quietest practicable working methods are employed for the work.

Control on Noisy Construction Equipment

To further reduce the noise from construction work, regulations have been made to control the noise emission from two commonly used noisy construction equipment - hand held percussive breakers and air compressors. Hand held percussive breaker that is heavier than 10 kg or portable air compressor that is capable of producing compressed air at 500 kPa or above has to meet with the specified noise standards. It is an offence to import, manufacture or supply hand-held percussive breakers or air compressors which do not comply with the noise standards as set out in the regulations. It is also an offence to use such equipment without a valid Noise Emission Label (NEL), generally known as "green label", fitted on them. Depending on the mass of the hand held breaker, and the air flow capacity of the air compressor, the permissible sound power level ranges from 108 to 114 dB(A) and 100 to 104 dB(A) with increasing mass and air flow rate respectively.

4. GUIDELINE ON RECOMMENDED PRACTICES

Practical Guide

EPD has published a booklet entitled "A Practical Guide for the Reduction of Noise from Construction Works" to promulgate the various practical measures to reduce construction noise for reference by the engineers or contractors. It contains information on quiet construction equipment and working practices which will be useful in reducing noise from construction activities. This booklet is distributed to the public free of charge.

Practice Notes

EPD has also produced practice notes for reference by the concerned professional bodies and widely distributed to the engineers and professionals to guide them on how to reduce construction noise impact through proper project planning, programming and execution. One of the practice notes is for the use of hydraulic breakers for demolishing works such as breaking-up of the central divider of roads.

5. PLANNING

The advantages of addressing construction noise problem early at the planning stage are to enable the tenderer to take the cost of noise control into the tender pricing, thereby minimizing any related contractual dispute; and to encourage conscientious noise planning of the execution of works in avoiding expensive retrofitting work and delay.

For a major private development, the project proponent is required to submit a project brief to EPD for an environmental review to identify any potential impact of the project, both in the construction and operation phases, on the environment. Similar environmental review will be conducted for public works during the preparation of the preliminary project feasibility study. If potential noise problem is identified for the project, the proponent would be required to conduct a detailed noise impact assessment, which forms a part of a detailed environmental impact assessment, to identify/evaluate the noise problems and to propose measures for meeting the noise planning standards as stipulated in the Hong Kong Planning Standards and Guidelines [4].

As noise from construction works during the daytime is currently not under any form of legislative control, the control of significant construction noise emitters through administrative means, i.e. through planning, becomes important. The planning standards for construction noise tabulated in Table 1 apply to general construction works during daytime on a working day.

Table 1: Planning Standards for Control of Construction Noise

Noise Sensitive Receiver	Planning Standards (L_{Aeq}(5 mins))
Dwellings	75 dB(A)
Schools	70 dB(A)
Schools during examination periods	65 dB(A)

Note: L_{Aeq}(5 mins) is the A-weighted equivalent continuous noise levels for a period of 5 minutes

Due to the relatively short term effect of construction noise and the legislative controls on construction works during the sensitive hours already in place, the planning standards would be applied in a flexible and pragmatic manner. In case that the NSR is a school, window insulation may be required as a possible means of noise abatement measures.

6. OUTLOOK

Due to the high density of population in Hong Kong and the intense construction activities going on all the time, the proximity of the work sites to neighbouring NSR has made the construction noise problem even more acute. The government therefore recognizes the need to further reduce construction noise to meet the increasing public demand on a better environment. As there are already stringent controls on construction noise during the sensitive hours, the priority would be to develop controls for daytime construction noise.

To further reduce the noise impact from daytime construction work, EPD is

considering to tighten control on the use of diesel hammer pile drivers in populated areas. Consideration has also been given to determine the feasibility of controlling the use of excavator mounted breakers in certain noisy work operations, such as road breaking or demolition of buildings, and to replace them with quieter hydraulic crushers or cutters.

7. CONCLUSIONS

This paper highlights the Hong Kong Government's efforts on the control of construction noise through legislation, administrative guidance, and construction noise planning. Despite the Government's commitment on reducing construction noise, the success in protecting people from construction noise depends also on the effort of the developers, engineers and contractors. Notwithstanding the topographical constraints, and pressures from the growth of population and further economic developments, the problem of construction noise can be considered to be well under control. Looking ahead, the EPD will not be complacent about the current available means of control and will continue to explore practical ways and means to further reduce the constructions noise.

References

[1] 'Technical Memorandum On Noise From Percussive Piling', Environmental Protection Department, Hong Kong Government (1989).

[2] 'Technical Memorandum On Noise From Construction Work Other Than Percussive Piling', Environmental Protection Department, Hong Kong Government (1996).

[3] 'Technical Memorandum On Noise From Construction Work In Designated Areas', Environmental Protection Department, Hong Kong Government (1996).

[4] 'Chapter 9 - Hong Kong Planning Standards & Guidelines', Hong Kong Government, (1991).