

**Contractors Safety Management
Programme for Consulting Engineers
(顧問工程師之承建商安全管理計劃)**

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Abstract

In Hong Kong, the building construction industry plays a major role in the economy. There are many construction sites where contractors are implementing their safety management system inadequately. It was observed that the problems / difficulties arise such as inefficiency in implementation due to competitive tendering, extensive use of subcontractors, poor accident record keeping and reporting system, the low priority given to safety, inadequate safety training provided to contractors management and workers, etc. In order to improve the site safety, the Government introduces safety and health requirements into the public works contracts in recent years such as Pay for Safety Scheme and Independent Safety Auditing Scheme and consulting engineers were employed to supervise contractors on behalf of the Government. This paper highlights the major safety and health requirements stipulated in the public works contracts and identifies the roles played by the consulting engineers. It also describes the safety management programme implemented by the consulting engineers for supervising and monitoring the safety performance of contractors.

1. Introduction

Hong Kong is a place with world famous infrastructures and construction projects since 1992 when the Government granted the green light to the construction of the new airport project (the Airport Core Programme – ACP projects). Nevertheless, it is frustrated that its safety records are still unsatisfactory – the average accident and fatality rate per 1,000 workers per year in the last 10 years were 182 (ranging from 68 to 275) and 0.58 (ranging from 0.328 to 0.960) respectively (Labour Dept, 2004). The unsatisfactory safety record has been a matter of concern to the Hong Kong Government of SAR, the clients and the public.

In July 1993, contractual provisions on construction safety was first introduced by the Works Branch of the Hong Kong Government (currently the Environment, Transport and Works Bureau) into its contracts and the whole Construction Site Safety Manual was fully published in May 1995 for Government works departments involved in the Public Works Programme (PWP) to comply with. As some consulting engineers are employed by the Government to supervise some contracts, they are also required to comply with the relevant sections of the Construction Site Safety Manual.

Recent studies (Ahmed et al, 1999) revealed that the major problems and difficulties of implementing site safety schemes were tight schedule of projects, inefficient communication due to multi-level subcontracting system, limited budget on safety investment, inability of safety officers to enforce safety regulations, poor accident record keeping and reporting system, the low priority given to safety, inadequate safety training provided to contractors management and workers, etc. Other studies (Kartam et al, 2000) also revealed the similar problems.

Albeit the rate of accidents in the Hong Kong construction industry are decreasing in the recent years, the costs of accidents, especially the social costs incurred by society, are still substantial. There is no doubt that the Government, Clients and Contractors should increase their safety investment in construction projects to improve site safety (Ngai et al, 1999).

2. Environment, Transport and Works Bureau's Strategy

The following general approach (Construction Site Safety Manual, ETWB) is currently adopted with a view to achieving the objectives set out in the Construction Site Safety Manual:-

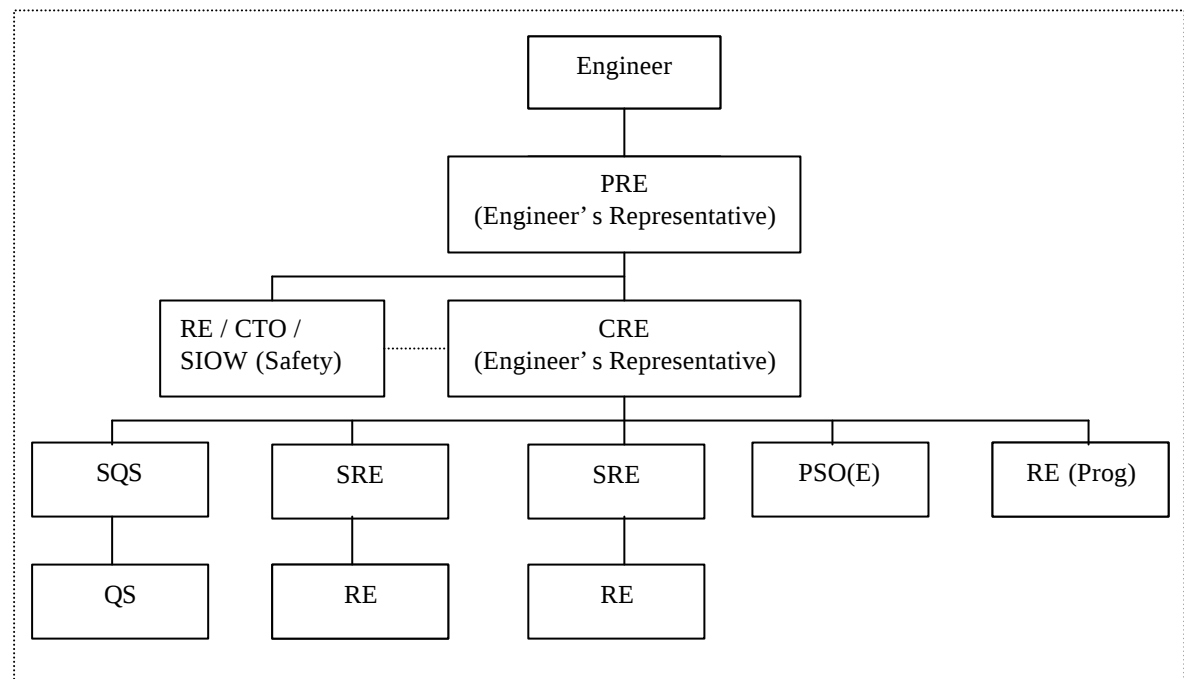
- Secure commitment of all parties involved, including the works departments and other concerned departments, the consultants (consulting engineers), the contractors, the sub-contractors, workers unions and the utility undertakings;
- Incorporate contractual provisions requiring contractors to provide a safe and healthy working environment for all personnel in public works construction sites and others who may be affected by the works; such contractual provisions should also require contractors to ensure compliance by their sub-contractors;
- Select contractors who give proper consideration to construction safety to carry out the works; safety aspects must be given a high weighting factor in pre-qualification exercises;
- Arrange accident prevention and safety management training for Architect / Engineers' site staff (including consulting engineers) supervising PWP contracts;
- Establish Site Safety Management Committees to monitor the implementation of safety plans and / or the contractor's site safety obligations as set out in the contract;
- Build up a database for dangerous occurrences and reportable accidents for monitoring, analysis and formulation of measures on accident prevention; and
- Review and update the PWP Construction Site Safety Manual to assist works departments in the administration of construction safety matters for PWP contracts.

3. Implementation of the Safety Management Programme

3.1 Site Organisation of Consulting Engineer

Some contracts are directly supervised by relevant Works Departments. Nevertheless, consulting engineers are normally employed by Works Departments to

supervise Contractors. Typical site organisation of a consulting engineer for large-scale project will be as follows:-



Staff who are employed by consulting engineer and required to reside on site to supervise Contractor(s) are called Resident Site Staff (RSS). They are required, in accordance with ETWB's TC No. 12/2001, to obtain relevant safety training certificates such as Basic Safety Management, Basic Accident Prevention, Construction Safety Supervisor course, certified worker for confined spaces work, etc. depending on their ranks and nature of duties.

3.2 Safety and Health Provisions for PWP Contracts

Some major safety and health requirements included in PWP contracts are as follows:-

- The Contractor shall prepare and submit to the Engineer a Safety Plan in respect of all aspects of the Works.
- If the 3-month moving average of the accident rates and the cumulative number of accident continue to rise, the Contractor will be required to submit monthly reports in writing to detail his latest mitigation measures and efforts to reduce the high accident rate. This will continue until the 3-month moving average accident rate is lower than 1.25.
- The Contractor's attention is drawn to that an Independent Safety Audit shall be implemented for the Contract. Detailed arrangement will be discussed in the following section.
- The Contractor shall employ a full time Safety Manager who shall be approved by the Engineer. The Safety Manager shall
 - ▶ hold an acceptable university degree or an equivalent qualification in civil engineering or a branch of civil engineering appropriate to the nature of the Works of this Contract,

- ▶ be a member of the Institution of Occupational Safety and Health or equivalent, and with at least 5 years' construction site safety experience at managerial level after registration as Safety Officer.
- The Contractor shall practice the "Site Safety Cycle" to improve and promote the safety and health of the Site.
- The contractor shall employ at least one full-time Safety Officer who shall be approved by the Engineer. The minimum number of full-time safety officer required will be in accordance with the total number of workers on Site.
- The Contractor shall not commence any construction work on the Site without the appointment of the required number of Safety Officer(s) unless expressly permitted by the Engineer in writing.
- If the Safety Officer is unable to perform his duties for any reason, the Safety Officer shall be replaced as soon as practicable but in any case within 14 days. The Safety Officer shall not be replaced without consent by the Engineer.
- The Contractor shall establish a Site Safety Committee which shall be responsible for ensuring the implementation of the Safety Plan, reviewing and monitoring the effectiveness of the safety and health measures taken and seeking the co-operation and commitment of staff at all levels.
- The Engineer shall establish a Site Safety Management Committee to monitor the adequacy of the Safety Plan and ensure its implementation on Site by the Contractor, and to enhance communication between the Engineer and the Contractor on safety and health matters.
- The Contractor shall arrange a weekly safety walk attended by the Contractor's Safety Manager, Safety Officer and Site Agent or his delegate and the Engineer's nominated site representative to inspect the Site checking that safety and health conditions are being maintained on the Site.
- The Contractor shall submit a monthly safety report for consideration at the meeting of the Site Safety Management Committee.
- All lifting gears shall be colour coded for identifying lifting gear which require re-inspection or disposal.
- No cradles shall be used for the lifting of reinforcement bars unless they are properly designed and with their safe working load certified.
- Construction vehicles and plant used on Site shall be equipped with audible signals on reversing.
- Voltage in excess of 110V shall only be used for heavy equipment such as hoists, tower cranes, etc. with an earth leakage circuit breaker installed and in proper function. Portable and hand-held tools and temporary site lighting shall be operated at a voltage of 110V or less.

3.3 Independent Safety Auditing Scheme (ISAS)

Selection and Appointment of the Safety Auditors:-

- Only those on the list of Accredited Safety Auditor (ASA) maintained by the Occupational Safety and Health Council (OSHC) shall be appointed to be the Safety Auditor. Those on the list of Safety Auditing Assistant (SAA)

shall assist the ASA in carrying out safety audits, but the ASA shall be personally responsible for the SAA.

- The fee (inclusive of traveling allowance) for the audit team shall be fixed at \$2,000 per hour. The maximum hours that an audit team can claim for an audit shall be 16 hours unless otherwise approved by the Engineer.
- The Engineer shall ask the OSHC for a copy of the ASA list and then send an invitation to all ASA requesting them to:
 - ▶ Indicate their workload, present workload as well as anticipated workload,
 - ▶ Indicate their spare capacity to take up more contracts for audits,
 - ▶ Declare “no conflict of interest” with the Contractor,
 - ▶ Express interests in taking up safety auditing for the Contract, and
 - ▶ Enclose a copy of curriculum vitae with the reply.
- Based on the return from the ASA, and in consultation with the Departmental Safety and Environmental Adviser (DSEA), the Engineer shall select three most suitable ASA and propose them to the Contractor for appointing one as the Safety Auditor.

Preparation for the Safety Audits:-

- Not less than 14 days before each safety audit, the Safety Auditor shall prepare an audit plan and provide a copy each to the Engineer, the Contractor and the DSEA. The Engineer shall then provide his comments on the audit plan to the Safety Auditor with a copy to the Contractor, especially on the dates of the audit and areas of high priority and special concern.
- Taking into account of the comments, the Safety Auditor shall provide the revised audit plan to the Engineer, the DSEA and the Contractor not less than 7 days in advance of the audit dates for information and implementation of the necessary arrangements.

Report on the Safety Audits:-

- The Safety Auditor shall prepare a report on the safety audit which shall include:
 - ▶ the scores in Part I and Part II
 - ▶ any situations of imminent danger notified during the safety audit
 - ▶ any deviation or inadequacy in the Safety Plan and its implementation
 - ▶ areas where improvement / further improvements are required and recommendations for these improvements
 - ▶ comments on the Contractor's site safety performance and his safety management system highlighting both the strengths and the weaknesses
- The Safety Auditor shall send the safety audit report to the DSEA, the Engineer, and the Contractor within 14 days of the safety audit.
- The Engineer shall carry out the checking of scores and scrutiny of the report and seek clarification from the Safety Auditor if required. The Engineer shall consult the DSEA where necessary for comment.

Follow-up action on safety audits:-

- All non-compliances identified during the safety audit and subsequently included in the safety audit report shall be raised in the following SSMC meeting.
- The Contractor is required to submit an action plan, which shall be signed by the Site Agent and the Safety Manager, to the Engineer, the Employer (i.e. the relevant works departments of ETWB) and the Safety Auditor within 14 days of the receipt of the safety audit report.
- Payment shall be made by the Contractor to the Safety Auditor after completion of each safety audit. The Contractor shall submit the Safety Auditor's confirmation of receipt of the payment with a copy of the invoice from the Safety Auditor to the Employer for reimbursement. No reimbursement shall be made to the Contractor if either of the scores in Part I and Part II is below 70%.

3.4 Site Safety Cycle

Daily Cycle:-

- Pre-work Exercise and Safety (PES) Meeting
- Hazard Identification Activity (HIA) Meeting
- Pre-work Safety Checks
- Safety Inspection by the Site Agent or his Representative
- Guidance and Supervision during Work
- Safety Co-ordination Meeting
- Daily Cleaning and Tidying Up of the Site
- Checking of the Site after Each Day's Work

Weekly Cycle:-

- Weekly Safety Walk
- Weekly Safety Co-ordination Meeting – shall be chaired by the Engineer
- Weekly Overall Cleaning and Tidying Up of the Site

Monthly Cycle:-

- Site Safety Management Committee Meetings
- Site Safety Committee Meetings

In addition, provision of Safety Bulletin Board and Hard-paved Area are also required.

3.5 Pay for Safety Scheme (PFSS)

PFSS are implemented on some selected contracts at the rate of about 2% of the contract sum and the following site safety items are normally included in the PFSS:-

- Provision of draft safety plan
- Provision of complete safety plan
- Updating of safety plan
- Provision of safety manager
- Provision of safety officer(s)

- Attend site safety management committee meeting
- Arrange and attend site safety committee meeting
- Arrange and attend weekly safety walk
- Provision of trade specific advanced safety training to skilled workers
- Provision of site specific induction training
- Tool box training
- Participation in safety promotional campaign as instructed by the Engineer
- Attendance of safety audit
- Arrange and hold site safety cycle
- Provision of safety bulletin board

These items will be certified and paid to the Contractor through interim payment provided the specified activities were satisfactorily performed. Failure to perform to the satisfaction of the Engineer will result in no payment for the relevant item(s).

3.6 ETWB and Works Departments Technical Circulars

ETWB has issued various Technical Circulars for works departments to implement as one of the management tools. Some relevant Technical Circulars related to site safety are as follows:-

<u>Circular No.</u>	<u>Subject</u>
02/2003A & 02/2003	Regulating Action where a Serious Incident has or Site Safety or Environmental Offences have occurred on a Construction Site
22/2003A & 22/2003	Additional Measures to Improve Site Cleanliness and Control Mosquito Breeding on Construction Sites
30/2002	Implementation of Site Safety Cycle and Provision of Welfare Facilities for Workers at Construction Sites
12/2001	Safety Training for Departmental Staff and Resident Site Staff
26/2000	Score Card for Assessment of Site Safety Performance
32/1999	Second Stage of the Independent Safety Audit Scheme
13/1998	Liaison with Labour Department and Marine Department on Construction Site Safety

Works Departments such as Highways Department has also issued their own departmental technical circular and some are as follows:-

<u>Circular No.</u>	<u>Subject</u>
3/2001	Reporting of Notifiable Accident / Serious Incidents on Highway Department Works Sites
4/2001	Liaison with Labour Department and Marine Department on Construction Site Safety Matters
7/2001	Clearing of Rubbish and Control of Rodents on Construction Sites

4. Discussion and Conclusion

The foregoing safety management programme stipulated in the contracts provides Contractors to consider safety costs in their tender and re-rank the priority of safety to highest level. It also facilitates the consulting engineers and their resident site staff to supervise and monitor Contractors' day to day safety performances during the routine supervision works. Safety staff from the consulting engineers also participated in the supervision work through conducting regular safety inspections, attending various site safety committee meetings, control of method statements and risk assessments, conducting safety promotional activities and attending independent safety audits, etc.

In addition to enforce the general safety provisions, individual consulting engineers has also developed their own internal safety administrative procedures to strengthen the supervision work such as daily joint safety inspections to high risk areas and activities by respective senior RSS and contractors senior supervisory staff. The consulting engineers may issue their own safety improvement notices to contractor when breaching of major safety rules and procedures are repeatedly observed.

While the ISAS is commonly deployed for assessing the safety management system of contractors, successful safety auditing may require the following conditions to be met:-

- satisfactory methods
- effective procedures
- supportive legislation
- sufficient data
- funds to pay for safety auditing
- freedom to assess effectively
- effective co-ordination and monitoring
- adequate participation from relevant parties
- integrity of those conducting and using safety auditing
- competent safety auditors

Improving site safety performance through enhanced safety culture (Tam, et al, 1999 and Tang, 2001), partnering (Rowlinson, et al, 1999) and sociological approach (Saunders, et al, 1991) may be another issues that should be further developed in the future strategy.

We need to remain open to a wide variety of sources of understanding, apply their insights to pressing safety and health issues and then reflexively monitor their validity and in this way progress towards better understandings and an enhanced ability to avoid safety problems rather than simply responding to them in a form of crisis management.

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