

Advisory for professional engineers on formwork safety

18 January 2014

To: Professional Engineers Board Singapore,

All Professional Engineers

ADVISORY FOR PROFESSIONAL ENGINEERS ON FORMWORK SAFETY*

In light of the recent accidents involving collapse of formwork structures, the Ministry of Manpower (MOM) is sending out this advisory to remind Professional Engineers (PEs) of their obligations in the design, construction and inspection of formwork structures.

2. Over the past week, two formwork collapse accidents took place at separate construction worksites (refer to **Annex A** for details on the two accidents). While the investigation into these accidents are in progress, preliminary findings showed that the formwork structures gave way during the concrete casting process, indicating that the structures were unable to support the load imposed on them during the casting process. Although it was fortunate that there were no serious injuries arising from these accidents, such dangerous occurrences could have catastrophic consequences and result in significant loss of lives.

3. General duties of stakeholders are imposed under the Workplace Safety and Health (WSH) Act while more detailed provisions on the design, construction, and safe use of formwork structures are regulated under the WSH (Construction) Regulations 2007. MOM takes a firm stance against any contraventions of the WSH Act and its subsidiary regulations, and will like to remind PEs involved in formwork-related activities to pay particular attention to the following:

Design of Formwork Structures

- If appointed to design any formwork structure, the PE should ensure that he is appointed in writing with a detailed documentation of the PE's work scope;
- PE shall comply with Part IX of the WSH (Construction) Regulations 2007, and make reference to the Singapore Standard 580:2012 (or any revision thereafter) and the various formwork guidelines published by WSH Council;
- All formwork structures shall be capable of sustaining the total dead load, live load and impact load imposed on the formwork structures with a minimum safety factor of 2;
- PE shall ensure that his design of the formwork structure can be executed safely by any person who constructs or uses the formwork structure according to his design;

- If the PE's design comprises any proprietary formwork system, the PE should obtain the manufacturer's manual which contains instructions on the safe use of the formwork and ensure that he is competent in the use of the proprietary formwork system, before incorporating the proprietary formwork system in his design; and
- Mix-and-match of formwork systems and components should be avoided. Should this be unavoidable, PEs shall ensure that the design for the entire combined formwork structure takes into consideration the compatibility of these systems as well as the overall strength and integrity of such systems. The PE's design and calculations shall be documented.

Inspection of Formwork Structures

- Before issuing a certificate to state that the formwork structure is safe for its intended use (hereinafter referred to as "certificate for safe use"), the PE should ensure that a site inspection is conducted jointly with the competent site personnel, e.g. site engineer/ formwork supervisor, to ensure that the formwork structure is constructed in accordance to the PE's design and safe for its intended use;
- PE should keep records of the inspections, such as location plans (indicating the inspection areas) and photographic records of the inspected formwork structure. These records should be kept and be produced for inspection upon request by a MOM inspector;
- PE's inspection shall include verification that all components required by the PE's design are not omitted, under-provided, substituted or deviated (e.g. dimension);
- PE shall ensure that the horizontal and diagonal bracings are provided in both longitudinal and transverse directions, as may be necessary to provide stability and rigidity to any formwork structure unless the formwork structure has been designed to be stable and rigid without the bracing;
- Any deviation to the PE's design must be rectified to the PE's satisfaction before the PE issues the certificate for safe use; and
- The certificate for safe use issued by the PE should cover the entire formwork structure to be used for concrete work, including the formworks, falseworks, shores, and any other support.

Penalty for Contravention of Requirements on Formwork Safety

4. Any PE who violates the Workplace Safety and Health Act (Chapter 354A), under Section 13 - Duties of Self-Employed Persons and Section 15 - Duties of Persons at Work, shall be liable to a fine of up to \$200,000 and / or imprisonment of up to two years. In addition, any PE who contravenes any provision of the Workplace Safety and Health (Construction) Regulations 2007 shall be liable to a fine of up to \$20,000 and / or imprisonment of up to two years.

Further information

5. More information can be obtained from these:

- Workplace Safety and Health Act (Chapter 354A);
- Workplace Safety and Health (Construction) Regulations 2007;
- Workplace Safety and Health (Risk Management) Regulations;
- Code of Practice on WSH Risk Management; and
- MOM Circular on Safety Requirements for Formwork Structures.

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DY. COMMISSIONER FOR WORKPLACE SAFETY AND HEALTH

* Please note that the information provided in this Advisory is not exhaustive and is for the benefit of enhancing workplace safety and health so that a recurrence may be prevented. The information provided is not to be construed as implying any liability to any party nor should it be taken to encapsulate all the responsibilities and obligations of the reader under the law.

Annex A

Recent formwork collapse accidents

1. 10 January 2014: Formwork accident at Lian Soon Construction Pte Ltd's worksite along Bishan Street 13

On 10 January 2014, a formwork accident took place at Lian Soon Construction Pte Ltd's worksite along Bishan Street 13. Preliminary findings show that a group of workers were carrying out concreting work for the second floor's slab of an indoor sports hall under construction when the support structure became unstable. Before the structure gave way, the group of workers left the affected area, but one of them was slightly injured as he lost his footing. The worker was conveyed to a medical clinic for treatment of minor injuries.

2. 11 January 2014: Formwork accident at SH Design & Build Pte. Ltd.'s worksite along Yishun Industrial Street 1

On 11 January 2014, a formwork accident took place at SH Design & Build Pte. Ltd.'s worksite along Yishun Industrial Street 1. Preliminary findings show that a group of workers were carrying out concreting work for the second floor's slab of a light industrial building under construction when the support structure started to sink. The group of workers then left the affected area and the structure later gave way. None of the workers were injured in the accident.