

Full Length Research

Investigation of safety and health compliance on the construction workers facilities

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It is important to inspecting construction site to ensure that appropriate control measures are in place which is a key element of an effective safety and health program. A well – manage inspection program can help to identify problems and assess risk before accidents or injuries occur. In general lack of controlled working environment and the complexity of the size of organization all have effect on safety performance within the construction sites. The aim of the study is to investigate the safety and health compliance on the facilities provided to construction workers on site. A structured or standardized questionnaire was used in the workplace inspection at 5 different construction sites that is, the construction industry standard (CIS), refer to as CIS 10:2008. The average score from the five sites as regard to the workplace inspection is 54.41%, which fall within 2 star categories in the star ranking (40 – 55). The result reveal that the level of compliance as regard to issue of safety and health facilities provided for workers at construction sites are averagely implemented, that is most of the potential and significant workplace facilities and their documentation process are averagely managed and that a few medium workplace facilities are neglected. The study recommended that in order to have a safe working environment free of all form of accidents, informal inspections are to be carried out by the safety supervisors and monthly by the health and safety representatives of the joint health and safety committee members. So that all the deficiencies identified during the inspection shall be communicated to the top management for further necessary action.

Key words: Inspection, construction, workers, safety, management.

INTRODUCTION

Provision of safe workplace at construction sites is a complex phenomenon. Edwin et al., (1999) stated that, in construction industry the risk of fatality is five times more likely than in manufacturing industry, whilst the risk of a major injury is two and half time higher. This makes the construction industry a high risk workplace. Reasons are lack of training, lack of proper equipment, unsafe sequencing and working under improper site condition. In addition, slippery surface, an excessive number of trades working in one area, and hazardous electrical and atmospheric condition contribute to accident occurrence in construction sites.

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problems and assess risk before accidents or injuries occur, a proper inspection program can identify potential problems, identify deficiencies in equipment and/or machinery, assess and determine the degree of compliance, and demonstrate management support for the safety and health program. In general lack of controlled working environment and the complexity of the size of organization all have effect on safety performance within the construction sites. The aim of this study is to investigate the safety and health compliance on the facilities provided to construction workers on site.

As according to Ridley (1986), accident doesn't just happen, they are cause and that 99% of the accidents are caused by either unsafe acts or unsafe condition or both. The unsafe act is a violation of an acceptable safety procedure, which could permit the occurrence of an

accident. The unsafe condition is a hazardous physical condition or circumstances which could directly permit the occurrence of an accident. Many factors are responsible for construction site accidents, Abdulhamid et al., (2008) identified the following as the root causes of construction sites accidents: failing to identify an unsafe condition that existed before an activity was started or that developed after an activity was started, deciding to proceed with a work activity after the workers identifies unsafe condition and deciding to act unsafe regardless of initial conditions of the work environment. Abdelhamid and Everett (2000) describe an unsafe conditions as a condition in which the physical layout of the workplace or work location, the status of tools, equipment, and/or material are in violation of contemporary safety standards. Abdelhamid and Everett (2000), identified two different types of unsafe condition in the work sequence, as well as who caused them to exist or develop. First, an unsafe condition may exist before an activity is started. Second, an unsafe condition may develop after an activity is started. Lack of proper site layout, lack of training, and lack of proper equipment and so on, will increased the chance of accident occurring in construction sites.

The aim of having a proper and well plan site layout and facilities as argued by Gibb and Knobbs (1995) is to produce a working environment that will maximize efficiency and minimize risks. As explain by Anumba and Bishop (1997), that an aspect of site layout planning that need to be address include access and traffic routes, material and storage handling, site offices and amenities, the construction plant, fabrication workshops, services and facilities and the site enclosure. On the other hand, Jannedi and Bu-Khamsin (2002) summarized the important research on safety from the year 1976 to 1993 and concluded that site safety was associated with factors such as site management and control, site supervision and leadership, site safety program and the influence of the general contractor on subcontractors.

The range of activities to be inspected can vary, depending on the kind of construction activities that is going on in the site. It is advisable for the a company to carried out in-house inspection on their construction site, and the persons conducting the inspection should have adequate knowledge about the kinds of hazard that may be presented and the legal requirement that need to be applied as well as the company requirement on safety and health programs.

Most management are not committed to the issue of safety at sites and the fact still remains that commitment and support from top management is vital to the success of safety in construction sites. Jaselskis et al., (1996), reported that commitment and support by top management would significantly drive up the performance of safety. Evelyn et al., (2005), state that in Singapore, the construction site safety legislation is governed by the requirements stipulated under the Factories Act (Chapter

104) and the Factories (Building Operation and Works of Engineering Construction) Regulation require all occupiers of construction worksites, which have contract values of S\$10 million or more to implement a Safety Management System (SMS) specified under the 1999 Code of Practice for Safety Management System for Construction Worksites (CP 79).

As such safety management and control system has to be taken serious when planning job activities and setting up company policies. Willion and Koch (2000), demonstrated that safety management is a process of controlling safety policies, procedures, and practices relating to project site safety. While, Ahmed et al., (2002) argued that establishing a clear, complete, and practicable site safety plan is one of the most effective methods for ascertaining site safety and minimizing potential hazards. Regular safety audits provide an effective way to review and refine site safety plans, thus improving safety at the jobsite. Rafiq et al., (2008) Indicate a typical organizational structure of a Hong Kong contractor figure 1.

The management of the company provides support to the kind of organizational structure that ensures effective site safety management. The management ensures training, provides personal protective equipment (PPE) in order to demonstrate its commitment.

MATERIALS AND METHODS

A structured or standardized questionnaire was used in the workplace inspection at 5 different construction sites that is, the construction industry standard (CIS), refer to as CIS 10:2008.the work place inspection check list was develop as safety and health in construction workplace by the technical committee on safety and health in construction with the assistance of construction industry development board (CIDB) Malaysia which acted as a moderator and facilitator for the technical committee throughout the development process in the standard. The five construction sites selected for workplace inspection in this studies must be:

- A building/ civil engineering construction sites;
- Its contract price is above 20 million Malaysian Ringgit and
- The progress of the work on site is between 25% - 75% completion.

In the workplace inspection checklist there are 63 items identified for inspection, and the inspection is expected to be carried out at five highly risk areas within the five sites. The assessor discuss with the site project manager prior to selection of those high risk area for assessment. The assessment will provide valuable visual comparison evidence on the OSH programs implemented, enforced and practiced at sites/workplace.

The following formula was used in order to determine the percentage level of compliance to the OSH

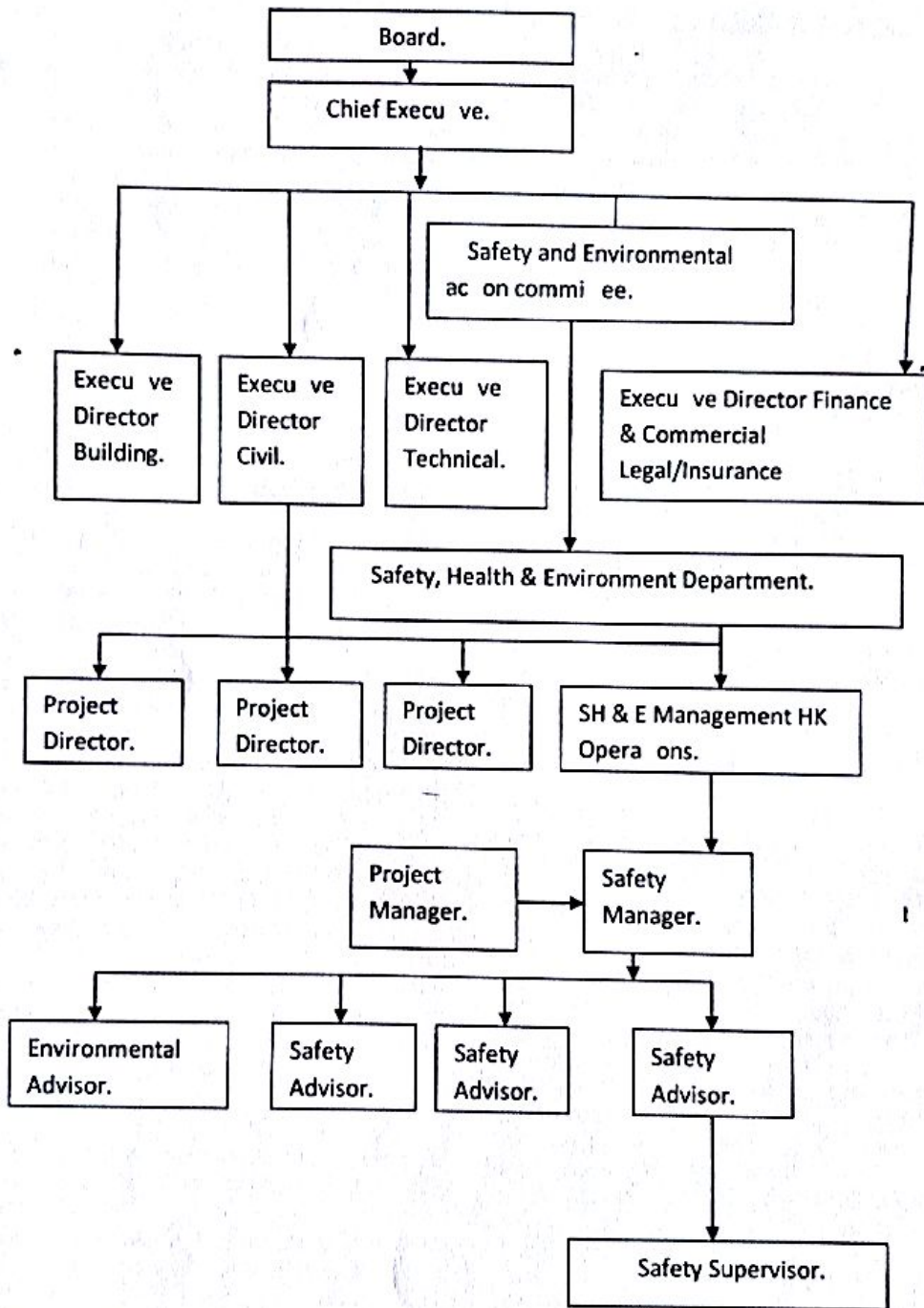


Figure 1: typical safety organization structure of a contractor.

workplace standard;

$$\frac{\text{Total number of 'C' scored.} \times 100}{(310 - \text{Number of 'NA'})}$$

Where, C = obtained scores, NA = not applicable.
 310 items identified for inspection in the five sites that is,

$62 \times 5 = 310$. It is also possible that some questions may not be applicable to a particular site.

Basic criteria

The following were the basic criteria consider in the workplace inspection as contain in the workplace

inspection checklist;

- Machinery: There are 3 questions associated with machinery inspection which are aim at checking the physical condition of the machineries, so as to make sure no defects or damages and no abnormality from sound/noise from the machine. (FMA 1967, section 14 and OSHA 1994 section 15).
- Scaffold: There are 3 questions in scaffold investigation checklist, which are aim at ascertaining the fitness of the scaffold used in the working operation. {FMA (BOWEC) Regulation 1986, part X}.
- Color Code for Signages: There are 4 questions, which are aim at visualizing the appropriate usage of international color codes for signages. {OSHA 1994 section 15 and OSH (CPHC) Regulation 1997}.
- Notice: there are 4 questions, which are aim at checking the availability of the area designated as assemble area are marked/indicated as required in OSHA 1994 section 15.
- Ventilation: This is aim at checking if adequate natural/mechanical ventilation are provided at the required workplace as contain in the FMA1967, section 22 and FMA{Safety, Health and Welfare (SHW) regulations 1970 regulation 25 and 26}.
- Housekeeping: There are 3 questions which are aim at visualizing the overall workplace is clean and tidy, free from unwanted materials, combustible/flammable material, dust and so on. {FMA 1967, section 22 and FMA (SHW) regulation 1970, regulation 23 and FMA (BOWEC) regulation 1986, regulation 22}.
- Illumination/lighting: This is aim at visualizing and observing that there are sufficient light (natural or powered) at the working vicinity. {FMA 1967, section 22 and FMA (SHW) regulation, 1970 regulation 29}.
- Fire Protection: There are 2 questions, which are aim at visualizing and observing that there are fire extinguishers available and easily accessible and also that there are dry riser installed for high rise project or building above 5 stories high {FMA (SHW) regulations 1970 regulation 21 and 22}
- Personal Protective Equipment (PPE): There are 11 questions, which are aim at inspecting the provision of the PPE to construction workers at site {FMA (SHW) regulation of 1970}.
- Barricade from Hazard Area: There are 3 questions which are aim at checking that all openings, edges and trenches/pits are protected and covered {OSHA 1994, FMA (SHW) regulation of 1970}
- Access/Egress: This is aim at observing for the provision of access/egress and if they are maintained and free from any obstructions {OSHA 1994, section 15/FMA (BOWEC) regulation 1986, regulation 10/FMA (SHW) regulation 1970, regulations 7 and 8}.
- Suitable Working Tools/Equipment: This is aim at checking the tools/equipment used by the workers are of the right tools for the job {FMA 1967, section 14 and

21/FMA (BOWEC) regulation 1986 part XVI}

- Electrical Safety: There are 2 questions, which are aim at observing unsafe condition such as electrical cords/cables running/soaked in water electrical appliances, tools and so on. {FMA 1967 section 14 and 21/OSHA 1994, section 15/FMA (BOWEC) regulation 1986, regulation 10}.
- Prevention of falling objects: There are 3 questions, which are aim at checking the catchment platforms erected and maintenance (for high rise construction works) {FMA (BOWEC) regulations 1986 part VI}, also to check for safety nets provided and maintained as per requirement of FMA (BOWEC) regulations 1980 part VII and finally to observed visually peripheral netting (green netting) fixed along the building perimeters (DOSH-Guidelines for public safety and health at construction site 1994).
- Hazardous substance: There are 2 questions which are aim at observing all hazardous substance at site such as toluene, petrol, thinner and solvents and so on are labeled as contain in OSH (USECHH) regulation 2000, regulation 20 and 21, also to visualized and observed for safety warning signage/fencing of hazardous substances storage area and the presence of fire extinguishers {OSH (USECHH) regulations 2000/FMA (SHW) regulation 1970, regulation 20}
- Safety policy: To visually observe if safety policy statement is visibly displaced in site (OSHA 1994 section 16).
- Perimeter Hoarding: to visualized and observed for perimeter hoarding erected at construction site (UBBL 1984, part VI section 98/DOSH-Guidelines for public safety and health at construction site 1994).
- Vehicular traffic management: There are 3 questions, which are aim at checking for safety warning signage's, such as speed limit signage, detour directions arrows, reflectors and so on. also to observed if there is a flag man at the site and to see if he is properly attires {FMA(BOWEC) regulations 1986, regulation 18}.
- Sanitation: To check for the availability of toilet/sanitary conveniences provided for man and woman employees/workers {FMA 1967, section 22/FMA (SHW) regulations 1970, regulation 37}.
- First Aid Box: To check for first aid box/boxes provided and with its contents {FMA (SHW) regulation 1970, regulation 38}
- Designated rest area: To check for canteen, eating area, smoking booth, praying room and so on are available and in good condition (OSHA 1994, section 15)
- Water ponding: To observe for availability of pools of water/inclusive of all potential mosquitoes breeding point/area such as junction boxes, empty and unused container, unused tyres, flower pots and so on at the site (OSHA 1994 section 15).

RESULTS AND DISCUSSION

The workplace inspection conducted on the five selected

Table 1: The results of workplace inspections at five sites

Site A	Site B	Site C	Site D	Site E
65.45%	23.75%	65.15%	64.68%	53.03%

Source: Data analysis.

Table 2: Combined workplace inspection scores for five sites

Components	Obtained scores	Total scores
Machinery	27	30
Scaffold	19	35
Signage's color code	25	70
Notices	27	53
Ventilation	6	6
Housekeeping	32	63
Illumination/ lighting	7	7
Fire protection	12	15
Personal protective equipment	60	94
Barricades for hazard area.	5	39
Access/egress	17	24
Suitable working tools/equipment	20	20
Electric safety	5	6
Preventing of falling objects	8	23
Hazardous substances	3	5
Safety policy	5	6
Perimeter hoarding	4	7
Vehicular traffic management	1	19
Toilet	7	7
First aid box	6	6
Designated rest room	6	6
Water ponding	2	5

Source: Data analysis

sites for this study, are shown in table 1. Table 1 shows that site A has the highest score with 65.42%, while site B, have the lowest with 23.75%. The site that score 65.42% show an averagely managed workplace whereby all its facilities consider for the inspection at the site are managed and well documented, but still there are few medium risk activities that are not managed and documented due to negligent on the site of the management of the sites. The site with low score that is, site B, with 23.75%, it shows a poorly managed workplace, whereby virtually all the facilities consider for inspection are poorly managed and not properly documented.

Table 2, shows the combined scores of the workplace inspection conducted on the five sites. While figure 2, show the performance of the various component consider in the inspection as regards to their score obtained from the total scores.

The average scores for the five sites as regard to the workplace inspection is 54.41%, which fall within 2 star category in the star ranking (within 40 – 55). This indicates that all the potential and significant workplace inspection conducted are partly managed and not properly documented.

From table 2, the total scores form the five sites is 555

and the sites score a total of 304, certain components scores below average in their scores while some components scores not encouraging. The components that scores below their average are, signage's color code, Barricades for hazard area, Prevention of falling object, Vehicular traffic management and water ponding. The components that their scores are not encouraging are Machinery, Scaffold, Notice, Housekeeping, Personal protective equipment and Access/egress.

Those components discussed above, are vital components for any free accident construction sites, failure to these components as observed from the finding means that the construction workers are working with the hazards that are dangerous to their safety and health.

CONCLUSION AND RECCOMENDATION

Inspecting construction site to ensure appropriate control is in place is key element of an effective health and safety program. The study identified 22 basic components of workplace inspection, and effective implementation of these components will provide a safe and healthy working environment. The result reveal that the level of compliances as regard to issue of safety and health facilities provided for workers at construction sites are averagely implemented, that is most of the potential and

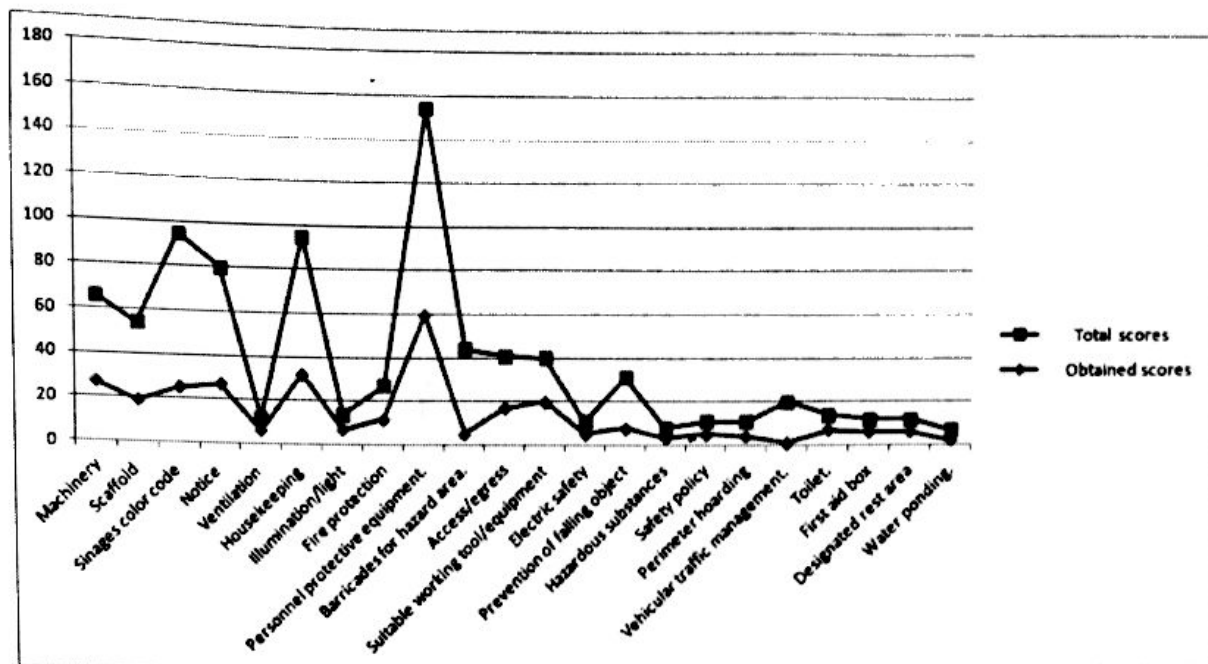


Figure 2: Line-graph of workplace inspection for five sites combined

significant workplace facilities and their documentation process are averagely managed and that a few medium workplace facilities are neglected. This study recommended that in order to have a safe working environment free of all form of accidents, informal inspections are to be carried out by the safety supervisors and monthly by the health and safety representatives of the joint health and safety committee members. So that all the deficiencies identified during the inspection shall be communicated to the top management for further necessary action.

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