DEVELOPING A FRAMEWORK TO ENSURE SAFETY OF MAINTENANCE WORKERS IN SRI LANKAN COMMERCIAL BUILDINGS

S.H.M.I. Udani, P.A.P.V.D.S. Disaratna, R.P.N.P. Weerasinghe* and H.W.N. Madhusanka

Department of Building Economics, University of Moratuwa, Sri Lanka

ABSTRACT

Maintenance is one of the most important and critical activities in every high rise commercial building. Maintenance activities often comprised of risk increasing factors and different kinds of potential hazards. Significant numbers of maintenance workers may be exposed to a variety of risks when doing their job. The safety of the maintenance workers should be prioritized in every maintenance work. It is mandatory to provide a safe working environment for their workers. Organisations and maintenance workers are not adhering appropriate safety practices to safeguard their lives and properties. Initiated regulations and standards are not specifically designed for the building maintenance activities. Therefore, this research intended to address this issue by developing a framework to ensure safety of maintenance workers in commercial buildings. Initially, a comprehensive literature review was carried out on the subject matter. Based on the nature of the study, data collection was carried out in two phases. A case study approach was used to gather existing information on maintenance works carried out under different categories, their related hazards. Semi structured interviews were conducted with a professional who is in the management level of the maintenance department in each selected case study. Expert survey was then carried out with three industry professionals to gather information about appropriate suggestions to ensure the safety of maintenance workers. The study highlighted key categories of maintenance works as confined space works, hot works, works at height, works involve with electrical equipment and works involve in using dangerous substance. These activities involve with different kinds of potential hazards such as physical, chemical, biological and psychological. The exposure level of the maintenance workers to the hazards is significantly high in this work environment. The study identified safe procedures to follow during different maintenance tasks.

Keywords: *Maintenance Works; Occupational Safety and Health; Safety and Health Measures.*

1. INTRODUCTION

In recent years, maintenance of a building has considered as one of the vital functions within any organization (Milczarek and Bienko, 2010). A proper maintenance is necessary for reducing its life cycle cost and for achieving expected life time of assets within its optimum performance (Hon *et al*., 2011). According to Booty (2006), maintenance of facilities and properties in any organization has a direct influence on the effectiveness of its functions. Maintenance can be considered as the most essential activity to perform required function from any physical item effectively (Blaise *et al*., 2014).

Maintenance associates with different types of work tasks in various sectors, different work phases and different kinds of working environments (Milczarek and Bienko, 2010). According to Vatn and Aven (2010), maintenance can increase the reliability and hence the safety of the equipment though failures and accidents often occur while execution of maintenance activities. Accordingly, workers who carry out maintenance operations in any work environment may directly interact with various hazards (Blaise *et al*., 2014). Grusenmeyer (2014) reported that the accidents exposure level of maintenance staff is higher than the production staff. European Agency for Safety and Health at Work (2010) emphasizes that maintenance activities has been contributed to the 10%-15% of fatal Occupational accidents from the 15%-20% of all accidents in Europe in 2006. Inappropriate walking or working surface, working while a machine is in motion, dangerous working practices, misinterpretation of instruction and accidental engine

*Corresponding Author: E-mail - nilminiweerasinghe@ymail.com

start-up are some of the causes for severe and fatal accidents in maintenance operations (Lind and Nenonen, 2008).

The safety of the maintenance should be prioritized in every industry and as well as it is mandatory to provide a safe working environment for their workers and subcontractors (Hadidi and Khater, 2015). Safety is ensured by the combination of management, workers and equipment (Raouf, 2004). International and local legislation and standards have been introduced for different work conditions. There is less attention for applying safety procedures in different maintenance works in buildings. Although maintenance is treated as a critical and risky operation according to occupational Safety viewpoint, the risk towards maintenance workers have been much less examined (Lind and Nenonen, 2008). Hence this study aims to develop a framework for ensuring safety of the maintenance workers in commercial buildings. The following objectives are set to reach the above aim,

1. To identify the different types of works carried out by maintenance staff,
2. To identify the health and safety hazards involved in maintenance works, and
3. To identify suitable safety procedures for maintenance work.

2. LITERATURE REVIEW

2.1. MAINTENANCE OF BUILDINGS

Success and continuity of the organization is influenced by efficiency and effectiveness of its maintenance functions (Cooke, 2003). According to Lai *et al*. (2008), it is essential to conduct properly organized operation and maintenance services for ensuring proper building performance and for preserving the economic rent pay for the buildings. The British Standards Institute defined maintenance as, "A combination of all the technical and associated administrative activities required to keep equipment, installations and other physical assets in the desired operating condition or to restore them to this condition" (Muchiri *et al*., 2010, p.8). Reason (1997) described the term maintenance as activities including unscheduled repairs, inspections, planned preventive maintenance, together with calibration and testing. Different types of maintenance are used by organizations based on their need. Dhillon (2006) categorized maintenance as,

- Preventive maintenance - actions carried out according to a schedule which is planned, specified and in a periodical condition to keep equipment and items in a required working condition by the process of reconditioning and checking.
- Corrective maintenance - unscheduled and unforeseen maintenance or repair to equipment and items to return them to the required state, carry out when after maintenance persons or the users identifying the failures and deficiencies.
- Predictive maintenance - correctly diagnosing the present condition of the equipment and items during its operations by using modern measurement and signal processing techniques.

The nature of the maintenance work has changed in recent times with variety of tasks, working conditions and technologies (Cooke, 2003). Lai *et al*., (2006) noted a wide range of maintenance works of building components such as roofing, façade and internal finishing as well as engineering services such as electrical, air conditioning, plumbing, fire services, lifts and escalators and drainage. Southwark Council (2008) categorized work activities take place in maintenance with consideration of safety aspects where the special attention should be there for the safety of maintenance workers and can be summarized as follows,

- Confined space works - totally or partially enclosed place which is not suitable to workers occupancy, entrance and exit is restricted due to the location and means, consisted with risks to safety and health of the worker because of the work to be carried, materials used, location and hazards (Canadian Centre for Occupational Health and Safety, 2012)

- Hot works - operations which have the possibility of producing heat, flames and sparks (Ontario Ministry, 2006). Hot work include the works such as welding, chipping operations, works with spark introducing tools and cutting operations (Weissman, 2008)
- Working at height - working at height is a situation which any person is carrying out the work at aheight of more than two meters/six feet: due to that height there is a possibility to fall if necessary safety precautions are not provided (The Employers' Federation of Ceylon, 2015).
- Excavation works - works carrying out with the purpose of creating an open face, cavity or hole with the use of any tool, machine or another thing for removal of soil or rock from a site to form an open face, hole or cavity. Machinery or explosives can be used during excavation works (Safe Work Australia, 2015)
    - Maintenance works on lifts, conveyors and hoists
    - Works on high voltage electrical equipment or on other electrical equipment
    - Works involving the use of hazardous/dangerous substances

Work tasks, work period and working environment vary in maintenance works according to the jobs carried out (Vinnem *et al*., 2012). It is obvious that maintenance activities always comprise with risk increasing factors (Kelly and McDermid, 2001). According to nature of the work, maintenance can be identified as a high risk activity as the work is consisted of several hazards (Lind and Nenonen, 2008). In addition, a significant number of accidents are related to maintenance activities and especially to corrective maintenance (European Agency for Safety and Health at Work, 2010). Accordingly, the next section discusses the prevailing hazards and risks of maintenance works.

2.2. EXISTING HAZARDS IN BUILDING MAINTENANCE

Lind *et al*., (2008) described hazards in work place as hazards relating to the working methods, working environment and machinery. Both British Standard (2004) and OSHAS 18002 (2007) identified the term hazards in a similar way as, “Source or situation with a potential for harm in terms of death, ill health or injury, or a combination of these”. In British Standard 8800 (2004) hazards are categorized under following four categories,

- *Physical hazards* - any factor existing in the environment which has the potential of causing the harm without necessarily touching it (Sutton, 2015).
- *Chemical hazards* - any mixtures, substances, and materials which are categorized as dangerous and having risk (Marshall, 1987).
- *Biological hazards* - any biological substance or organic matter which affect in a bad manner to the health of human (Stitt-Fisher, 2015)
- *Psychological hazards* - the workplace stressors and other violence (Pryor and Capra, 2012)

Table 1 shows the identified hazards in all four categories. Lind *et al*. (2008): Neitzel, *et al*., 2008: Zhao, *et al*., 2015; Cowles (2001); Phoon (1997) and Sedlatschek (2011).

Table 1: Existing Hazard in Maintenance Work

Type of Hazard	Existing Hazards in Maintenance Work
Physical Hazards	▪ Electrical: capacitors, high voltage, static ▪ Mechanical movement: rotating elements such as flywheels, unexpected startups, computerized auto-start ▪ High pressure fluids ▪ Oxygen deficient atmospheres, Radiation ▪ Fire/explosion; Extreme heat/cold, Noise, Vibration ▪ Work at Height; Weather, Ergonomics ▪ Slipping, tripping, falling ▪ Lifting and holding heavy loads
Chemical Hazards	▪ Dusts and Fibers such as asbestos, silica, respiratory sensitizers

Type of Hazard	Existing Hazards in Maintenance Work
	▪ Dangerous substances such as chlorine, hydrogen ▪ Toxic, oxidizing, explosive, flammable, corrosive substances ▪ Hydraulic fluids, oils, acids, alkalis, organic solvents
Biological Hazard	▪ Pathogenic bacteria such as salmonella and legionella ▪ viruses, parasites, moulds and fungi
Psychological Hazards	▪ Time pressure; Long hours; Shift work ▪ Poor work organization; Unsocial working hours

Moreover, solid, gas or liquid which have the possibility of occurring harm to the persons can be identified as hazardous substances (Work Safe Victoria, 2015). The hazards which worker is exposed may lead to risk of causing work related injury and accidents. The factors affecting for increasing the risk of injury is wider than simply unsafe acts and unsafe conditions existing in workplaces (Keyserling and Smith, 2007). Hadidi and Khater (2015) mentioned that the occupational risk from the potential hazards in maintenance work is much higher than other sort of routine work, in-house workers, outsource parties and sub-contractors involve in maintenance work and they expose to variety of risks. Raouf (2004) noted that maintenance policies and safety performance has direct impact on the effectiveness of functions. Companies need to adhere appropriate health and safety management systems to prevent and diminish accidents by identifying and selecting the most essential hazards and by managing the hazards and the preventive measures (Vinnem *et al*., 2012).

2.3. OCCUPATIONAL SAFETY HEALTH LEGISLATIONS AND STANDARDS INFLUENCE TO MAINTENANCE

Some of the international and local standards and polices are initiated to eliminate the hazards by providing appropriate safety procedures.

- International Labour Organization (ILO) Conventions

ILO deals with all labour issues by providing guidelines on Occupational Safety and Health management systems. ILO - OSH (2001) has provided conventions for radiation protection, occupational cancer, working environment; (noise, vibration and air pollution), exposing to asbestos, using of chemicals at work and prevention of major industrial accidents.

- BS Occupational Health and Safety Assessment Series (OHSAS) 18001:2007

BS OHSAS 18001 (2007) standard emphasized the requirement of occupational health and safety (OH&S) management systems in workplaces. The standard enables organizations to establish an Occupational Health and Safety policy, planning (for identification of Hazard, risk assessment and determining controls, Legal and other requirements) implementing and operation, checking and obtaining corrective actions under the management responsibilities and their commitment to OH&S management system. OHSAS 18001 aims to confirm a firm's Occupational Health and Safety Management System (OHSMS) which helps to develop and sustain a safe workplace while securing workers from accidents and illness (British Standards Institution, 2013). The objective of the OHSAS 18001 standard is to uphold the good practices in the area of occupational health and safety through the methodical and planned management systems support (Chang and Liang, 2009).

- Factories Ordinance No. 45 of 1942

Factories Ordinance has made provisions for ensuring the safety, health and welfare of persons working in the factories and other workplaces which the provisions of this ordinance apply. According to The Employers' Federation of Ceylon (2015) below mentioned provisions are most affecting to maintenance works.

- Requirements of building services Examination and reporting the results of examinations
- Regulations for accidents notification and dangerous occurrences notification
- Requirements for providing effective and suitable PPE such as screens, shields, goggles or spectacles as necessary.

- Requirements for notification of industrial diseases occurring in any factory
- Requirements to securely fence the flywheel or prime mover
- Requirements for fencing, using driving belts of the transmission machinery
- Regulations for the use of other machines
- Requirements to provide suitable ear defenders for those who are exposed to noise above upper limit
- Investigation into case of death by accident or industrial disease
- Provisions for protection from radiation and vibration

Even though the ordinances and standards exist, those have given a less attention for the specific task of maintenance. Hence the intention of this study is to investigate the safety procedures of maintenance workers in buildings.

3. RESEARCH METHODOLOGY

An extensive literature review was conducted to identify the types of maintenance works and existing safety and health hazards of the maintenance works. The study needs to investigate the existing maintenance works, its associated hazards and appropriate safety procedures for the maintenance works in Sri Lankan commercial buildings. The study used a qualitative approach. Naoum (2013) described that the type of the research approach selected for any research is determined on the type of the study, purpose of the study and information availability for the study. By using a qualitative approach the researcher will be able to study whole population as individuals or groups and could be able to identify beliefs, understandings, opinions and views of people (Fellows and Lui, 2003). Naoum (2013) mentioned that the qualitative research approach includes experiments, case study research, surveys, enthnography, ground survey and action research. Based on the nature and purpose of the study, data was collected through two phases.

In first phase, data were gathered to investigate existing maintenance works and hazards of the maintenance works. According to Crowe *et al*. (2011), when there is a need to do an in-depth investigation of an issue, phenomenon or event of interest, in its natural real-life context the case study approach is specifically useful to employ. Hence, the case study approach was used with the aid of semi structured interviews. Five case studies were selected and a professional who is in the management level of the maintenance department in each selected case study, were interviewed. The selected five high rise commercial buildings were located in the western province of Sri Lanka. Selected buildings have more than twelve stories and have more than 15 workers as maintenance staff. The details of the case studies are presents in Table 2.

Table 2: Details of the Case Study

Criteria	Case A	Case B	Case C	Case D	Case E
Years of establishment	20	30	13	21	4
Stories of the building	37	32	23	12	12
Number of maintenance workers	55	60	25	17	15
Details of the interviewees and experience	Senior manager, facilities management 20 years	Maintenance Manager 6 years	Senior manager operations and maintenance 8 years	Engineering manager 7 years	Maintenance engineer 2 years

The data were gathered under following topics and are presented in findings section.

i) Maintenance works in commercial buildings

ii) Related hazards of maintenance work

In second phase, the objective was to determine suitable safety procedures for the maintenance workers in identified maintenance tasks. Hence, experts' opinion was required. The data were collected through semi

structured interviews by focusing the experts for the purpose of obtaining suggestions to enhance the safety of maintenance workers. Three experts were interviewed. Interviewees were selected based on their experience and their knowledge on the Occupational Safety and Health. The details of the experts are presented in Table 3. Collected data was subjected to the content analysis.

Table 3: Details of the Experts

Criteria	Expert A	Expert B	Expert C
Designation	Formal Chief Factory Inspection Engineer	Director General: National Occupational Safety and Health	Occupational Safety and Health Consultant
Work experience	Over 40 years	Over 20 years	Over 20 Years

4. DATA ANALYSIS AND FINDINGS

4.1. MAINTENANCE TASKS OF COMMERCIAL BUILDINGS

This section identified existing maintenance tasks of commercial buildings. Gathered data were categorised according to the literature findings of Southwark Council (2008). Figure 1 shows the maintenance tasks of commercial buildings in Sri Lanka.

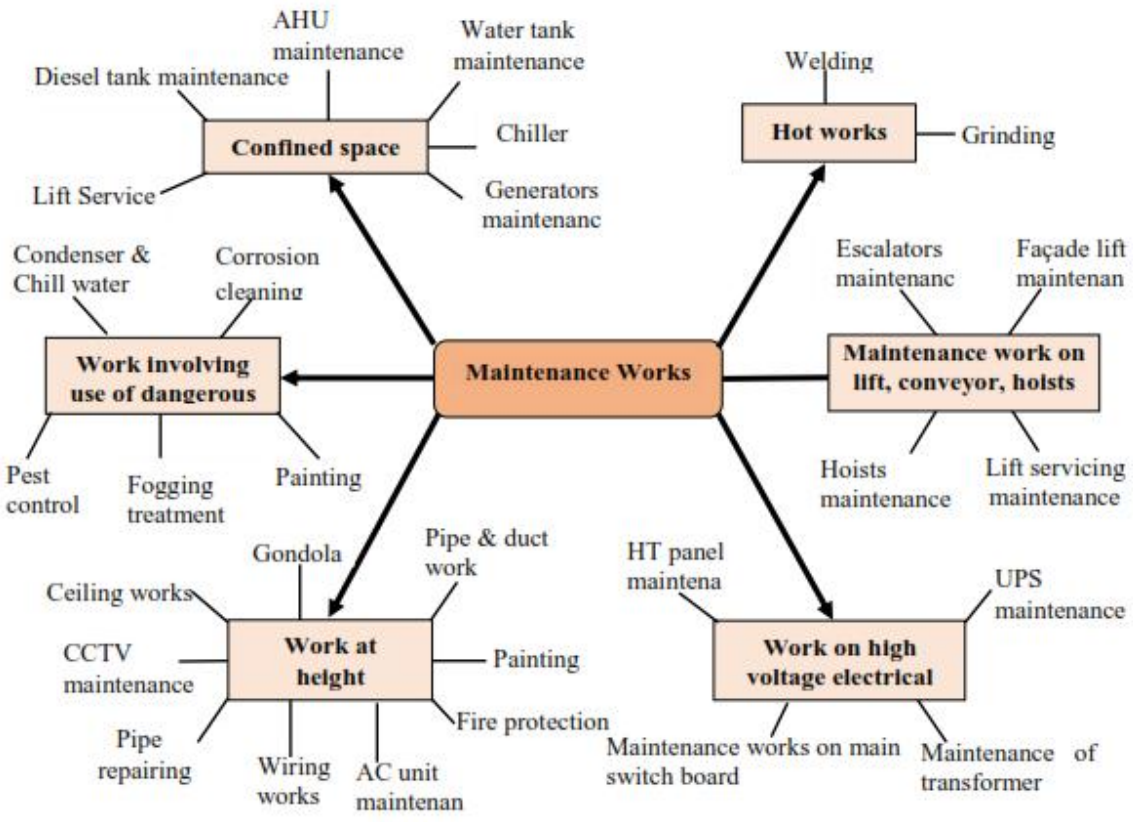

Figure 1: Maintenance Work of Commercial Buildings

It was revealed that many maintenance works carried out in confined spaces in commercial building are common to each other. Majority of the interviewees have mentioned that maintenance works of water storage tanks, diesel storage tanks, generators, Air Handling Units, chillers and lifts can be considered under confined spaces category. The interviewees have mainly emphasized welding work and grinding work under hot work category. It was identified that welding work is done very frequently by the maintenance staff in commercial buildings. As selected buildings are high rise buildings, gondola work

became a major one of the significant and risky maintenance works in commercial buildings under height category. Further, ceiling works, painting, CCTV maintenance, split Air Conditioning (AC) maintenance, maintenance of fire protection and detection systems, duct works are classified as working at height. Also pipe and valve replacing maintenance works can be categorized under the maintenance works carried out at height. According to the findings, excavation work are very rarely carried out in commercial buildings. The escalator and elevator servicing and maintenance come under the category of maintenance works on lifts conveyors and hoists. All the respondents agreed escalator and elevator servicing and maintenance as their main maintenance activity which is done by an outsourced party. Further, maintenance of hoists like façade lift is included in this category. Maintenance work relating to medium voltage switch gear, maintenance of transformers, maintenance of capacitor banks, motor control panel, bus duct, oil circuit breakers, distribution boards, High Tension (HT) and Low Tension (LT) panel board maintenance such as cleaning and testing, and UPS maintenance are categorized by all respondents as the maintenance of high voltage electrical equipment and other electrical equipment. Chemicals usage for corrosion cleaning, chemical treatments of HVAC system, painting, fogging and pest control were highlighted as maintenance works involved in hazardous and dangerous substances. Five commercial buildings which were selected conducts similar maintenance activities as their daily operations.

4.2. MAINTENANCE RELATED HAZARDS

The hazards which related to above identified maintenance works have been analysed. Finally the relationship between maintenance works and their related hazards were summarized. Table 4 shows maintenance works and the potential hazards.

Electrical hazard, high pressure fluids, fire, explosion and extreme heat, vibration, falling, ergonomics were highlighted as physical hazards by the interviewees. All five case studies come up with dust, fibres and respiratory sensitizers, Dangerous substances, explosives, flammable and corrosive substances, acids, and alkalis and organic solvents as chemical hazards in their work place. Pathogenic bacteria such as legionella and fungi highlighted as biological hazards. Time pressure and long hours work were indicated as psychological hazards of the maintenance workers. Interviewees highlighted the number of work related hazards in their context, giving various examples.

Table 4: Maintenance Works and their Related Hazards

Maintenance Work	Specifically Related Hazard	Common Hazards
Confined space works	Oxygen deficient atmospheres	Noise, vibration, Dust, Ergonomics, time pressure, long hour works, biological hazards
Hot works	Fire, explosion and extreme heat	
Working at height	Falling	
Maintenance work on lifts, conveyors, hoists	Falling	
Work on high voltage electrical equipment or other work on electrical equipment	Electrical hazard	
Work involving the use of hazardous/dangerous substances	All chemical hazards	

4.3. SAFETY PROCEDURES FOR CARRYING OUT DIFFERENT TYPES OF MAINTENANCE WORK CATEGORIES

According to the statements of experts appropriate safety procedures should be taken when carrying out maintenance works in confined spaces, works relating to hot works, works on lifts, conveyors and hoists, works in high voltage electrical equipment or other electrical equipment and works involving the use of hazardous or dangerous substances. Safety procedures for aforementioned areas are described in following sections.

Maintenance Works in Confined Spaces

According to the findings, three experts highlighted the requirement of work permits for carrying out maintenance works in confined spaces. As an example expert A stated that "*as these confined spaces are*

high risk areas; should have a work permit form to fill before working in confined spaces". Expert C stated "*some organizations use a general risk assessment form for the confined spaces also and if there are many confined spaces there should be a risk assessment form which is specific only for confined spaces*". According to the findings, this work permit is issued by the health and safety officer of the organization based on the usage of the space, PPE requirements, lighting levels and etc. Expert B indicated that the location of the confined spaces, exit routes, emergency escape procedures power supply to the equipment are important to consider in such spaces. Further, expert C indicated that there should be a pre-determined way to communicate in an emergency situation. Moreover, findings emphasised that the work permit is issued for particular individual work and when the work is completed the permit should be closed. It was indicated by expert C as "*due to the changes such as working environment, worker and time, each and every work carried out in confined spaces need to have a separate permit to work*".

Maintenance Works Relating to Hot Works

The experts emphasized that obtaining the work permit as a safety and health measure for carrying out hot works. Expert B added as *"if the hot work is a routine maintenance work that work can be carried out according to Standard Operating Procedure (SPO) or if the hot work is carried out as non-routine work, work permit is required"*. Gathered data indicated that when carrying out maintenance work relating to the hot works it is essential to make sure that the work is carried out by a competent worker. Further, suitable fire extinguishers should be available at a nearest place and the working environment should be continuously ventilated. Further, gathered data indicated that the workers should use all the PPE required for carrying out hot works such as face shield, insulated gloves or gauntlet gloves and cotton cloths. In addition, expert A indicated that before starting the work, all the equipment and tools should be inspected and tested for leakages to ensure whether those are in good condition or not. Further, the respondent indicated that working environment also should be inspected to make sure that the area is free from combustible materials. Moreover, expert B specified that workers should have a clear knowledge about emergency precautions and emergency escapes in case of fire.

Working at Height

The experts emphasized the requirement of training and competence for the maintenance workers who involve in the maintenance works at height. Experts described that it is necessary to consider the nature of the work and workplace in which work is taken place at height, duration of the work, frequency of the work and height of which the worker works. These factors help to select means of access to the work place and to recognize the hazards involve in working at height. As an example expert B stated that "*if the duration of the work at height is short and if the risk level is low for that kind of works ladders can be used*". Further, expert C emphasized that "*if the work is taken place in the outside of the building it is necessary to consider about the weather condition*". In addition, three experts have highlighted the importance of using proper PPE such as safety harness, safety helmet and eye protections according to the nature of the work. Workers use permanent and temporary equipment as means to access to high working areas. Findings of data emphasized that those equipment should be in good condition and if those equipment are temporary they should be tight well at the bottom and the top to prevent from any movements. Moreover, expert A indicated that if the size of the workplace at height is small it is required to provide fall protections such as a guard rails, fall arrests or safety nets.

Maintenance Works on Lifts, Conveyors and Hoists

The experts emphasized that the maintenance work should be carried out by trained and competent workers. Further, they highlighted the necessity of conducting a risk assessment and identifying the possible hazards. Further, findings revealed the importance of proper power supply to the lift, conveyor or hoists. Experts A and C emphasized the requirement of lock and tag out the switches. If the maintenance work is carried out in a confined space such as in a lift core, sufficient ventilation and illumination should be provided. Here also findings indicated the requirement of using proper and relevant PPE according to the type of work such as safety helmets and body harnesses.

Work on High Voltage Electrical Equipment or Other Electrical Equipment

Two experts described about maintenance works on de-energized electrical equipment and energized electrical equipment. Expert B emphasized that "*sometimes it is not possible to de-energize the electrical*

equipment for maintenance works". According to the experts' opinion, it is essential to identify whether the electrical equipment can be de-energized or not before starting the maintenance work. If the equipment can be de-energized power supply should be disconnected and have to lock and tag out. If the equipment cannot be de-energized it should be ensured that safety precautions have been taken. And also it is essential to do a risk assessment and identify the possible hazards. Further, experts emphasized specially that a competent person should be appointed to the maintenance works on electrical equipment and relevant PPE have to be used such as non-conductive gloves, clothes and protective shoes. Further, tools and equipment used for the maintenance work should have non-conductive handles. Finally the work should be carried out according to the Standard Operating Procedures (SOP) or should obtain a work permit.

Work Involving the Use of Hazardous or Dangerous Substances

Expert B highlighted 'if *possible, eliminate the use of hazardous or dangerous substances or substitute them with the substances which are not highly hazardous*". According to the experts, chemicals in the work place should be labelled by indicating the type of chemical and Material Safety Data Sheet (MSDS) should be available for each chemical. In addition, expert A indicated the necessity of record keeping of hazardous substances. Moreover, findings revealed about the need of risk assessments and preparedness for the emergencies. The experts' opinion is that all workers should aware on hazards related to the work and its safety procedures. Further, experts indicated that if the work is highly hazardous, a work permit should be obtained for the work and if not the work can be carried out according to the SOP.

5. FRAMEWORK TO ENSURE THE SAFETY AND HEALTH OF MAINTENANCE WORKERS

According to the findings of the research, a framework was developed for enhancing the Safety and Health of maintenance workers. The framework mentions the safe procedures of carrying out the identified six major maintenance tasks in commercial buildings. Mainly it is important to state that the framework is developed by indicating the most important and fundamental safety and health actions to be taken when carrying out maintenance works. The developed framework is illustrated in Figure 2.

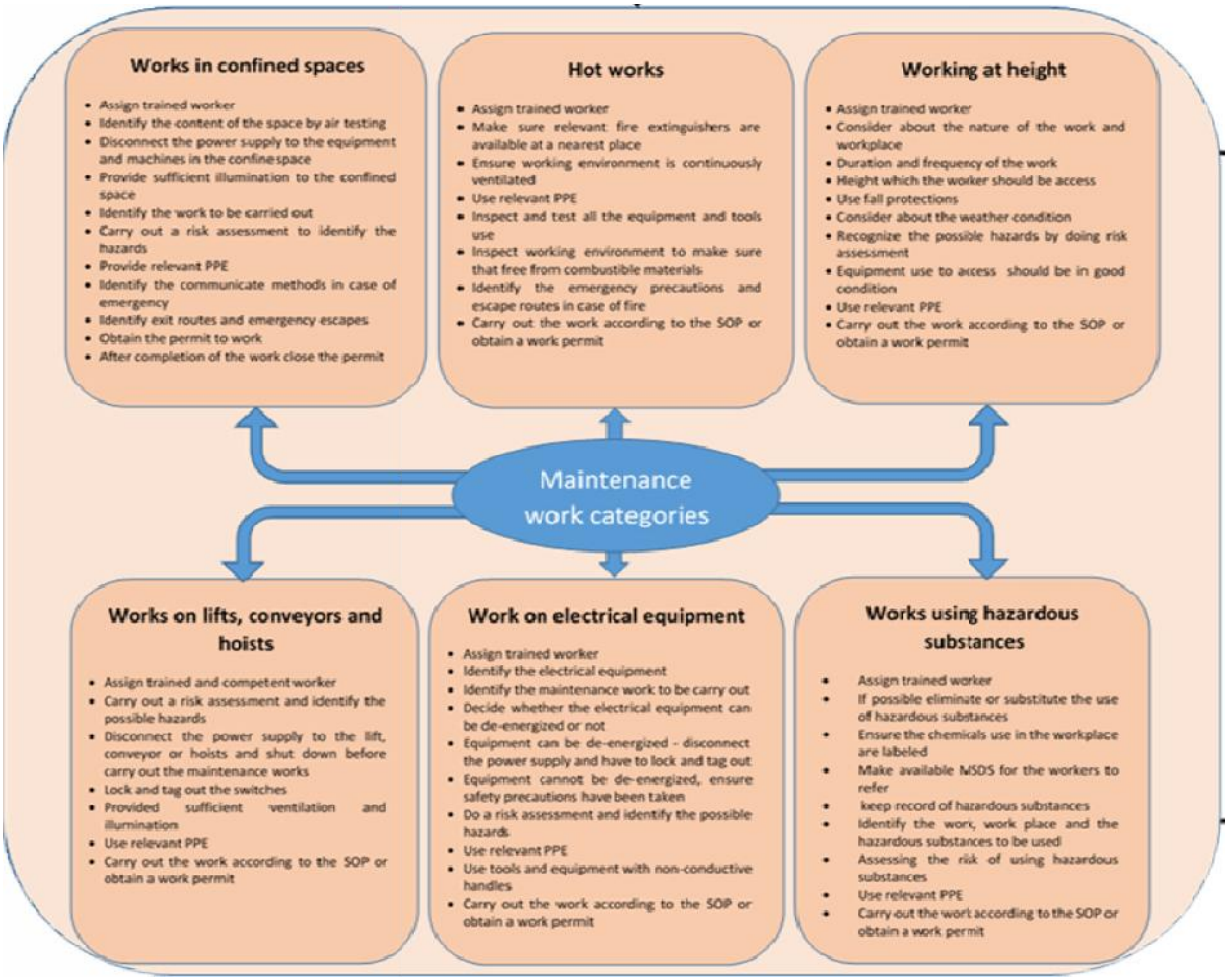

Figure 2: Framework toEnsure the Safety and Health of Maintenance Workers

6. CONCLUSIONS AND RECOMMENDATIONS

Maintenance in the buildings has received high importance as a non-core activity which mainly affects to the core business of the organization. Maintenance works are often exposed to hazards that can be harmful to the maintenance workers as well as work environment. The study highlighted key categories of maintenance works as confined space works, hot works, works at height, works involve with electrical equipment and works involve in using dangerous substances. Aforementioned maintenance activities involve with different kinds of potential hazards such as physical, chemical, biological and psychological. The exposure level of the maintenance workers to the hazards is significantly high when comparing to the other working population in buildings. As a result of that a considerable number of fatal accidents, non-fatal accidents and other health and safety issues are occurring through maintenance works to the maintenance worker. Therefore, the study identified health and safety procedures to follow during different maintenance tasks. It was identified the fact that most of the organisations have given less priority for the health and safety of maintenance worker. On the other hand, maintenance workers themselves are ignoring the safety practices while conducting their maintenance operations. This will result in great risks to their lives as well as the organisation.

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