Chapter 2 – Literature Review

2.1 – Introduction

The first part of the research works is the Literature Review. The Literature Review reviews and analyses the industrial accident of working at height in different building repair and maintenance operations. Also, different tools and equipments for working at height are discussed in this section. At last, different types of preventive measures were mentioned.

2.2 - Definition of Accident

According to "Collins Co-build English Dictionary (1999)**,** "Accident" is described as "if someone has an accident, something unpleasant happens to them that were not intended, sometimes causing injury or death".

The reportable "Accident" under the Employee' Compensation Ordinance (Chapter 282) remarks that "when the employee is off-duty from work for more than three days when injured or sustains fatal injury arising out of or in the course of his employment".

2.3 – Construction Industrial Accidental Rate in Hong Kong

For the period from 2000 to 2011, both of the reportable construction industrial

accident rate was dramatically improved. According to the Occupational Safety and Health Statistics Bulletin (September 2011), the reportable accident rate and fatality rate per 1000 workers were 149.8 and 0.364 respectively in 2000 and these figure were recorded around 54.6 and 0.376 respectively in 2011. Both figures shown that over the past 10 years, significant improvement has made. Although Hong Kong has continuously improved the construction safety, Steve Rowlinson (2003) stated that Hong Kong still has a major problem with construction site safety.

2.4 – Location of Fall from Height Accidents

Location of fall from height accidents includes the following

1. Truss-out bamboo scaffold at height at external wall of construction project
2. Elevated Working Platform
3. Suspended Working Platform (Gondola)
4. Ladders at Height in Construction Site
5. Metal Scaffold

2.4.1 –Truss-out Bamboo Scaffold at Height at External Wall of Construction Project

Truss-out bamboo scaffolds are commonly used in building external wall repair and

maintenance works. In recent years, many serious fall-of-person industrial accidents have resulted from the erection, use and dismantling of this particular type of bamboo scaffolds. The erection, dismantling and safety requirement of the work platforms and scaffold shall be in accordance with the Construction Sites (Safety) Regulations (1997) and the relevant codes of practice on scaffolding safety issued by the OSHB of Labour Department (2007). The works shall be carried out by trained workmen under the immediate supervision of a competent person.

2.4.2 - Use of Elevated Working Platform

According to OSHB of Labour Department (2008), the use of elevated working platform is popular. They are widely used to carry workers for works at height, such as maintenance of ceilings and cleaning the external wall of buildings. There are many different designs of elevated working platforms. Each type of working platform has its own application. When choosing a suitable elevated working platform, the following points should be taken into consideration

a. type and size of the platform required
b. the loading capacity, height of elevation, mobility and stability
c. the conditions and restrictions on the road or at the place where the platform is set up

d. the distance to be kept between the platform and the nearby object

e. passageway for safe access to and egress from the platform

f. type and nature of the material to be carried and

g. whether the manufacturer or the agent provides training courses on maintenance and operation of the platform

As OSHB of Labour Department (2008) stated that elevated working platform should be operated by the competent person. The competent person should be well trained to operate the particular elevated working platform within the construction site. No unauthorized person should be allowed to operate the elevated working platform and should be strictly complied within the construction site.

2.4.3 - Use of Suspended Working Platform (Gondola)

Suspended working platforms which are commonly known as gondolas are widely used in Hong Kong, according to Buildings Department (2001). They carry workers, site personnel, or engineers for working at high level of building external wall such as installation of curtain walls and windows, window cleaning, external renovation and decoration of buildings. According to Code of Practice for Safe use and Operation of Suspended Working Platforms, Buildings Department (2001), suspended working platforms can be classified as permanent and temporary suspended working platform

and they are suspended by ropes chain or lifting gear and capable of being raised and lowered by mechanical means. It should be operated by a competent person, in relation to any duty to be performed by such a person under the “Factories and Industrial Undertakings (Suspended Working Platform) Regulation (SWPR). A competent person means a person who is appointed by the gondola’s owner to ensure that the duty is carried out and by reason of substantial training and practice experience, competent to perform the duty. A safety system of work should be established for every operation of a suspended working platform by the owner. The system should be prepared and endorsed by the owner, with the advice of project engineers, safety professionals, and relevant personnel of the site or of the building management. It should be distributed to all personnel involved in the operation. The safety system of work should be monitored and supervised by a competent person.

2.4.4 - Use of Ladders at Height in Construction Site

Ladders can be classified as portable ladders and fixed ladders. There are also straight ladders and stepladders. As required by the OSHB (2008), to ensure safety, consideration is necessary on safety means regarding of what kind of application, selection of what type of ladder, what safety precautions should take and what training should be received in use of ladder.

Ladder to be used in the construction site should be in good condition and well maintained. Before using the ladder within the construction site, it is necessary to identify the potential hazard and conduct the risk assessment at the workplace. As suggested by the OSHB (2008), ladder should be avoided to be used near a door or on a busy passageway. It is recommended that using of ladder should be in accordance with the manufacturer's instruction. It should be made sure that use the right type of ladder and ensure it is structurally sound. It is of paramount importance that under no circumstances should the structure of the ladder be altered without authorization

Moreover, training to construction workers to use the ladder within the construction site is also important. It is recommended that workers using the ladder should be trained with related safety information or under supervised by the experienced. The content of training should include the proper technique of climbing a ladder. In overall, the ladder users should work out other safety measure according to their own needs to suit their working procedures and environment.

2.4.5 - Use of Metal Scaffold

Metal scaffolding can be used for different purposes in different construction activities within the construction project. In Hong Kong, it is commonly used as the supporting scaffolding in a falsework system according to Code of Practice of Metal

Scaffolding Safety, Labour Department (2001). Safety of metal scaffolding should be implemented throughout the using period including design & initial planning, selection of sub-contractor, site management, training to competent staff, safety working place and access, erection, monitoring safety performance and dismantling & alternation

As Labour Department (2001) pointed out that a trained workman in respect of metal scaffolding refers to a scaffolder who is responsible for on-site erection, addition, alternation and dismantling of metal scaffold under the immediate supervision of a competent person, and has satisfactorily completed a formal training in metal scaffolding work equivalent to any of those mentioned for a competent person and possessed at lease two years of experience in metal scaffold work.

In construction project, metal scaffold application should be designed with safety in mind. This approach makes it possible to eliminate or minimize the work hazards by proper planning and design of the methods of construction, sequence of activities, co-ordination, etc. The safe scaffold and its erection/alternation/dismantling for all different stages of construction should be designed and planned well beforehand. The safe method of scaffolding devised should be kept under continual review. The strength and stability of the scaffold throughout all stages of scaffolding should be ensured. Realistic assessment of loadings on the scaffold at all work stages should be

made. Safe access to and egress from the working places should be provided. Effective bonding system to earth should be provided to the scaffold. Additional features such as attachment points for ladders, working platforms, guard-rails and toe-boards should be provided for the protection of workers using the scaffold. Safety nets and safety belts should also be provided for the protection of scaffolders. Scaffolding components/materials/equipment should be handled, lifted, stored, stacked and transported safely. The time when the scaffold would be erected and dismantled should be decided in the design and planning stage. The metal scaffold should be dismantled as soon as it is no longer required to be used.

2.5 – Working at Height for Repair and Maintenance Works

The safety management for repair and maintenance of existing building requires extra attention because in this sector a large number of untrained and unskillful labour were employed, according to Albert (2005). In most of the repair and maintenance works of occupied building development in Hong Kong, execution of safety management is adequate as the same stringent safety regulations as in new construction. Therefore there have been many incidents of workers being seriously injured or killed by fall of person from height. Although many personal safety protection equipments available in the market, it is seemed to be not adequate for reducing the rate of fatality due to accidents related to fall person from height.