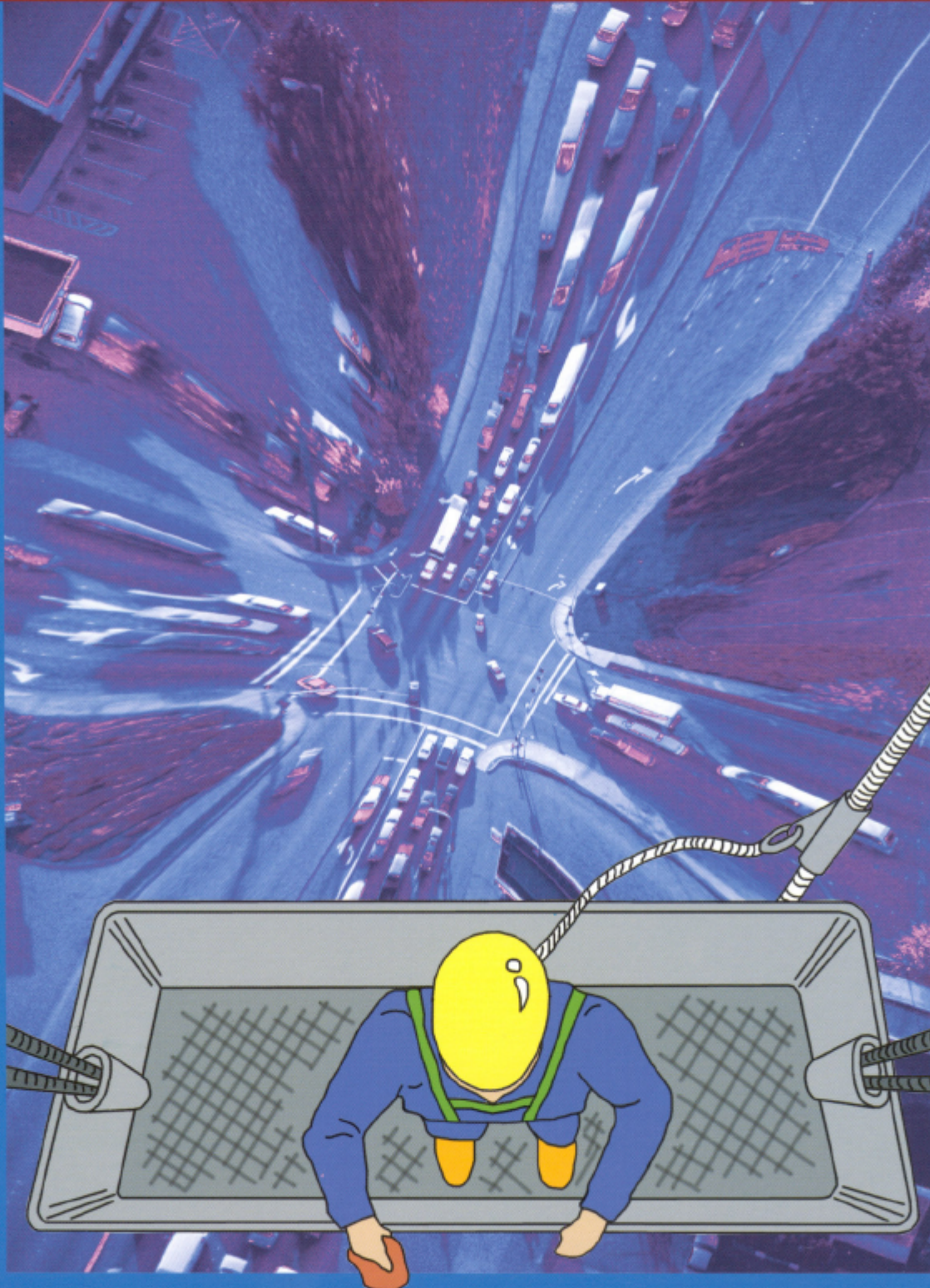


# Code of Practice for Safe Use and Operation of Suspended Working Platforms



Occupational Safety and Health Branch  
Labour Department

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This Code of Practice is prepared by the  
Occupational Safety and Health Branch  
Labour Department

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# CONTENTS

<b>1. Introduction</b> .....	3
1.1 Purpose .....	3
1.2 Scope .....	3
<b>2. Definition</b> .....	5
<b>3. Description</b> .....	10
3.2 Permanent Suspended Working Platform .....	10
3.3 Temporary Suspended Working Platform .....	10
<b>4. Management Of Safe Operation Of The Suspended Working Platform</b> . . .	12
4.1 General .....	12
4.2 Responsibility .....	13
<b>5. Design And Construction</b> .....	17
5.1 General .....	17
5.2 Design Loads .....	18
5.3 Anchorage And Support .....	19
5.4 Stability Against Overturning .....	26
5.5 Counterweight .....	28
5.6 Suspension .....	28
5.7 Wire Rope .....	30
5.8 Drum And Pulley .....	31
5.9 Working Platform .....	32
5.10 Brakes .....	33
5.11 Control Levers, Switches .....	34
5.12 Protection Against Weather .....	35
5.13 Safe Means Of Access .....	35
5.14 Electrical Component .....	36

<b>6. Safe And Proper Use</b> .....	38
6.1 Erection, Dismantling And Alteration .....	38
6.2 Trained Operators And Workers .....	39
6.3 Safety Belt And Lifeline .....	40
6.4 Use In Adverse Weather Conditions .....	42
6.5 Marking Of Safe Working Load And Number Of Persons .....	43
6.6 Safe Use The Suspended Working Platform .....	43
6.7 Use Of Special Working Platform .....	44
<b>7. Maintenance</b> .....	46
7.1 General .....	46
7.2 Wire Ropes .....	47
7.3 Record Of Maintenance .....	47
<b>8. Inspection, Examination And Test</b> .....	48
8.1 Inspection By Competent Person .....	48
8.2 Thorough Examination By Competent Examiner .....	49
8.3 Test And Thorough Examination By A Competent Examiner .....	51
8.4 Display And Keeping Of Certificate .....	53
<b>9. Information For Use</b> .....	54
9.1 General .....	54
9.2 Documentation .....	54
<b>List Of Reference</b> .....	56
<b>Enquiry</b> .....	58

# 1. INTRODUCTION

## 1.1 Purpose

- 1.1.1 Suspended working platforms which are commonly known as gondolas are widely used in Hong Kong. They carry workers, site personnel, or engineers for working at height during the installation of curtain walls and windows, window cleaning, external renovation and decoration of buildings, bridges, chimneys, silos and other structures, etc. This Code of Practice (hereinafter referred as the Code) is approved and issued by the Commissioner for Labour (hereinafter referred as the Commissioner) in accordance with Section 7A of the Factories and Industrial Undertakings Ordinance, Chapter 59 (hereinafter referred as the FIUO). It provides practical guidance to the owner of a suspended working platform for compliance with the requirements under the provisions of the Factories and Industrial Undertakings (Suspended Working Platforms) Regulation (hereinafter referred as the SWPR).
- 1.1.2 The advice contained in this Code should not be regarded as exhausting those matters which need to be covered by the relevant safety legislation, nor is it intended to relieve persons undertaking the work of their statutory responsibilities. It is important to note that compliance with this Code does not, of itself, confer immunity from legal obligations.
- 1.1.3 This Code has a special legal status. Although failure to observe any advice contained in this Code is not in itself an offence, that failure may be taken by a court in criminal proceedings as a relevant factor in determining whether or not a person has breached any of the provisions of the regulations to which the advice relates.

## 1.2 Scope

- 1.2.1 Suspended working platforms can be classified as permanent and temporary suspended working platforms. This Code covers the safety requirements of these working platforms suspended by ropes, chains, or lifting gear and capable of being raised and lowered by mechanical means. It is applicable to the use and operation of the suspended working platforms as well as the related supporting activities such as test and examination of the suspended working platforms.

- 1.2.2 Reference should be made to other relevant legislation, including :
- (i) sections 6A and 6B of the FIUO;
  - (ii) the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations (hereinafter called LALGR);
  - (iii) the Construction Sites (Safety) Regulations (hereinafter called CSSR);
  - (iv) Buildings Ordinance, Cap 123; and
  - (v) Engineers Registration Ordinance, Cap. 409.
- 1.2.3 Throughout this Code, relevant safety standards of the British Standards Institution are usually quoted. However, if there are some other international standards or provisions which are equal in standard as those mentioned, they would be acceptable as an alternative. In addition, statutory provisions referred to or cited in this Code are those in force as at 1st January 1999.
- 1.2.4 This Code is not intended to cover the safety requirements of the following chairs or platforms which are used for carrying persons:
- (i) sky chairs whose safety requirements are covered by LALGR;
  - (ii) boatswain's chairs whose safety requirements are covered by CSSR and LALGR; and
  - (iii) a working platform suspended by a mobile crane or a tower crane for which the safety requirements are governed by LALGR and the Code of Practice for safe use of mobile cranes and tower cranes.

## **2. DEFINITION**

2.1 For the purpose of this Code, the following definitions apply:

### **Approved form**

A form approved by the Commissioner by notice published in the Gazette under the SWPR (regulation 27 of SWPR).

### **Automatic safety device**

A device or devices acting on a safety rope which will arrest and sustain a working platform in the event of the failure of a suspension rope, the winch, the climber or any part of the mechanism for raising or lowering the working platform.

### **Climber**

A lifting appliance through which the suspension rope passes which is controlled either by friction grips or by turns of the rope round drums within the appliance. The lower end of the rope is not anchored to the climber (regulation 3(1) of SWPR).

### **Competent examiner**

A competent examiner, in relation to the carrying out of any thorough examination or load test and thorough examination required by the SWPR, means a person who is:

- (a) appointed by the owner required by the SWPR to ensure that such thorough examination or load test and thorough examination is carried out;
- (b) a registered professional engineer registered under the Engineers Registration Ordinance (Cap. 409) within a relevant discipline specified by the Commissioner; and
- (c) by virtue of his previous experience, competent to carry out such thorough examination or load test and thorough examination (regulation 3(1) of SWPR).

As at the date of this code, mechanical engineering and marine engineering are the two disciplines specified by the Commissioner.



## **Competent person**

A competent person, in relation to any duty to be performed by such a person under the SWPR, means a person who is :

- (a) appointed by the owner to ensure that the duty is carried out; and
- (b) by reason of substantial training and practical experience, competent to perform the duty (regulation 3(1) of SWPR).

## **Counterweight**

A weight or series of weights which are attached to the roof rig to counterbalance the overturning moment and provide the required factor of safety against overturning.

## **Factor of safety against overturning**

The coefficient by which the maximum overturning moment is multiplied in order to calculate the restoring moment required to ensure safety against overturning, being the ratio of the sum of the restoring moments to maximum overturning moment.

## **Lifting appliance**

It includes a winch, climber, chain block, hoisting block, pulley block or gin wheel used for raising or lowering, or as a means of suspension of, a suspended working platform (regulation 3(1) of SWPR).

## **Lifting gear**

It includes a chain sling, wire rope sling or similar gear, a ring, link, hook, shackle swivel or eyebolt (regulation 3(1) of SWPR).

## **Maintain**

Be maintained in safe working order and in good repair (regulation 3(1) of SWPR).

## **Maximum total suspended load**

The maximum force which may be imposed on the roof rig including the safe working load on the working platform, the self-weight of the working platform and the suspension and safety ropes, together with any portion of the means of suspension, and the rope tensions, plus any extra force resulting from the operation of the automatic safety device, impact surges, stalling torque or other environment loads.

## **Mobile suspended working platform**

A mobile suspended working platform is a suspended working platform which is travelling on wheels without use of any tracks and rails (see Figure 7).

## **Outrigger**

The cantilever portion of the roof rig or similar support or arrangement for suspending the working platform, including any assembly of beams, joists, tubular scaffold framework or proprietary brackets to which the upper ends of the suspension members are secured.

## **Owner**

Owner, in relation to any suspended working platform, includes the lessee or hirer thereof, and any overseer, foreman, agent or person in charge or having the control or management of the suspended working platform and, in the case of a construction site, includes the contractor responsible for the construction site (regulation 3(1) of SWPR).

## **Primary brake**

A brake, automatically applied, which stops the hoist and holds the working load under normal operating conditions, when power to the prime mover is interrupted or discontinued.

## **Professional engineer**

A professional engineer is either a registered professional engineer in mechanical engineering, marine engineering or structural engineering discipline or a registered structural engineer.

## **Reeler**

A storage drum onto which a wire rope or electric cable is reeled.

## **Registered general building contractor**

A registered general building contractor means a person whose name is for the time being on the register of general building contractors maintained under section 8A of Buildings Ordinance, Cap. 123.

### **Registered professional engineer**

A registered professional engineer (hereinafter called RPE) is a person whose name is currently entered in the register established under section 7 of the Engineers Registration Ordinance, Cap 409.

### **Registered structural engineer**

A registered structural engineer (hereinafter called RSE) means a person whose name is for the time being on the structural engineers' register kept under section 3(3) of Buildings Ordinance, Cap 123.

### **Roof trolley**

The mobile portion of the roof rig capable of horizontal movement by power or manual means, such movement usually being guided by means of a trolley track.

### **Roof rig**

The portion of the suspended working platform (excluding the track system) mounted on the roof or at roof level to support and position the working platform.

### **Safety or secondary rope**

A wire rope which is normally not carrying the weight of the working platform and the imposed load thereon but rigged in conjunction with a safety device or arrestor to come into operation for supporting the working platform in the event of a failure of the suspension rope, the winch, the climber or any part of the mechanism for raising or lowering the working platform.

### **Safe working load**

Safe working load, in relation to a suspended working platform, means the safe working load for operating it as specified in the current certificate of thorough examination or load test and thorough examination given by a competent examiner (regulation 3(1) of SWPR).

### **Secondary brake**

A brake acting directly on the drum or the traction sheave, or the final drive shaft, intended to stop the descent of the working platform, under emergency conditions.

### **Slung scaffold**

A scaffold suspended by means of lifting gear, ropes or chains or rigid members and not provided with means of raising or lowering by a lifting appliance or similar device (regulation 3(1) of SWPR).

### **Suspended working platform**

A scaffold (not being a slung scaffold) or a working platform suspended from a building or structure by means of lifting gear and capable of being raised or lowered by lifting appliances (but does not include a boatswain's chair or similar device). It also includes all lifting appliances, lifting gear, counterweights, ballast, outriggers, other supports, and the whole of the mechanical and electrical apparatus required in connection with the operation and safety of such a scaffold or working platform (regulation 3(1) of SWPR).

### **Suspension rope**

The wire rope carrying the weight of the working platform and the imposed load thereon.

### **Toe board**

A board set on edge used to prevent tools, materials or a person's feet from slipping off the working platform.

### **Trolley track**

The rail or rails normally installed at roof level which support and guide the roof trolley in its working positions.

### **Winch**

A lifting appliance operated to raise and lower the working platform by means of a suspension rope reeled on to a drum.

### **Working platform**

The working platform of the suspended working platform, consisting of a framework and decking used for carrying persons and their equipment.

## **3. DESCRIPTION**

3.1 This Code specifies the safety requirements of two major groups of suspended working platforms, i.e. permanent suspended working platforms and temporary suspended working platforms.

### **3.2 Permanent Suspended Working Platform**

3.2.1 A permanent suspended working platform is designed especially to be permanently installed on a specific building or structure for the inspection, cleaning and maintenance of the facades. It is also known as a building maintenance unit.

3.2.2 It comprises a working platform suspended by wire ropes from a roof rig, a trolley of the monorail fixed to the building, or a roof trolley. The roof rig may be a fixed structure to which a working platform is attached. The working platform may be lifted and lowered and may be traversed and rotated.

3.2.3 If the suspended working platform consists of a roof trolley, the roof trolley can operate either on rails or on suitable surface, e.g. a concrete track.

3.2.4 The system may be power or hand operated. The hoisting mechanism may be mounted either on the roof rig or on the working platform.

### **3.3 Temporary Suspended Working Platform**

3.3.1 A temporary suspended working platform is temporarily assembled on a building or a structure. It will be dismantled at the end of the work for which it was installed.

3.3.2 This type of temporary suspended working platform is generally used for painting and insulating work, cladding, repairs and refurbishment on building, bridges, chimneys, silos and other structures.

3.3.3 A temporary suspended working platform comprises a working platform, normally suspended on wire ropes attached to a roof rig. The working platform may be lifted or lowered by winches or climbers which are usually mounted on the working platform. Sometimes, the working platform is also designed to traverse. The stability of the roof rig may be achieved either by counterweights or direct attachment to the structure component of the roof of the building or structure.

3.4 Fig. 1 illustrates some permanent and temporary suspended working platforms.

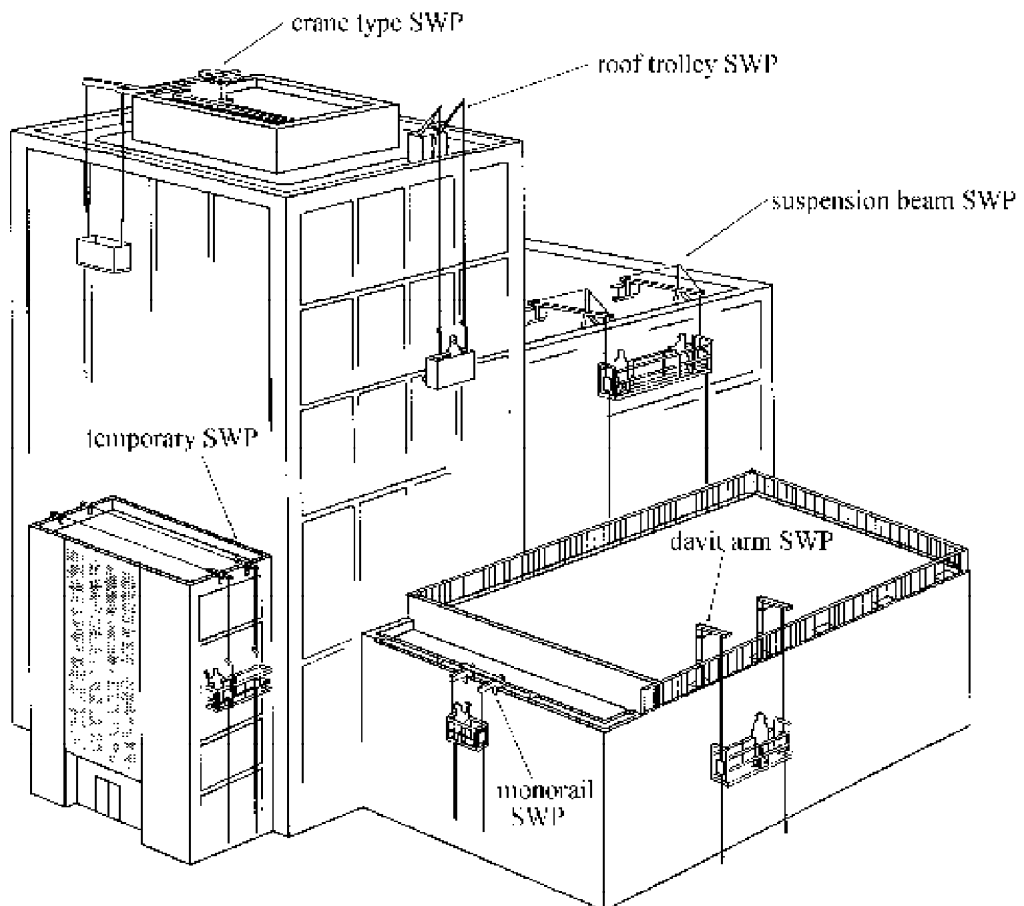


Fig. 1 Various types of suspended working platforms (SWP).  
(various technical details such as independent life lines,  
safety ropes and automatic safety devices are not shown).

## 4. MANAGEMENT OF SAFE OPERATION OF THE SUSPENDED WORKING PLATFORM

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### 4.1 General

- 4.1.1 It is the duty of the owner of a suspended working platform to ensure that every operation of the suspended working platform is safe and without risk to health to the personnel working inside or nearby the working platform.
- 4.1.2 A safe 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 safe system of work should be monitored and supervised by a competent person.
- 4.1.3 The safe system of work should include the following:-
- (a) planning and assessment of the operation including the selection of a suitable suspended working platform for the type of the job and the working environment;
  - (b) method of installation and means of securing the stability of the suspended working platform;
  - (c) arrangement of testing and thorough examination of the suspended working platform by a competent examiner;
  - (d) provision of periodic maintenance of the suspended working platform, including on-site maintenance;
  - (e) provision of operation and maintenance manual, log book, repair record, and certificates of test and thorough examination of the suspended working platform;
  - (f) provision of a competent person for erection, repositioning and dismantling of the suspended working platform;
  - (g) ensuring that every person working on the working platform receives suitable training and possesses a certificate of training;

- (h) provision of personal protective equipment and communication system between the person on the working platform and the person in charge of the operation;
- (i) termination of the use of the suspended working platform during unsafe condition;
- (j) emergency preparedness including the recovery procedure of the plant and the personnel staying on the working platform; and
- (k) arrangement for monitoring and supervision in the implementation of the safety precautions and measures.

## 4.2 Responsibility

### 4.2.1 Responsibility of owner

4.2.1.1 It is the overall responsibilities of the owner to ensure that:

- (a) the suspended working platform is of good mechanical construction, fitted with all necessary safety devices for the safe operation of the suspended working platform, and free from patent defect;
- (b) the suspended working platform is properly maintained in accordance with the instructions and advice stated in the operation and maintenance manual. A record of maintenance schedule should be made available for the use of the competent person or competent examiner during the routine inspection and periodic examination;
- (c) the suspended working platform is properly installed and anchored to the building or structure in accordance with the manufacturer's specification and under the advice of professional engineers. The installation should be carried out under the supervision of a competent person in accordance with the manufacturer's specification and the plan approved by professional engineers;
- (d) the suspended working platform is of suitable working capacity to perform the job. The suspended working platform should not be restructured or modified without the prior approval from the manufacturer and certification by a competent examiner;



- (e) the suspended working platform is load tested and thoroughly examined by a competent examiner before the suspended working platform is put into use after installation, repositioning and periodically (see clauses 8.2.1 and 8.3.1). The suspended working platform is inspected by a competent person every 7 days. Moreover, each day, before operation is commenced, the suspended working platform including the roof rig is inspected to see that it is sound and has not been interfered with in any way;
- (f) suitable and safe access and egress to the working platform are provided;
- (g) information concerning the details of the suspended working platform, the operation and maintenance manual, the maintenance log book, history of repairs and test and examination records are available for the reference of the user, competent person and competent examiner. Notice specifying the safe working load, number of persons allowed on the working platform should be posted on the working platform;
- (h) the competence of the competent person in charge of the suspended working platform is commensurate with his qualification, training and experience to that particular type of suspended working platform and that the personnel working on the working platform has received suitable training to operate the suspended working platform and possess a valid certificate of training;
- (i) the personnel on the working platform are wearing and using proper personal protective equipment, such as a safety harness and a helmet with chin strap;
- (j) the information and instructions contained in the safe system of work are disseminated to all working personnel and necessary training in connection with the subject are provided to them; and
- (k) suitable communication means are provided for the personnel working on the working platform.

## 4.2.2 Responsibility of competent person

4.2.2.1 A competent person is responsible for on-site inspection, supervision on the installation and use of the suspended working platform. He should possess adequate knowledge of the suspended working platform under his control and has substantial experience in handling the inspection, erection and dismantling of the suspended working platform. He should be familiar with the safety precautions, procedures, instructions and emergency procedure stated in the safe system of work for the project. He should possess adequate knowledge of the design loads of the suspended working platform specified under clause 5.2.1(b). His responsibility is to ensure that :

- (a) the erection and dismantling of the suspended working platform follow the procedures and recommendations specified in the manufacturer's assembly manual. In particular, he should ensure that the secondary protection such as tie backs to the roof rig is installed;
- (b) the lifeline is properly installed and anchored;
- (c) the suspension rope and safety rope of the suspended working platform are free from kink, broken wires, flatten surface or any other patent defect;
- (d) a thorough inspection to the suspended working platform is conducted before the suspended working platform is first put into use after erection, at regular intervals, and after exposure to adverse weather;
- (e) machine parts and safety devices that are listed in the operation and maintenance manual, repair log books, and history of the suspended working platform are in good working order;
- (f) any defect of the suspended working platform is recorded and reported to the owner or the maintenance contractor if such defect is out of repair under his control; and
- (g) the suspended working platform stops to operate if an unsafe condition or operation occurs to endanger the person working in or nearby the suspended working platform.

#### 4.2.3 Responsibility of working personnel on the working platform

4.2.3.1 The person working on the working platform should have received appropriate training in the safety procedure and emergency preparedness as specified in the safe system of work and the general construction of the suspended working platform. He should possess the skill to operate the suspended working platform safely and have obtained a certificate of training issued by the person who provided the training. Apart from operating the suspended working platform, he should :

- (a) exercise the general duty of care for his own safety as well as for other members working in or nearby the suspended working platform (section 6B of the FIUO);
- (b) properly take care of his hand tool and equipment;
- (c) ensure that the working platform is not so loaded with building materials that may affect his foothold and handhold, and endanger the stability of the working platform;
- (d) in case of emergency, know how to prepare himself for rescue and recovery;
- (e) wear safety harness with its lanyard attached properly to the independent life line or specified anchorage so provided. The lanyard should never be anchored to any railings or fittings of the working platform unless they have been specified and tested for the purpose;
- (f) make proper use of all safety devices, maintain them in functional positions, and never interrupt their assembly (regulation 28(1) of the SWPR);
- (g) have read and understood the safety procedure, relevant instruction and the arrangement for emergency preparedness as specified in the safe system of work;
- (h) in the event of any malfunctioning or suspected defect, not attempt to put it right if he is not competent to do it. He should communicate and report any defect to the competent person for technical assistance;
- (i) make full use of all facilities and proper means of access provided for him;
- (j) keep the working platform clean;
- (k) pay attention to projecting features on the building which could impede the movement of the working platform; and
- (l) never attempt to extend any power lead of the working platform for convenience.

## 5. DESIGN AND CONSTRUCTION

### 5.1 General

- 5.1.1 A suspended working platform should be capable of sustaining all loads applied to the complete unit. These loads should comprise the self weight of the suspended working platform, the safe working load, moving loads, impact loads and wind loads.
- 5.1.2 Particular attention should be given to the rigidity and retention of the working platform. Each unit of the suspended working platform should be so designed that an omission or failure of any individual joints or fixing component will not result in the structural collapse of the working platform causing danger to the safety of the occupants. All fittings and connections should be so designed that when assembled no part can become accidentally detached.
- 5.1.3 The structural design of the working platform, the suspension points and the members of the suspension systems should be based on the rope tensions and load outputs of the suspension systems, taking into account the load output of any pulley system used in the suspension system.
- 5.1.4 The roof rig should be designed so that the permissible stresses appropriate to the materials of the construction are not exceeded when the maximum total suspended load is applied to the suspension point. In addition, the design should ensure that 90% of the minimum yield stress of the materials used is not exceeded when the maximum rope tension is developed as a result of the operation of slipping clutches, load limiting devices, stalling torque, etc.
- 5.1.5 All materials and components used in the construction and assembly of the suspended working platform should be of sound construction and adequate for the purpose for which they are intended. Welded steel joints should be made in accordance with the requirements of BS 5135 : 1984- Specification for arc welding of carbon and carbon manganese steels, and should be suitably protected against corrosion.

5.1.6 The whole suspended working platform should be suitable for use in outdoor environment. All parts of the suspended working platform should be appropriately protected against atmospheric corrosion and weather damage.

5.1.7 For permanent suspended working platforms, restraint systems and safety devices should be, as far as reasonably practicable, equipped to the suspended working platform as recommended by BS6037:1990 - Code of Practice for permanently installed suspended access equipment.

## 5.2 Design Loads

5.2.1 The design and construction of the suspended working platform should be capable of carrying the combined load, the calculation of which should be based on the sum of the following:-

- (a) dead load which includes the weight of the wire ropes, working platform, climber, outriggers, the roof rig, etc.;
- (b) safe working load which takes into account of the number of persons intending to use the working platform, and any other known weights generally required on the working platform. Each person should be assumed to weigh 90 kg. The design of all parts of the suspended working platform should take into account of the possible grouping of the persons using the working platform at one end of the working platform adjacent to the point of suspension;
- (c) allowance for impact load resulting from the operation of winch or climber which must be at least 25 % of the dead load and the safe working load; and
- (d) wind load. The whole installation in its docked position should be able to withstand the wind pressure during typhoon condition. All loose items of suspended working platform are securable to fixed structures so that during the typhoon conditions, the items will not be disintegrated or damaged. In considering the wind load on the whole installation, reference should be made to the Code of Practice on Wind Effects Hong Kong 1983.

- 5.2.2 Working platforms should be capable of withstanding a distributed load of one of the following declared ratings:
- (a) light duty working platforms : 1.5 kN/m<sup>2</sup>;
  - (b) medium duty working platforms : 2.0 kN/m<sup>2</sup>;
  - (c) heavy duty working platforms : 2.5 kN/m<sup>2</sup>; or
  - (d) three persons with hand tools and materials each weighing a total of 115 kg, and all congregated at any point on the working platform to give the worst combination of loads.
- 5.2.3 The suspended working platform in its operating position should be designed to withstand the sustained wind speed up to 14 metres per second and gust up to 31 metres per second.

### 5.3 Anchorage and Support

- 5.3.1 A suspended working platform should be adequately and securely supported, and the arrangement for its fixing and anchoring should be adequate to secure its safety. Furthermore, every structure supporting or for anchoring a suspended working platform should be of good construction and free from patent defect (regulation 5(1) of the SWPR).
- 5.3.2 The details of anchorage and support of a suspended working platform that may affect the structural integrity of the building should be submitted to the Building Authority or relevant authority for approval. The maximum total suspended load and the maximum rope tension of a permanent suspended working platform should be calculated and the details submitted to the architect or professional engineer in charge of the building or structure for approval. The building or structure should be strong enough to resist these loads without sustaining damage or permanent deformation.
- 5.3.3 Any holding-down bolts joining the roof rig or the track to the building should be of an appropriate grade of austenitic stainless steel, and should be designed in accordance with the Code of Practice of the Structural Use of Steel 1987. The design criteria, appointment of registered general building contractor, installation requirements and supervision arrangement corresponding to the relevant approving authority should be strictly complied with.

- 5.3.4 Where bolts are used for anchoring rails to the roof, they should have a minimum diameter of 16 mm. These bolts may, for additional security, be locked beneath some of the reinforcement of the roof slab. Where appropriate all nuts securing fixings should be kept in place by locking device. Nuts should be tightened to, but not beyond, the torque recommended by the manufacturer.
- 5.3.5 Any metal components used to interconnect between the trolley rails, ancillary equipment and the roof should be of steel suitably protected against corrosion, including electrolytic reaction.
- 5.3.6 The deflections of the rail under load should not exceed 1/250 of the span between the rail supports. The rails should be capable of safely withstanding the forces resulting from the maximum total suspended load, the weights of the various parts of the roof rig, the self-weight of the rails, any counterweights or beams attached thereto, the longitudinal surges resulting from traversing the roof rig and from the wind effects.
- 5.3.7 Roof fixing
- 5.3.7.1 When roof fixings of a permanent suspended working platform are relied on to ensure stability, the factor of safety against overturning should be at least 3. The roof and fixings should then be designed according to the design stresses appropriate to the materials. The design and construction of the roof fixing should be approved by a professional engineer.
- 5.3.7.2 When roof fixings of a temporary suspended working platform are relied upon as the sole means of achieving stability, they should be capable of providing a factor of safety of at least 3 against uplift. Where a roof is insufficiently strong to provide this factor of safety, counterweights should be added to provide an overall factor of safety against overturning of at least 3. The roof fixing should be approved by a professional engineer.

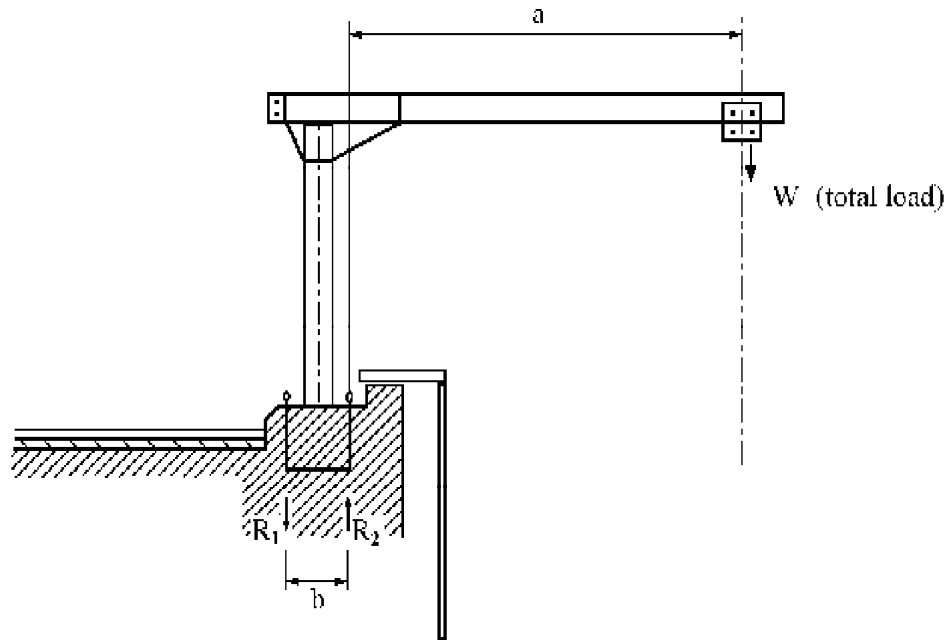


Fig. 2 A davit arm configuration.

The stability of the davit is

$$\text{achieved by: } \frac{R_1 \times b}{W \times a} \geq 3$$

5.3.7.3 In the case of davit arm configuration, a davit is regarded as adequately stable if the bolts fixing the davit to the roof could provide a holding down force to achieve a factor of safety against overturning of at least 3. The design of the fixing should be carried out by a professional engineer. Fig.2 illustrates the calculation of the factor of safety of the davit.



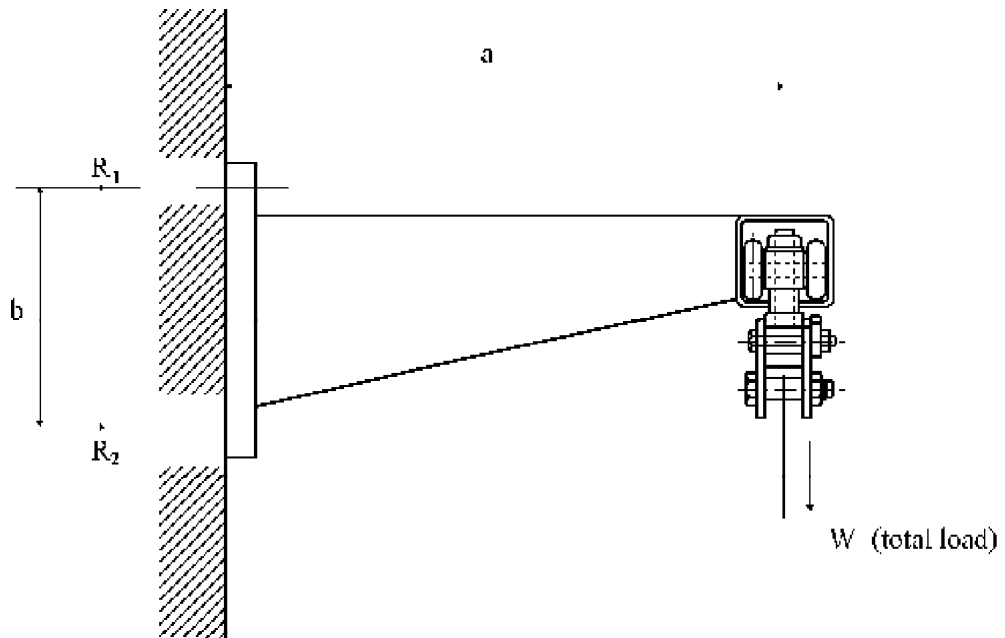


Fig. 3 Monorail.

The stability of the monorail is

achieved by: 
$$\frac{R_1 \times b}{W \times a} \geq 3$$

5.3.7.4 In case of a trolley unit to which the suspension wire ropes are attached, and which is mounted and traverses on a monorail, the monorail is regarded as adequately stable if the bolts fixing the supports to the wall could provide a holding-down force to achieve a factor of safety against overturning of at least 3. The design of the monorail should be carried out by a professional engineer. Fig. 3 illustrates the calculation of the factor of safety of the monorail system

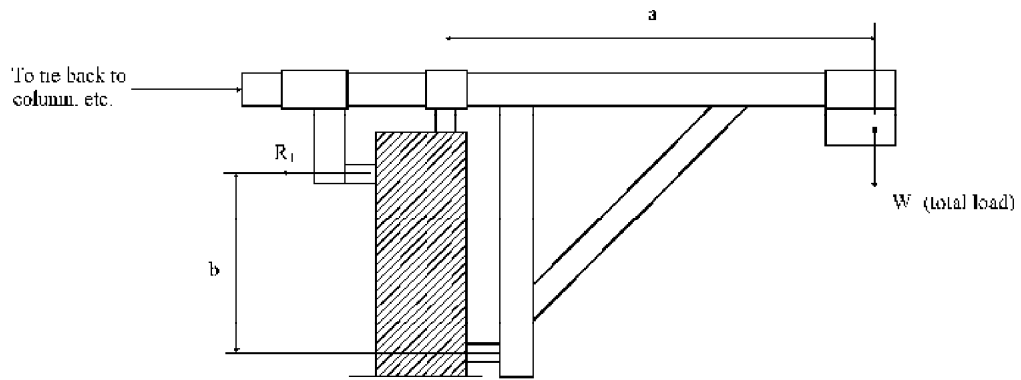


Fig. 4 Parapet clamp.

The stability of the parapet clamp

is achieved by:  $\frac{R_1 \times b}{W \times a} \geq 3$

5.3.7.5 Where parapet wall clamps are used to achieve the stability of a temporary suspended working platform, the suspended working platform is regarded as adequately stable if the clamps could provide gripping force to achieve the factor of safety against overturning of at least 3. Fig. 4 illustrates the calculation of the factor of safety of the parapet wall clamps. The stability of the parapet wall clamps should be tested by a competent examiner to ensure that the clamps are adequately stable.

5.3.7.6 In addition to having adequate stability against overturning, the roof rig, outriggers and traversing track should have sufficient lateral strength or be adequately braced against lateral sway parallel to the face of the building. The forces producing lateral sway include wind forces, surge and braking forces, and the applied forces in the traversing lines.

### 5.3.8 Outriggers

5.3.8.1 Where outriggers are used, the outriggers should be :

- (a) of adequate length and strength and properly installed and supported;
- (b) firmly anchored at the inner ends; and
- (c) securely fastened to any ballast or counterweights (regulation 5(2) of the SWPR).

5.3.8.2 Outrigger should be properly constructed. It should not contain welded joint when it is in tension unless the joint is supplemented. Any welded steel joints should conform in all respects to BS 5135: 1984 or equivalent.

5.3.8.3 Special attention should be given to ensure that the strength of the building or structure is adequate at places where the outrigger bears on the building or structure.

5.3.8.4 Where roof hooks and parapet wall clamps are used to serve the purpose of outriggers (see Fig. 5) of a temporary suspended working platform, the following requirements should be followed:

- (a) there should be sufficient tie-backs anchored onto the roof beams or internal columns of the building;
- (b) every tie-back should be of steel wire rope having a diameter not less than that of the suspension rope;
- (c) a turn-buckle or other similar device should be incorporated in every tie-back;
- (d) every tie-back should at all times be kept taut;
- (e) the roof hooks, parapet wall clamps and anchor points of tie-back should not be used on non-reinforced structures such as masonry and brick wall;
- (f) any packing used should be securely clamped; and
- (g) suitable stiffener should be used to prevent the open-up of the outrigger leg.

5.3.8.5 A rope guard or other means should be fitted at the outer end of the outrigger to prevent the suspension rope and safety rope from slipping off the outrigger.

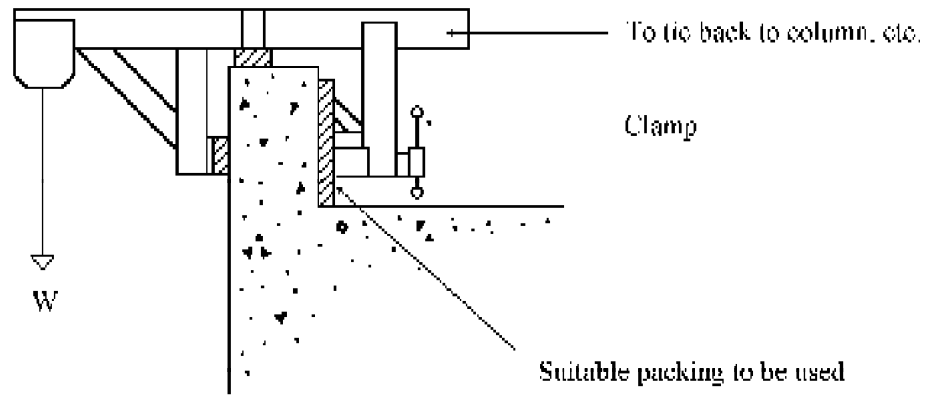


Fig. 5a. Adjustable parapet clamps with tie-back to columns or roof beams.

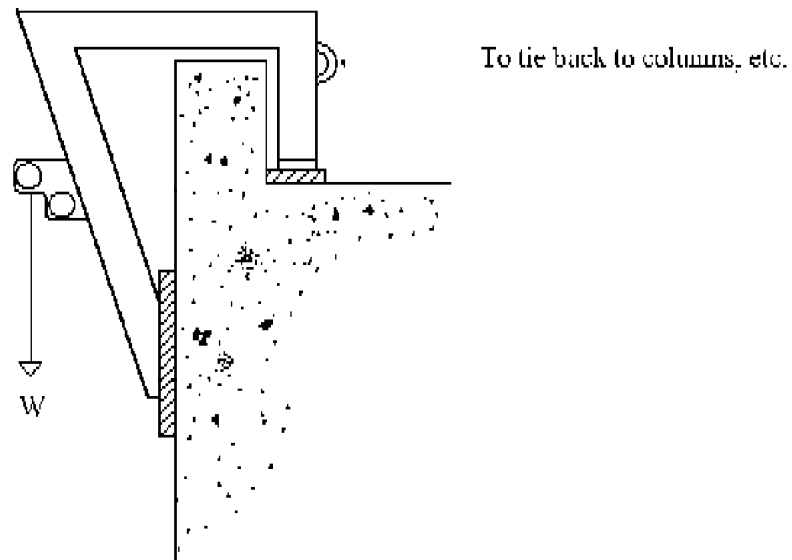


Fig. 5b. Parapet hooks with tie-back to columns or roof beams.

Fig. 5. Roof hooks and parapet wall clamps systems.

## 5.4 Stability Against Overturning

5.4.1 Where a suspended working platform is counterbalanced by counterweights, the counterweights on any outriggers should not be less than 3 times the weight necessary to balance the load on the projecting part of the outriggers when the working platform is fully loaded (regulation 7(d) of the SWPR). Counterweight on outrigger system is illustrated in Fig. 6.

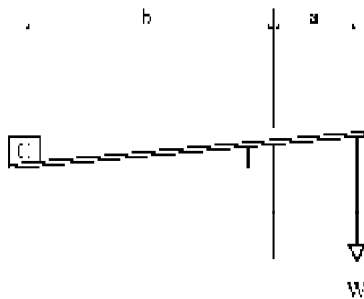


Fig. 5a Lay down system.

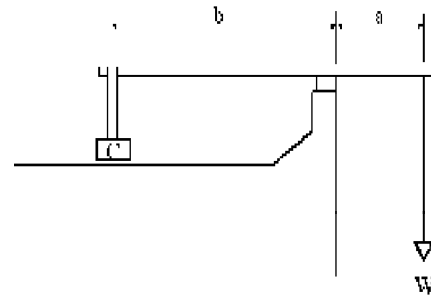


Fig. 5b Raised up and resting on parapet system.

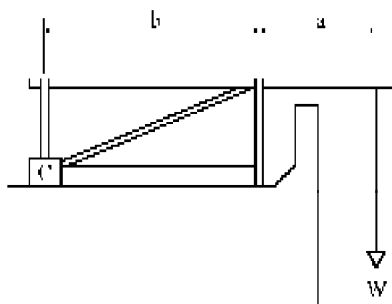


Fig. 6c Independent of parapet system.

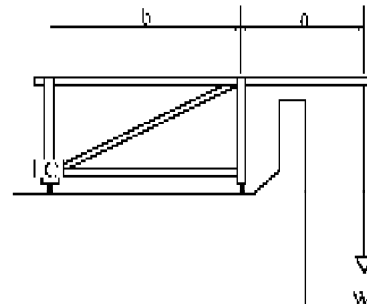


Fig. 6d Independent system on castors

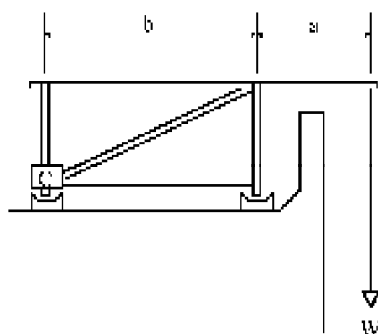


Fig. 6e Independent system on rails.

N.B. The product of the tailing length and the counterweight should not be less than three times the product of the projection length and the designed load, i.e.:

$$C \times b \geq 3 \times W \times a$$

where:  $b$  = tailing length  
 $C$  = balancing force  
 $a$  = projection length  
 $W$  = the maximum weight which may be suspended under the outrigger  
 $3$  = factor of safety against overturning

Fig. 6 Counterweight outrigger systems.

- 5.4.2 The stability factor against overturning of a temporary suspended working platform should not be less than 3 based on the maximum overturning moment, resulting from the combined load specified in clause 5.2.1.
- 5.4.3 For mobile suspended working platforms having a trolley which is not operated on trolley track, the factor of safety against overturning should be at least 3, see Fig. 7.

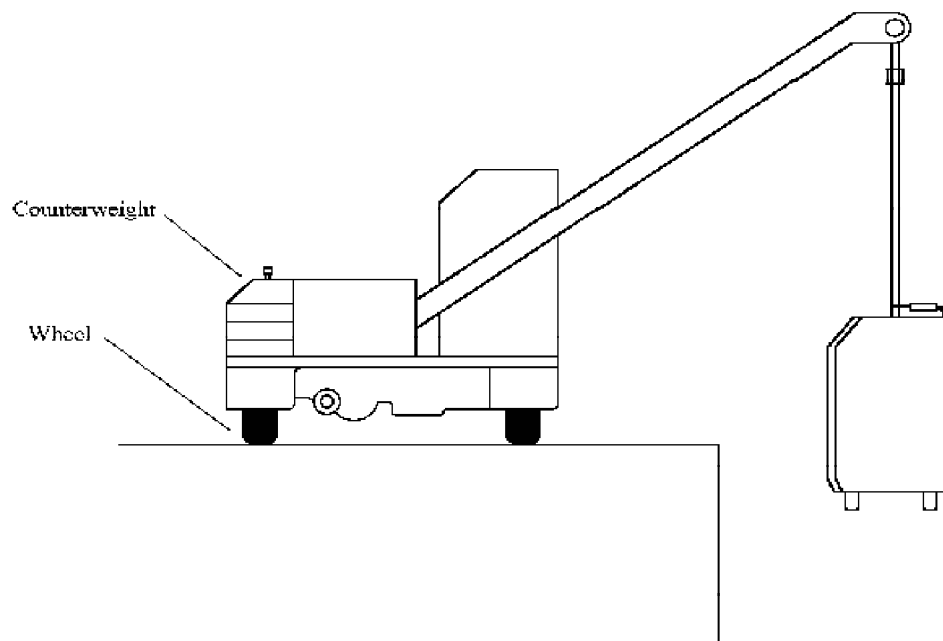


Fig. 7 Mobile Suspended Working Platform.

- 5.4.4 Every permanent suspended working platform for which stability against overturning is achieved either by the self-weight of the in-board portion of the roof trolley or by the self-weight and counterweights, should have a factor of safety against overturning of at least 3 in each case.
- 5.4.5 In case where the self-weight of the in-board portion of the roof trolley or the counterweights are insufficient to provide a factor of safety against overturning of 3, the stability against overturning should be achieved by the holding down strength of the roof such as to provide an overall factor of safety against overturning of at least 3.

## 5.5 Counterweight

- 5.5.1 Where counterweights are used to achieve the stability against overturning, the design of the suspended working platform should ensure that the balancing moments cannot be adversely affected by easy removal of any counterweight.
- 5.5.2 The materials used for counterweight are such that they cannot be removed or discharged accidentally. Water or other liquids, earth, clay, sand, chipping or aggregates cannot be used as counterweights (regulation 7(a) of SWPR).
- 5.5.3 Every portable counterweight should have its weight permanently and distinctly stamped, engraved or embossed in it (regulation 7(b) of SWPR).
- 5.5.4 All counterweights should be securely attached at the inner end of the outriggers to prevent tampering by any person (regulation 7(c) of SWPR).
- 5.5.5 When counterweights are used to achieve stability of the roof trolley, the frame should be so designed that counterweights cannot be easily removed. The counterweights should form an integral part of the roof trolley and should be secured to the structure.
- 5.5.6 The counterweights should be so placed that in the event of the failure of the working platform (e.g. tilting), the counterweights should be capable of sustaining the loads and the working platform.

## 5.6 Suspension

- 5.6.1 Every working platform should be supported on two independent suspension wire ropes at or near each end such that in the event of the failure of one suspension wire rope, the other wire rope is capable of sustaining the weight of the working platform and its load and preventing it from tilting (regulation 14(2) of SWPR).

- 5.6.2 Where a working platform is raised or lowered by means of climbers or winches with one suspension wire rope at or near each end, the working platform should be provided, at each suspension point, with a safety rope with an automatic safety device mounted on it, such that the safety rope with the automatic safety device will support the working platform in the event of the failure of the primary suspension rope, the winch, climber or any part of the mechanism used for raising or lowering the suspended working platform (regulation 14(1) of the SWPR).
- 5.6.3 The automatic safety device must be designed to cover the following situations:
- (a) the breaking of one of the suspension wire ropes; and
  - (b) the mechanical failure of one of the winches or climbers, causing a slow or rapid slippage of the wire rope. The maximum incline of the working platform deck should be less than 25% (i.e. 1:4).
- 5.6.4 The automatic safety device should not be used to stop and hold the working platform under normal operating conditions. It should be engaged mechanically and must be operational after resetting. It should not be possible to release the device under load but should allow the working platform to be lifted.
- 5.6.5 The points of suspension of a suspended working platform should be at adequate horizontal distances from the face of the building or other structure so as to prevent the suspended working platform from coming into contact with such face (regulation 6(a) of SWPR). The suspension and safety rope should at all times be kept vertical during the raising, lowering or suspension of the working platform.
- 5.6.6 Wire ropes or chains should be used for raising, lowering and suspension of the working platform. They should be securely attached to the outriggers or other supports (regulation 6(b) & (c) of SWPR). In case of chains, they should comply with the requirements specified in BS 3114:1959- Specification for alloy steel chain, Grade 80-Polished short link calibrated load chain for pulley blocks.
- 5.6.7 The wire ropes or chains used in the suspension system should be of such lengths that the working platform should be capable of being lowered to the ground or a safe landing place (regulation 6(d) of SWPR).



5.6.8 Adequate arrangements (e.g. traversing rope, slack rope device, or anti-tilt device etc.), should be used to prevent undue tipping, tilting or swinging of the working platform and to secure it to prevent undue horizontal movement while it is being used (regulation 6(e) of SWPR).

5.6.9 The wire rope or chains used in the suspension system should be in one continuous length and free from joints and repairs.

## 5.7 Wire rope

5.7.1 Only wire rope specified by the manufacturer of the working platform should be used.

5.7.2 Where the suspension of a working platform is by means of four suspension ropes, that is, two at each end of the working platform, 6mm diameter steel wire ropes would be the minimum acceptable requirement. Preferably, 8mm diameter steel wire ropes or above are recommended.

5.7.3 Where the suspension of a working platform is by means of primary suspension ropes and safety ropes, wire ropes used for primary suspension ropes or safety ropes should be made of steel wire ropes of not less than 8 mm diameter and the diameter of the safety rope should not be less than the diameter of the primary suspension rope.

5.7.4 Each suspension and safety rope should have a factor of safety of not less than 8, based on the maximum rope tension when related to the minimum breaking load of the rope, or such other higher factors as specified by the manufacturer of the winch or climbing device.

5.7.5 Where the working platform is raised or lowered by a winch, there should be at least two turns of the wire rope remained on the drum when the working platform is at the lowest level (regulation 10(b) of the SWPR).

5.7.6 Where the working platform is raised or lowered by a climber or traction pulley, after the working platform has reached the ground or a landing place, the free ends of the suspension and safety ropes should have a minimum length of three metres measured from the discharge of the climber or traction pulley.

- 5.7.7 Where a wire rope is fixed to a jib or outrigger arm, the rope termination should be attached to the outrigger or jib with a shackle or other suitable means. Where a wire rope is attached to a working platform, the rope termination should be attached to a structural load bearing portion of the working platform with a shackle or other suitable means. U-bolt grips should not be used.
- 5.7.8 Wire rope termination should be suitable for their purpose and should have a strength of not less than 80% of the minimum breaking load of the rope. Any free end of rope should be finished to prevent unlaying.
- 5.7.9 The end of the suspension rope other than that on or through the lifting device or winch should be fixed to the suspension point on the roof rig or on the working platform with a thimble eye splice or ferrule secured eye termination or other rope coupling device giving a strength of not less than 80% of the breaking load of the rope.
- 5.7.10 Wire ropes should be properly maintained and lubricated to prevent corrosion. Ropes with the following defects should not be used:
- (a) ropes with kinks, birdcage or any other distortion;
  - (b) when the total number of visible broken wires exceeds 5 % of the total number of wires in the rope in any length of ten diameters of the rope;
  - (c) there is on the rope marked signs of wear or corrosion (regulation 23 of SWPR); and
  - (d) reduction of nominal diameter of more than 10 %.

## 5.8 Drum and Pulley

- 5.8.1 When wire ropes pass over pulleys or round drums in winches and climbers, such pulleys or drums should have a pitch circle diameter of not less than 19 times the diameter of the rope.
- 5.8.2 Where the rope terminates at the winding drum, the rope should be fastened on to the drum in the manner specified by the manufacturer.

- 5.8.3 If the rope is to be wound on to the drum in more than one layer, the rope anchorage should be so located as to avoid interference with even winding. It should preferably be placed outside the drum flange and should be capable of sustaining twice the maximum force induced in the rope system.

## 5.9 Working Platform

- 5.9.1 The working platform should be of sufficient area for the persons employed on it and of at least 440 mm wide (regulation 8(a) of SWPR). The working platform should be of sound material and the surface should be slip resistant.
- 5.9.2 Except for the provision of drainage holes, the working platform should be closely boarded, planked or plated (regulation 8(b) of SWPR). Any gap in the working platform should not exceed 6 mm in width.
- 5.9.3 The working platform should be provided on all sides with suitable toe boards placed at a height not less than 200 mm above the level of the working platform (regulation 8(c) of SWPR).
- 5.9.4 The working platform should be provided on all sides with suitable guard-rails of adequate strength to a height between 900 mm and 1150 mm above the level of the working platform. The space between any toe board and the lowest guard-rail above it does not exceed 700 mm (regulation 8(d) of SWPR).
- 5.9.5 No guard-rail should fracture or show any permanent deformation when a 50 kg weight is hung on its centre point and the working platform is tilted at an angle of 30 degrees.
- 5.9.6 If a working platform extends beyond a suspension point, a factor of safety against overturning of 2 should be ensured in the working platform design in order to provide adequate stability.

## 5.10 Brakes

5.10.1 Each winch, climber or other lifting appliance or similar device of the suspended working platform should be provided with the following braking system:

- (a) in case of manually operated appliances or devices, an efficient brake which comes into operation when the operating handle or lever is released; and
- (b) in case of power operated appliances or devices, two independent efficient braking systems, i.e. the primary brake and the secondary brake capable of preventing the suspended working platform from falling out of control or in a dangerous manner (regulation 11 of the SWPR).

5.10.2 Where a temporary suspended working platform is raised or lowered by a manually operated hoist, the hoist should be designed to have:

- (a) a positive crank force to lift and lower the load. The maximum force applied to the end of the crank or cranks for lifting the rated capacity of the hoist should not exceed 250N;
- (b) an interlocking device must be provided to prevent the release of the gripping mechanism when the suspension wire rope is under a load above 2% of the maximum safe working load; and
- (c) a means to prevent rapid handle movement, fast unreeling or uncontrolled descent.

5.10.3 The primary brake should :

- (a) engage automatically in the event of power failure or interruption;
- (b) be capable of stopping and sustaining the working platform even when the working platform is overloaded by 25%;
- (c) be directly coupled to the drive train of the appliance or climbing device and not by using belts, pins, clutches, roller chain or rollers; and
- (d) be capable of being released manually in the event of a power failure or emergency. The means of releasing the brake should ensure its immediate reapplication as soon as the control is released.

- 5.10.4 The secondary brake should be mechanically operated independently of the primary brake. It should be capable of arresting and sustaining the working platform if the primary braking system fails and in the event of overspeeding of the working platform.
- 5.10.5 Each climbing device should be provided with an automatic emergency type secondary brake that could stop and hold 125 % of the rated load of the climbing device. If such a secondary brake is of the instantaneous stopping type, it should stop and hold its total load before the device travels a vertical distance of 450 mm. If such a secondary brake is of the deceleration type, it should stop and hold its total load before the device travels a vertical distance of 1.2 m.
- 5.10.6 Secondary brakes should be independent of the drive trains on all climbing devices. In normal operation, such a brake should not engage before the device is stopped by the primary brake.

## 5.11 Control Levers, Switches

- 5.11.1 Every lever, handle, switch, or other device used for controlling the operation of any part of the suspended working platform (being a lever, handle, switch, or other device the accidental movement or displacement of which is liable to cause danger ) should be, unless it is so placed as to prevent accidental movement or displacement, provided with a suitable spring or other locking arrangement to prevent any such accidental movement or displacement (regulation 12(a) of the SWPR).
- 5.11.2 Every lever, handle, switch, or other device for controlling the operation of any part of the suspended working platform should have either on or adjacent to it clear markings to indicate its purpose and mode of operation (regulation 12(b) of the SWPR).
- 5.11.3 The control for the power unit and hence the climbing device should be such that when manual application is released, the power unit will stop.
- 5.11.4 Emergency stop device should be located at each operator control station and other places where emergency stop may be required. It should be operative irrespective of whether the control station is in operation. The device should be in red colour.

## 5.12 Protection Against Weather

- 5.12.1 All winches, climbers, or other lifting appliances or similar devices should be adequately protected against the effect of weather, dust, or material likely to cause damage to them that could result in a malfunction (regulation 13 of the SWPR).
- 5.12.2 The machinery of the roof trolley should be enclosed by weatherproof covers. They should be so designed and constructed to enclose the equipment and moving parts as completely as possible. Lockable maintenance access covers should be so fixed that they are not readily removable.
- 5.12.3 The suspended working platform in its docked position should be designed to withstand the wind pressure as given in the Code of Practice on Wind Effects Hong Kong 1983. All loose items of the suspended working platform are securable to fixed structure so that during the typhoon conditions, the items will not be disintegrated or damaged.

## 5.13 Safe Means of Access

- 5.13.1 Sufficient safe means of access and egress should be provided to :
- (a) the working platform of the suspended working platform; and
  - (b) those parts of the installation of the suspended working platform requiring periodic inspection, maintenance or normal usage (regulation 9 of the SWPR).
- 5.13.2 When access to the working platform is from the roof of the building, the access must be inside the parapet. If an access gate is necessary in the side frame of a working platform, it should not open outwards and should close automatically (springloaded, for example). It should not be possible to open the lock accidentally.
- 5.13.3 When working platforms are adjacent, neither scaffold boards nor any other form of decking should be used to provide access from one to the other.
- 5.13.4 In the case of a davit arm suspended working platform, the design of the davit should be such that the working platform can be raised above the parapet of the building to ensure safe access and egress and to ensure the safety of persons rigging the davit system.

5.13.5 The place where persons access to and egress from the working platform of a davit arm suspended working platform should be safe and they should not be required to climb over the parapet of the building.

## 5.14 Electrical Component

5.14.1 All power and control cables of the suspended working platform should be of the proper type and size. The power cable connecting the roof trolley to the power supply point and the cable suspended from the roof trolley or davit arm to the working platform should be suitably sheathed and protected wherever possible from damage of breaking, and should have sufficient cable strength to avoid the cables from being damaged by its own weight. All other cables should be suitably protected against mechanical damage by being enclosed in conduit and/or trunking or other suitable means.

5.14.2 Protection should be provided for all electrical parts, motors, cables etc. against accidental or environmental damage. All circuit panels should be locked when not in use.

5.14.3 Provision should be made to ensure that in the event of the power failure, no damages can occur to the suspended working platform nor can there be any uncontrolled movement.

5.14.4 All electrical equipment should have adequate mechanical strength and should be adequately protected against mechanical damages and water ingress under site condition. Cable terminations to the suspended working platform and electrical panels should also be the weatherproof type or higher rating to avoid ingress of water and moisture.

5.14.5 All exposed metal parts or extraneous conductive parts of the roof trolley and of the working platform should be properly earthed in accordance with BS 7671:1992 (IEE Regulations) and BS 7430:1991-Code of Practice for earthing.

5.14.6 The rail tracks, davit arm brackets and other exposed and extraneous metal parts should be connected to the roof lightning protection conductor. All connections should be of negligible resistance, metal to metal and mechanically sound and with non-ferrous nuts, bolts and washers using clamps where necessary.

- 5.14.7 All electrical equipment and wiring should be protected against overloads, short circuits and earth faults. Enclosure for electrical equipment which are exposed to open air should be protected from ingress of water or solid foreign objects by having an IP (Ingress Protection) rating of not less than 54 according to BS EN 60529:1992. All terminals should be protected from corrosion.
- 5.14.8 The power supply for the suspended working platform should be provided with appropriate overload short circuit and earth-fault electrical protection. Power supply cables passing over parapets, edges of roofs or over the corners of beams or slabs should be protected from abrasion or other mechanical damage.
- 5.14.9 Any plug and socket should be so placed that they would not be damaged by the intended movement of the working platform or by the accidental swinging of the working platform against the building.
- 5.14.10 All control units and pendant controls should be so marked and identified that there is no confusion between the various controls. Their purpose and the direction of travel resulting from their operation should be clearly identified.
- 5.14.11 Pendant controls should be so placed or fixed that they cannot be damaged by the intended movement of the working platform or by the accidental swinging of the working platform against the building. The control button or levers should be robust and require continuous light pressure to maintain powered movements, and the control units should be so designed as to prevent them from being operated accidentally, e.g. by the provision of shrouds.
- 5.14.12 If 3-phase induction motors are employed as power drives of the suspended working platform, protection devices should be provided to protect against single phasing and wrong phase sequence.
- 5.14.13 Cable reels or other suitable device should be used for the proper handling of the cables connected from the fixed building to the working platform. It is to minimize the risk of physical damage to the cables due to stress and strain. It also helps to eliminate the risk of trip and trap to the operators.



## **6. SAFE AND PROPER USE**

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### **6.1 Erection, Dismantling and Alteration**

- 6.1.1 The erection and dismantling of any part of a suspended working platform should only be carried out by or under the supervision of a competent person in accordance with the manufacturer's assembly manual (regulation 16 of the SWPR).
- 6.1.2 The alteration of any construction from the original design of a suspended working platform should only be carried out by a competent person under the advice of a professional engineer. The professional engineer should be in either mechanical or marine discipline if the alteration involves mechanical parts of the suspended working platform or in structural discipline if the alteration involves roof anchorage or roof fixings. It is not recommended to bolt working platforms of two or more temporary suspended working platforms together to provide a longer working range except under the written permission and authorization of the manufacturer. Similarly, no alteration to the electrical or mechanical parts of the suspended working platform should be allowed except under the written permission of the manufacturer.
- 6.1.3 The work of attaching the wire ropes to anchor points for a davit arm suspended working platform should be completed from roof level and before the davit is raised to its working position.
- 6.1.4 The rotating davits of an davit arm suspended working platform should be designed to allow the davits to be easily rotated. After the working platform is rotated to the facade of the building, the socket of the davit arm should be properly locked to prevent any lateral movement of the working platform.
- 6.1.5 The davits and working platform should be provided with wheels to allow relocation of the suspended working platform with minimum physical effort.
- 6.1.6 Where parapet clamps of a temporary suspended working platform are used, the structural strength of the parapet must be determined prior to any site-rigging taking place. In any case, the parapet clamps and the clamps for back-ties should not be anchored to any brick or masonry work.

- 6.1.7 Proper manual handling method should be used and applied to carrying and transporting of counterweights, davit arms, wire ropes, clamps, individual parts and body of the temporary suspended working platform. In case of a heavy weight, say 50 kg or above, it should be carried by two or more persons.
- 6.1.8 The procedure for erection and dismantling should be such that at no time should there be an unstable condition. If it is required to move a temporary suspended working platform to another location, the user should instruct a competent person who is preferably the original erector to carry out the move.
- 6.1.9 During the dismantling, care should be taken in disposal of materials and components. Components should not be thrown on the ground. They should be lowered hand to hand in an orderly fashion or brought down by gin wheel or other suitable means.

## 6.2 Trained Operators and Workers

- 6.2.1 Every person operating the suspended working platform or working thereon should:
- (a) be at least 18 years old;
  - (b) be fit, agile and not height phobic;
  - (c) have undergone training that is either recognized by the Commissioner or provided by the manufacturer of the suspended working platform or its local agent; and
  - (d) have obtained a certificate in respect of such training from the person who provided the training (regulation 17(1) of the SWPR).
- 6.2.2 The training of the persons operating or working on the suspended working platform should cover areas including:
- (a) the basic construction of the suspended working platform and its system;
  - (b) the operational features including all safety devices;
  - (c) the anchorage and suspension systems;
  - (d) the proper use of safety belts, independent lifeline and other suitable fittings; and
  - (e) the emergency procedure and the precautionary measures to be taken in cases such as malfunction, locking of safety device, manual cranking of the working platform in case of power failure, use of proper communication device for assistance, etc.

## 6.3 Safety Belt and Lifeline

- 6.3.1 Every person carried on a suspended working platform should be provided with a suitable safety belt, an independent lifeline or suitable anchorage and fittings. Each safety belt, lifeline, anchorage and fitting should be of such a design, so constructed and properly maintained as to prevent serious injury in the event of a fall of any person using it (regulation 15 of the SWPR). Reference should be made to the Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems.
- 6.3.2 Full body harness meeting the specifications of a national standard such as British Standard or equivalent should be used instead of a general purpose safety belt. The hook of the lanyard should be anchored to the rope chuck of an independent lifeline or a fitting of the working platform designed by the manufacturer. The hook should be above the user's waist.
- 6.3.3 Independent lifeline used for permanent suspended working platform should be properly anchored to the structural member of the roof rig and should be independent of the suspension system.
- 6.3.4 No part of the working platform including its railing should be used to anchor the lanyard of a safety harness. However, in case of a permanent suspended working platform which is suspended by two suspension ropes at each end, the lanyard of a safety harness can be hooked to an eye bolt on the structural member of the working platform which is designed by the manufacturer, see Fig. 8. Where a permanent suspended working platform involves the use of safety ropes and automatic safety devices, the lanyard of a safety harness should be anchored to an independent lifeline.
- 6.3.5 Independent lifeline should be used for anchorage of the lanyard of a safety harness for all temporary suspended working platforms. The lifeline should not be secured to any part of the roof rig, including the outriggers, parapet clamps or any counterweights. They should be secured to reinforced concrete beams or column, structural steel beams or other fixture which are sufficiently strong. It is not recommended to anchor the lifeline to railings or any member of a temporary scaffolding, bamboo scaffolding, or in any section of water, gas or drainage pipes of the building as these fixtures are not designed to withstand sudden shock or impact force.

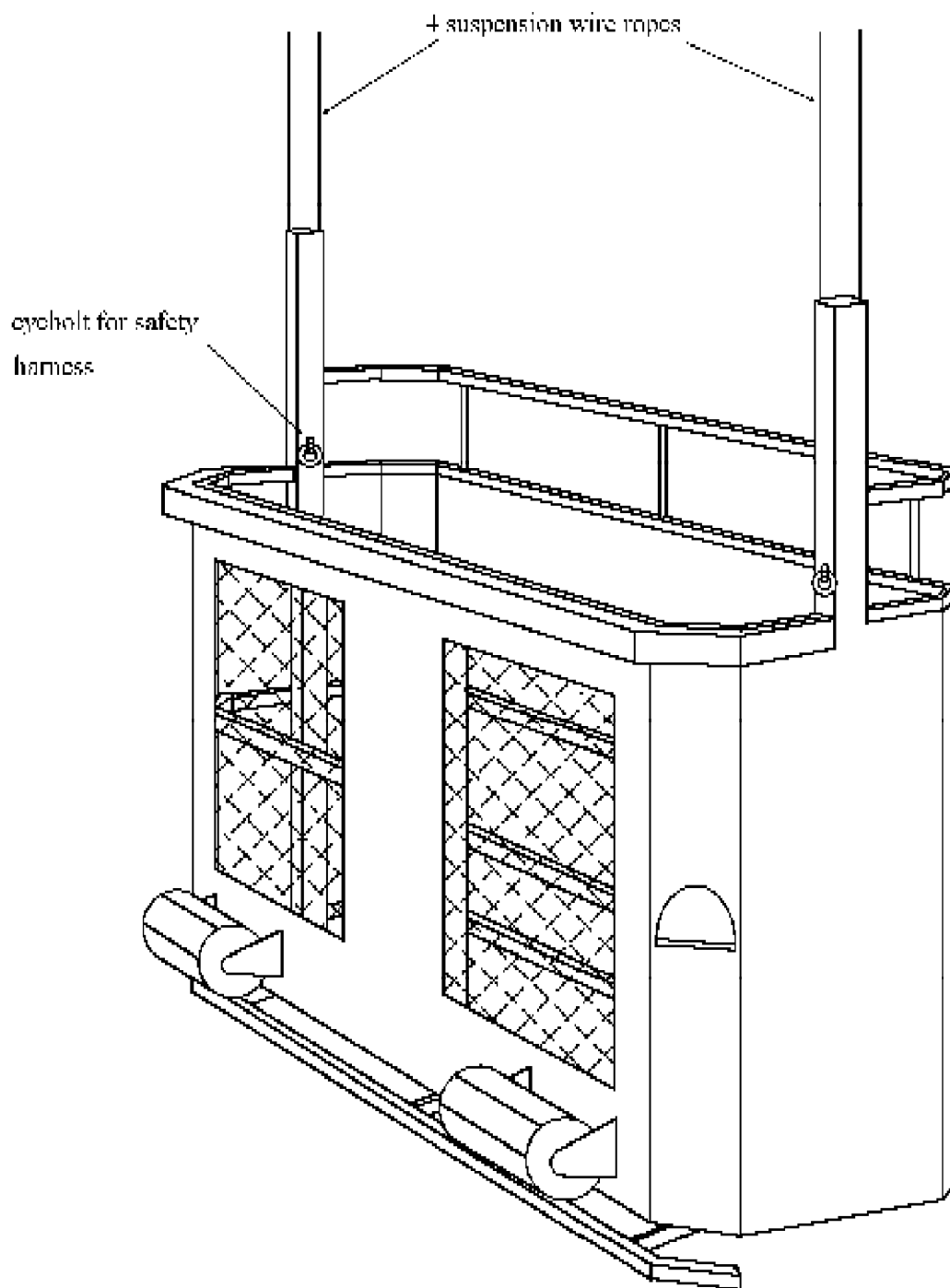


Fig. 8 Safety Eyebolt for safety harness.

- 6.3.6 Each person on the working platform should be provided with a safety harness and an independent lifeline or an eye bolt as specified in clause 6.3.4. No more than one lanyard should be anchored to each independent lifeline or eye bolt.
- 6.3.7 Notices in English and Chinese in the following forms should be displayed prominently on the suspended working platform (regulations 15(3) and 19(2)(b) of the SWPR):
- (i) ‘All wire ropes shall be inspected prior to commencement of daily work’  
‘每日開工前須檢查所有纜索’  
and
  - (ii) ‘Every person riding on a suspended working platform shall wear a safety belt properly attached to an independent lifeline or an appropriate anchorage’  
‘吊船上的人員須佩戴安全帶；安全帶須繫於獨立救生繩上或穩固的繫穩物上。’

## 6.4 Use in Adverse Weather Conditions

- 6.4.1 Suspended working platform should not be used under weather conditions likely to endanger its stability or cause danger to the persons carried thereon (regulation 18(1) of the SWPR).
- 6.4.2 When winds give rise to unsatisfactory working conditions, work should be stopped until the winds subside. Wind conditions which arise during the use of suspended working platforms can do damage to the buildings they serve and the ropes on which the working platforms are suspended. Suspended working platform should not be used where there is thunder and storm in the vicinity, during rainy periods or when a strong wind signal is hoisted.
- 6.4.3 After exposure to weather conditions likely to have affected the stability of the suspended working platform, the suspended working platform should be load tested and thoroughly examined by a competent examiner as soon as practicable thereafter and before the suspended working platform is used again. In the event of the anchorage, ballast, counterbalance or supports being found on examination to be unsafe, steps should be taken to ensure the stability of the suspended working platform (regulation 18(2) of the SWPR).

## 6.5 Marking of Safe Working Load and Number of Persons

- 6.5.1 Every suspended working platform should be marked clearly and legibly on its working platform :
- (a) the safe working load applicable to the suspended working platform;
  - (b) the maximum number of persons that may be carried at any one time; and
  - (c) an appropriate mark to distinguish it from other similar suspended working platforms (regulation 22(a) of the SWPR).

## 6.6 Safe Use of the Suspended Working Platform

- 6.6.1 The suspended working platform should only be used by a person who is trained and instructed to operate it. The operatives should use the proper means of access to and egress from the working platform.
- 6.6.2 Where electric arc welding and/or cutting is to be carried out from the working platform, special precautions should be taken to reduce the possibility of the welding current arcing through the suspension wire rope during the course of welding from the working platform and to prevent the transfer of stray welding currents to the suspension or safety ropes as this could impair their strength or cause their fracture. Reference should be made to ANSI A10.8-1988 American National Standard for construction and demolition operations: scaffolding safety requirements.
- 6.6.3 When portable electrical equipment is used by operatives on the working platform, electrical supply for these equipment should not be drawn from the power source of the suspended working platform. Electricity should be supplied from an independent power source from the building.
- 6.6.4 When flammable substance is used by operatives on the working platform, the flammable substance should be contained in a proper container. Fire extinguisher of a suitable type should be provided on the working platform. Under no circumstances should any person be allowed to smoke on the working platform, nor any naked flame process such as gas welding work be conducted.

- 6.6.5 The working platform should be at all times kept in a horizontal position except for hinged continuous suspended working platforms which are designed such that they may be used on a slope. The maximum slope to which any such working platform may be set should be ascertained from the manufacturer and the limit should not be exceeded.
- 6.6.6 When being stationed or left in place between two periods of work, the working platform should be tied at each end into the building to prevent undue movement.
- 6.6.7 The working platform should be kept clean at all times. Materials which would cause slipping hazards on the working platform or on the place of access to it should be removed. No materials should be stored on the working platform. Adequate precautions should be taken to prevent materials and hand tools from falling down at height.

## 6.7 Use of Special Working Platform

### 6.7.1 Hinged continuous suspended working platform

- 6.7.1.1 No equipment other than proprietary equipment should be erected on the working platform. The equipment should be used strictly in accordance with the manufacturer's instruction. Special regard should be given to the use of safety devices provided by the manufacturer of the equipment.
- 6.7.1.2 Only complete units or units assembled from prefabricated parts of hinged continuous working platforms should be used. The angle of displacement at a hinge point should not exceed 15 degree in any type of hinged continuous working platform, see Fig. 9. The maximum slope to which the working platform may be set should be ascertained from the manufacturer and the limit should not be exceeded. The limiting slope of the working platform and the safe working loads should be marked on the working platform.

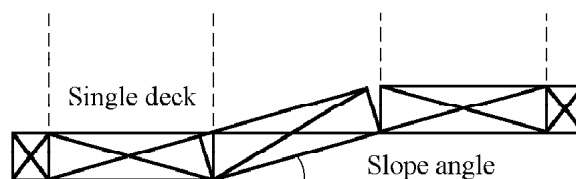


Fig. 9 Hinged continuous platform.

- 6.7.1.3 The working platforms should be raised and lowered in such a manner that the deck remains approximately horizontal in the direction at right angle to the building.
- 6.7.2 Multi-level suspended working platform
- 6.7.2.1 Multi-level suspended working platform should only be used in operations which require work to be done simultaneously at several levels, e.g. fixing of sheet metals to frames in cladding operations. A proprietary system should be erected and used in accordance with the manufacturer's instructions.
- 6.7.2.2 Wire ropes should not be used as structural members for joining the working platforms. The structural members used should have adequate strength and should be arranged in such a way so as to prevent any relative movement between the working platforms.
- 6.7.2.3 A ladder should be provided and used for safe access between the upper and the bottom decks. Where the distance between the two decks is greater than 2 metres, protection hoops on the access ladder should start at 2 metres height measured from the surface of the lower working platform base, see Fig. 10.

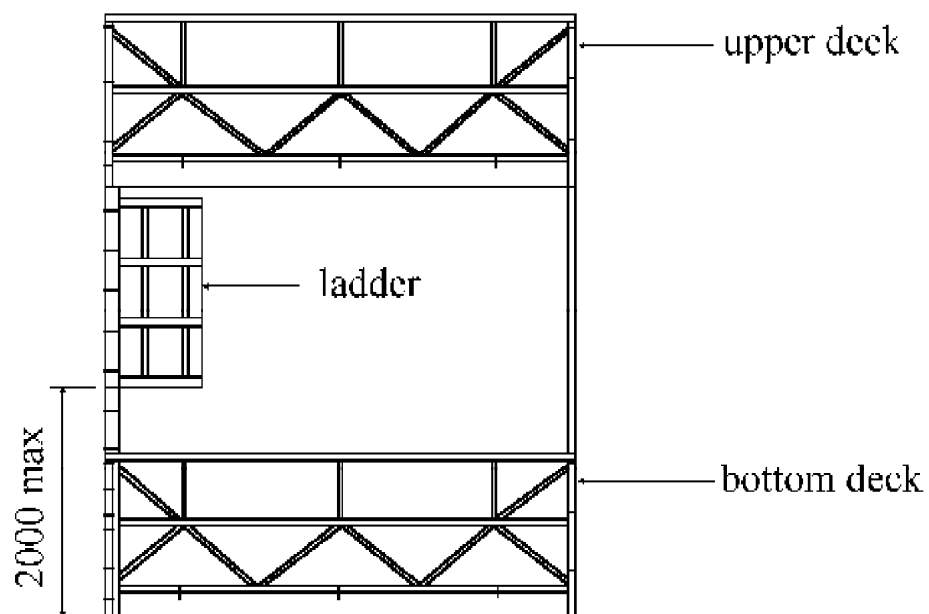


Fig. 10 Multi-deck platform.



## **7. MAINTENANCE**

### **7.1 General**

7.1.1 All parts of the suspended working platform, including the outriggers, parapet wall clamps, the suspension gear, the working platform and the whole of the mechanical and electrical apparatus required in connection with the operation and safety of the suspended working platform should be properly maintained. In particular:-

- (a) all such parts on which safe operation depends should be maintained in proper working order so that they perform the function for which they are intended; and
- (b) broken or worn parts, worn switch contacts, damaged electrical devices and sticky switches, which may interfere with safe operation, should be replaced.

7.1.2 No maintenance or alteration of the suspended working platform should be carried out whilst the suspended working platform is in use.

7.1.3 All parts should be properly maintained by a competent person in accordance with the manufacturer's instructions.

7.1.4 All moving parts should be inspected for wear and replaced as necessary. Only spare parts supplied by manufacturer should be used for replacement. Such parts should be suitably lubricated. Care should be taken to ensure that the lubricant is not transferred to the ropes if this would adversely affect operation of the suspended working platform.

7.1.5 Roof fixings should be included in the maintenance inspections and any defective parts should be repaired or replaced as necessary. In particular, the welded joints of the outriggers and the parapet wall clamps should be checked to ensure that they are free from corrosion and cracks. Rusty parts should be reconditioned or replaced as necessary. Professional engineers should be consulted for maintenance of structural anchorages.

7.1.6 Electrical equipment including the cables of the suspended working platform should be visually inspected and checked before putting into use. They should also be regularly examined, tested, serviced and maintained by qualified electricians or other competent persons.

## 7.2 Wire Ropes

- 7.2.1 All ropes should be regularly serviced in accordance with the instructions of the manufacturer of the winch or climbing device. Suspension ropes and safety ropes, together with their termination, should be of sound material and free from patent defects. The ropes should be removed from service if there are signs of wear, distortion, kinks, broken strands or corrosion.
- 7.2.2 No attempt should be made to repair, splice or straighten ropes found to be damaged. The ropes should be in one continuous length and free from joints.
- 7.2.3 Detached ropes should be numbered separately. When detached they should be properly wound on to a drum or reel and stored under cover, clear of the ground and away from corrosive materials.
- 7.2.4 The maintenance should include the lubrication of moving parts and the general cleaning of the suspended working platform.

## 7.3 Record of Maintenance

- 7.3.1 A record of maintenance, i.e. maintenance log book, should be kept up-to-date to record down the parts or items of the suspended working platform which have been inspected, repaired and replaced. The record should note down the dates on which the parts or items are repaired or replaced.
- 7.3.2 The record of maintenance should be kept in a safe place. If the suspended working platform is taken out of use, the records of maintenance should be kept for a period of at least 6 years after the date on which it was taken out of use (regulation 24 of the SWPR).

## 8. INSPECTION, EXAMINATION AND TEST

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### 8.1 Inspection by Competent Person

- 8.1.1 Prior to commencement of daily work, all the suspension ropes and safety ropes should be inspected by a competent person (regulation 19(2) of the SWPR). The ropes should be in safe working condition before they are put into use. The inspection should ensure that no bolts are loose or have been removed and that all connections are sound.
- 8.1.2 Every suspended working platform should be inspected in the immediately preceding 7 days before its use by a competent person. A statement to the effect that it is in safe working order should be entered into an approved form (Form 1) by the competent person (regulation 19(1) of the SWPR).
- 8.1.3 The visual and physical inspection is to find out if there are any items having abnormal wear and tear, malfunction, oil leakage, overheating, corrosion, unusual noise, dislocation, misalignment, visual cracks, overloading, abnormal slackening or elongation, and excessive vibration etc. Any defect discovered during the inspection should be recorded in the maintenance log book and thereafter effectively remedied immediately.
- 8.1.4 The inspection should cover the following:
- (a) any apparent defect in the hoist mechanism, wire ropes and shackles;
  - (b) any abnormal function of the braking system, the automatic safety device;
  - (c) the condition of the outriggers, socket for the davit arm, parapet wall clamp, the tie-back;
  - (d) any defect in the power cable, control button, and plug;
  - (e) incorrect fitting of lifeline and safety harness and their anchorages;  
and
  - (f) the condition of guide rails and toe-boards of the working platform.

- 8.1.5 During the inspection, functional test of the following items should also be carried out by the competent person in accordance with the manufacturer's instructions:
- (a) all operational control including emergency stop;
  - (b) communication system;
  - (c) manual descend facility;
  - (d) all limit switches;
  - (e) all electrical wiring and earthing component;
  - (f) automatic safety devices; and
  - (g) braking systems.
- 8.1.6 Any defect and abnormal function noted during the inspection should be recorded in the maintenance log book. Minor repairs such as tightening of bolts and nuts should be immediately carried out. If repairs involve the strength and stability of the suspended working platform, the effectiveness and efficiency of the driving mechanism, function of electrical equipment or proper function of the various safety devices, the suspended working platform should be removed immediately from service. The suspended working platform should be returned to maintenance contractor for repair and thereafter tested and thoroughly examined before put into service again.

## 8.2 Thorough Examination by Competent Examiner

- 8.2.1 Every suspended working platform should be thoroughly examined by a competent examiner in the immediately preceding 6 months before it is put into use. A certificate in the approved form (Form 2) should be obtained from the competent examiner to certify that the suspended working platform is in safe working order (regulation 20(1) of the SWPR).
- 8.2.2 Every thorough examination of a suspended working platform should be to detect significant defects of critical parts before they result in the failure of the working platform structure, anchorage system, suspension gear or a safety device.
- 8.2.3 All critical parts of the working platform structure, anchorage system, suspension gear and safety devices should, where accessible, be examined for failures, cracks, broken members, deformation, corrosion or excessive wear.

- 8.2.4 The frame, decking, weld and other joints of the working platform structure should be closely examined for corrosion, cracks, and general deterioration.
- 8.2.5 The whole length of every wire ropes including safety ropes should be thoroughly examined for wear, damage and corrosion in order to ensure the safety of the rope system. Particular attention should be paid to tucked splices and those sections of rope lying close to terminal fittings.
- 8.2.6 When examining a winch operated suspended working platform, the working platform should be lowered to the lowest level and all parts of the rope, including those that remained spooled on the drum, should be carefully examined.
- 8.2.7 The anchorage system, including the outriggers, tie-back ropes, turnbuckles, imbedded eye-bolts, anchor bolts or other roof fixing or structure should be carefully examined for corrosion and defects.
- 8.2.8 Rollers and guide pulley should be checked to see that they are free to rotate.
- 8.2.9 All lock nuts, cotter pins and other retaining devices should be replaced if they are found to be defective or missing. All load bearing bolts should be re-tightening.
- 8.2.10 All critical parts of every winch, climber and drive mechanism should be thoroughly examined, including the adjustment of all brakes if necessary.
- 8.2.11 All electrical components and earthing capacity should be checked and tested in accordance with the manufacturer's specification by a qualified electrician.
- 8.2.12 Non-destructive test should be carried out if necessary to determine or confirm whether the load bearing capacity of the suspended working platform system is adversely affected to the extent that a repair must be immediately carried out, and that the safe working load may have to be reduced.

8.2.13 Functional tests of the following devices should be conducted under the maximum safe working load:

- (a) all operational control including emergency stop;
- (b) manual descend facility;
- (c) all limit switches;
- (d) automatic safety devices; and
- (e) braking systems.

### 8.3 Test and Thorough Examination by a Competent Examiner

8.3.1 Every suspended working platform should be load tested and thoroughly examined by a competent examiner during the preceding 12 months before its use. A certificate in an approved form (Form 3) containing a statement to the effect that the suspended working platform is in safe working order made by the competent examiner should be obtained in respect of the suspended working platform after such examination (regulation 20(2) of the SWPR).

8.3.2 Every suspended working platform has to be further load tested and thoroughly examined by a competent examiner when the suspended working platform has subsequently undergone:

- (a) substantial repair;
- (b) re-erection, including erection following its removal to a different location;
- (c) adjustment to any member of the suspended working platform, being an adjustment which involves changes in the arrangements for anchoring or supporting the suspended working platform; or
- (d) failure or collapse.

A certificate in an approved form (Form 3) containing a statement to the effect that the suspended working platform is in safe working order made by the competent examiner should be obtained after the examination (regulation 20(3) of the SWPR).

### 8.3.3 Test Requirements

- 8.3.3.1 Prior to any overload test, a thorough examination by a competent examiner should be conducted as mentioned in clause 8.2 to ensure that the suspended working platform is suitable for the overload test.
- 8.3.3.2 Every suspended working platform should be subjected to a load test carried out at the site of installation.
- 8.3.3.3 The proof load for testing of a suspended working platform should be 150 per cent of the safe working load.
- 8.3.3.4 The proof load for testing of a rope, chain or lifting gear should be at least twice the safe working load.
- 8.3.3.5 Where a wire rope is tested, a sample of the rope should be tested to destruction, and the safe working load should not exceed 1/8 of the breaking load of the sample tested.
- 8.3.3.6 Overload device function test should be carried out in accordance with the manufacturer's instruction. The amount of overload used should be in line with the manufacturer's recommendation.
- 8.3.3.7 A drop test should be carried out at the safe working load on every suspended working platform to test that the automatic safety devices are capable of stopping and holding the load at the slope of the working platform specified by the manufacturer.
- 8.3.3.8 Proof load test, overload device function test and operational test should be conducted at or near ground or landing level. Before conducting the tests, a thorough examination should be carried out by the competent examiner to ensure that no defective parts, malfunction of devices or loose components are present in the suspended working platform.
- 8.3.3.9 After the proof load test, drop test, overload device function test and operational test, the suspended working platform should be thoroughly examined by the competent examiner to ensure the safe working order of the suspended working platform. The thorough examination should include those items as stated in clause 8.2.
- 8.3.3.10 When conducting the tests, the area under which the test is to be carried out should be cleared of all persons. No person is allowed to remain on the working platform during the tests.

## 8.4 Display and Keeping of Certificate

- 8.4.1 The certificates or reports in respect of any thorough examination or load test and thorough examination should be kept in a safe place for a period of 3 years after the date the owner of the suspended working platform received the certificates or reports (regulation 25(1) of the SWPR).
- 8.4.2 A most recent certificate or report should be prominently displayed on the suspended working platform (regulation 25(2) of the SWPR).
- 8.4.3 If the suspended working platform is taken out of use, the most recent certificates or reports should be kept in a safe place for a period of at least 2 years after the date on which it was taken out of use (regulation 25(3) of the SWPR).



## **9. Information for Use**

### **9.1 General**

There should be sufficient information provided on a suspended working platform for the use of any personnel in managing, operating, maintaining and examining and testing the suspended working platform. The information includes:

- (a) name and address of the manufacturer;
- (b) designation of series or type;
- (c) serial number;
- (d) year of construction;
- (e) diameter of wire rope;
- (f) power supply information; and
- (g) rated load of the working platform and maximum number of persons.

### **9.2 Documentation**

9.2.1 There should be an operation and maintenance manual of a suspended working platform made available for use of any personnel involved in the managing, operating, erecting and dismantling, and maintaining of the suspended working platform. The manual should be in English and Chinese and should contain the following information:

- (a) clear instructions for safe use and operation;
- (b) clear instructions for procedure to be followed in case of malfunction of the suspended working platform; and
- (c) information relating to the use of the suspended working platform.

9.2.2 The instructions for safe use and malfunction of the suspended working platform should include the following:

- (a) a warning that the suspended working platform should only be used by a person who has received sufficient training to permit him to operate the suspended working platform safely;
- (b) the suspended working platform should not be used in adverse weather conditions and this instruction should contain advice on the limiting wind condition appropriate to the operation of the suspended working platform;

- (c) in case of a temporary suspended working platform, method of assembly and the safety precautions to note;
- (d) instructions concerning actions the operative must take if the secondary device is released;
- (e) instructions for fault identification such as malfunction in brake application, defect of hoisting wire rope, etc., and the remedial action to be taken for the safe landing of the suspended working platform;
- (f) in case where anchorage points are provided in the working platform for securing the lanyards of safety harnesses, a diagram of the working platform to show the position of the anchorage or fittings for such purpose;
- (g) safety precautions for hazardous trade processes to be carried out in the working platform such as welding or use of flammable substance; and
- (h) procedure for the 'out of service' position .

9.2.3 The information relating to the use of the suspended working platform should include the following:

- (a) description of manual controls;
- (b) means for stopping and emergency stopping;
- (c) description of how to operate the no-power descent and the automatic safety device;
- (d) nature and frequency of inspections;
- (e) in case of a temporary suspended working platform, a plan to show the requirement and method of anchorage and its erection and dismantling procedure; and
- (f) drawings and diagrams enabling maintenance personnel to carry the on-site maintenance, periodic maintenance and preventive maintenance.

## List of reference

1. British Standard BS 6037 : 1990 — Code of Practice for permanently installed suspended access equipment.
2. British Standard BS 2830 : 1994 — Specification for suspended access equipment (suspended chairs, traditional seats, work cages, cradles and platforms) for use in the building, engineering construction, steeplejack and cleaning industries.
3. British Standard BS 5974 : 1990 — Code of Practice for temporarily installed suspended scaffolds and access equipment.
4. Singapore Standard CP 20 : 1981 — Code of Practice for suspended scaffolding.
5. Ministry of Labour, Republic of Singapore : Code of Practice for examination and test of suspended scaffolds for approved persons.
6. Code of Practice on wind effects Hong Kong 1983 by the Building Authority, Hong Kong.
7. The Factories and Industrial Undertakings (Suspended Working Platforms) Regulation, Cap 59.
8. American National Standard ANSI A120.1-1970 : Safety requirements for powered platforms for exterior building maintenance.
9. American National Standard ANSI A10.8-1988 — Scaffolding safety requirements.
10. Draft for Public Comment prEN 1808: 1995 — Specification for the safety requirements of suspended access equipment.
11. British Standard BS EN 361 : 1993 — Personal protective equipment against falls from a height - full body harnesses.
12. British Standard BS EN 795 : 1997 — Protection against falls from a height - anchor devices - requirements and testing.
13. Technical guideline on safety standards in installing transportable gondola by Japan's Ministry of Labour.

14. Guidance note on classification and use of safety belts and their anchorage systems by Labour Department, HKSAR.
15. Code of Practice of the structural use of steel 1987 by the Building Authority, Hong Kong.

## **ENQUIRY**

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If you wish to enquire about this Code of Practice or require advice on occupational safety and health, you can contact the Occupational Safety and Health Branch through:

Telephone : 2559 2297 (auto-recording after office hours)

Fax : 2915 1410

E-mail : [enquiry@labour.gov.hk](mailto:enquiry@labour.gov.hk)

Information on the services offered by the Labour Department and on major labour legislation can also be found by visiting our Home Page on the Internet. Address of our Home Page is <http://www.labour.gov.hk/>.