Guidance Notes on the Inspection, Thorough Examination and Testing of Suspended Working Platforms

Occupational Safety and Health Branch
Labour Department

Occupational Safety & Health Council

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1. Introduction

1.1 This Guidance Notes (hereinafter referred to as GN) has been prepared to provide practical guidance on the inspection, thorough examination and testing of suspended working platforms. The purpose is to ensure their safety and reliability as well as the safety of personnel involved in the inspection, thorough examination and testing.

1.2 This GN should be read by all concerned parties including owners of suspended working platforms, competent persons conducting inspections and competent examiners involved in thorough examinations and tests. It should be read in conjunction with relevant legislation, national/ international standards, codes of practice and manufacturer's instructions in order to ensure the quality of inspections, examinations and tests. Particular attention should be drawn to the requirements of the Factories and Industrial Undertakings (Suspended Working Platforms) Regulation (hereinafter referred as the SWPR) and the Code of Practice for Safe Use and Operation of Suspended Working Platforms (hereinafter referred as the Code of Practice).

1.3 Past investigations into failures of suspended working platforms have indicated that certain important components were not receiving proper attention when thorough examinations and tests were carried out. The guidance is therefore also intended to remind:

- persons responsible for making arrangements for inspection, thorough examination and testing,
- competent persons carrying out inspection, and
- competent examiners carrying out thorough examination and testing,

of the need to pay particular attention to such components. To ensure the continued safe use of suspended working platforms, it should be borne in mind that the design and construction of most suspended working platforms may require certain components to be dismantled for determining their conditions.

1.4 Not every suspended working platform would have the same design and construction. Items/components laid down in this guidance may not be all applicable to a particular suspended working platform. Nor should the guidance be regarded as exhaustive. It is therefore important to note that the guidance should not limit the scope of a competent person or competent examiner in his assessment to the conditions of the suspended working platform.

1.5 Suspended working platforms should be taken out of use whilst inspection, thorough examination or testing is being carried out. Suitable preventive measures should also be taken to prevent unauthorized persons from gaining access to the affected suspended working platform. A safe system of work should be formulated, agreed and followed by all personnel associated with each of these operations.

2. Definition

For the purpose of this GN, the following definitions apply:

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

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 for Labour; 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 the SWPR).

As at the date of this GN, Mechanical Engineering and Marine & Naval Architecture are the disciplines specified by the Commissioner for Labour.

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 the SWPR).

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 the 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.

Dynamic test

A test during which the suspended working platform is operated under a loaded condition with account being taken of the dynamic effect for the purpose of verifying the proper functioning of the mechanisms, components and safety features.

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 the 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 the SWPR).

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 the contractor who has control over the way any construction work which involves the use of the suspended working platform is carried out and, in the case of a construction site, includes the contractor responsible for the construction site (Regulation 3(1) of the SWPR).

A contractor is responsible for a construction site if he is undertaking construction work there or, where there is more than one contractor undertaking construction work at the site, if he is the principal contractor undertaking construction work there (Regulation 3(2) of the 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.

Reeler

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

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 (SWL)

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 the 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.

Static test

A test during which the suspended working platform is first inspected and then subjected to a load corresponding to the working load limit (WLL) multiplied by the appropriate test coefficient. It is then re-inspected after the said load has been removed to ensure no damage has occurred.

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 the SWPR).

Suspension rope

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

Winch

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

Working load limit (WLL)

Maximum load which the hoisting equipment of the suspended working platform is authorized to sustain as designed by the manufacturer. The WLL is specified by the manufacturer.

3. Legal Requirements for Inspection, Testing and Examination

3.1 Objective of Inspection, Testing and Examination

3.1.1 The safety and reliability of a suspended working platform is primarily dependent on the integrity of its design, construction and maintenance. To ensure the suspended working platform has the required integrity, inspections, examinations and tests must be carried out periodically and under certain conditions as prescribed by the SWPR so that it can safely be used throughout its lifetime.

3.2 Inspection

3.2.1 Prior to commencement of daily work, all the suspension ropes and safety ropes shall be inspected by a competent person to ensure that they are in safe working condition. (Regulation 19(2) of the SWPR)

3.2.2 Every suspended working platform shall be inspected in the immediately preceding 7 days before its use by a competent person. The result stating whether it is in safe working order shall be entered into an approved form (Form 1) by the competent person. (Regulation 19(1) of the SWPR)

3.3 Thorough Examination

3.3.1 Every suspended working platform shall be thoroughly examined by a competent examiner in the immediately preceding 6 months before it is put into use. A certificate in an approved form (Form 2) stating that the suspended working platform is in safe working order shall be obtained from the competent examiner after the examination. (Regulation 20(1) of the SWPR)

3.4 Test and Thorough Examination

3.4.1 Every suspended working platform shall be load tested and thoroughly examined by a competent examiner during the immediately preceding 12 months before its use. A certificate in an approved form (Form 3) stating that the suspended working platform is in safe working order shall be obtained from the competent examiner after the examination. (Regulation 20(2) of the SWPR)

3.4.2 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:

- substantial repair;
- re-erection, including erection following its removal to a different location;
- 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
- failure or collapse.

A certificate in an approved form (Form 3) stating that the suspended working platform is in safe working order shall be obtained from the competent examiner after the examination. (Regulation 20(3) of the SWPR)

3.5 Remark

3.5.1 For those suspended working platforms installed in workplaces other than industrial undertakings, it is important to note that similar standards of inspection, examination and testing shall also be applied though they are not subjected to the specific regulations above. Alternately, they are subjected to the Occupational Safety and Health Ordinance (Chapter 509) under which every employer is placed with the responsibility to ensure the safety and health at work of all his employees including the provision and maintenance of safe plant and systems of work.

4. Inspection

4.1 Importance of Inspection

4.1.1 Inspection plays a very important role in the maintenance programme of suspended working platforms as it provides a useful means of detecting potential hazards which could contribute to accidents. Regular inspection can also forewarn of necessary preventive maintenance or repair, the lack of which can lead to serious deterioration and expensive replacement or repair charges.

4.1.2 Inspection is a careful check on the state and working order of the components/parts requiring attention. The purpose is to determine whether a suspended working platform can continue to be used safely. Special attention should therefore be drawn to particular areas where wear, maladjustment, dislocation, etc may be anticipated so that remedial actions can be taken before a critical condition exists.

4.1.3 Most manufacturers have recommended the intervals for certain items/components to be inspected. Usually, items/components having a direct bearing on the safety of a suspended working platform are required to be inspected daily. Weekly or more frequent inspection covering all items/components (this can be done without dismantling as far as possible) is also required. Some manufacturers may also require certain components to be dismantled for inspection after a specific period of time or number of working cycles. It is therefore important that a proper maintenance programme should be formulated. Besides, the use of inspection checklists should also be adopted in ensuring that all items/components requiring proper attention are not missed out during the checking process.

4.1.4 The following inspection guidance is intended to remind competent persons in carrying out inspection of the need to pay particular attention to the signs of defect or malfunction commonly anticipated on suspended working platform. Not every suspended working platforms has the same design and construction, it is strongly recommended that a proper inspection procedure, by making reference to this guidance and paying due regard to the manufacturer's instructions, should be devised.

4.1.5 It is important to note that, as a normal and safe practice, an inspection should consist physical examination of the components/parts as well as the functional/operational tests on the motion mechanisms, safety devices, etc.

4.2 Weekly Inspection

4.2.1 This is a statutory requirement for a suspended working platform to be inspected within the preceding 7 days prior to use by a competent person. In fact, nearly in every preventive maintenance schedule, weekly inspection is recommended under the manufacturer's instruction and maintenance manual.

4.2.2 The coverage of a weekly inspection should be as broad as possible. Reference should be made to the manufacturer's instruction and maintenance manual, and, if necessary, the professional advice from the manufacturer should be sought before determining the inspection items.

4.2.3 **In general, a weekly inspection should cover but not limited to the following items, if applicable:**

(a) *Electrical System and Components*

The following electrical components of the suspended working platform should be visually checked to ensure that they are properly protected and without any patent defect:

- earth wiring at the source of electricity supply;
- connections to the source of electricity supply;
- electrical cables/wiring;
- electric motors;
- control panel; and
- push buttons, emergency stop buttons, selector switches, etc.

(b) *Lifelines and Safety Belts*

All lifelines should be checked to ensure that they are properly and independently secured to permanent structures of the building and that they do not pass over sharp edges. The lifelines should also be checked for the presence of any signs of excessive wear and tear, deformation or distortion.

Safety belts/safety harnesses together with their arresting devices should be checked to ensure that they are in good condition.

(c) *Anchorage and Support*

Every component for fixing or anchoring the suspended working platform including roof fixing should be checked to ensure that they are in proper position, securely tightened and in good condition. Typical components requiring attention include:

- holding-down bolts;
- bolts and nuts;
- tie-back ropes;
- tie-bars;
- tying in rope;
- turn-buckles;
- bracings/ledgers; and
- stiffeners/paddings.

The structure for supporting the suspended working platform should also be checked to see whether there are any visual cracks, deformation, corrosion or dislocation. The structure usually comes under one of the following categories:

- luffing/telescoping jibs;
- davit arms;
- monorail;
- outriggers;

- counterweighted suspension beams;
- parapet clamps; and
- parapet hooks, etc.

Where the suspended working platform is counterbalanced by counterweights, it is important to ensure that there are sufficient counterweights and they are in proper position.

(d) *Wire Ropes*

Every wire rope should be checked for the presence of any signs of wear and tear, kinks, distortion, abrasion, flattening, strand nicking or corrosion, etc. It should also be checked to ensure that its end is properly finished and is sufficiently long.

The suspension wire rope or safety wire rope shall be immediately discarded and replaced under any of the following conditions:

- in any length of 10 diameters, the total number of visible broken wires exceeds 5 % of the total number of wires in the rope;
- there is any kink or distortion in the rope; or
- there is on the ropes marked signs of wear or corrosion.

(e) *Wire Rope Termination*

The end fastenings of the wire rope such as thimble eye splice, wedge type sockets, ferrule-secured eye terminations and wire rope clips should be checked to ensure that they are free from excessive wear and tear, deformation, corrosion, cracks, rope damage or looseness.

Particular attention should also be paid to:

- whether there are broken wires or deformation of the wire rope protruding from a termination; and
- whether there is excessive protrusion on the socket, which may be an indication of cracks being developed.

(f) *Working Platform*

The structural components of the working platform should be checked for any signs of excessive wear and tear, corrosion, deformation, visual cracks or dislocation. Care should be taken to ensure that there is no overloading and the platform itself including the safety notice board and relevant copies of test and examination certificates is kept in clean and tidy condition.

Typical items requiring attention include:

- main frame structure;
- guard rails and toe-boards;
- welded joints;
- bolt & nut sets;
- wire rope restraint pins;
- rubber wall rollers or similar devices;
- safety notice board; and
- relevant copies of test and examination certificates, etc.

(g) *Drums, Winches and Pulleys*

The rope bearing surfaces of drums, winches, pulleys, sheaves and rollers should be checked for the presence of any excessive wear, scoring, undersized groove, deformation or cracks. Pulleys and rollers should, as far as reasonably practicable, be checked to ensure that they are free to rotate. Attention should also be paid to the rope winding condition on the drums and the condition of coiling aids (if applicable) to ensure no looseness, misalignment, cross-coiling or uneven winding. The rope anchorage should also be checked for any looseness or corrosion.

Typical components requiring attention include:

- drums;
- pulleys;

- rollers;
- wire ropes;
- rope guides; and
- rope anchorage.

(h) *Power Transmission Mechanism*

The components of the power transmission mechanism should be checked to ensure that there is no excessive wear and tear, dislocation, leakage of lubrication, visual cracks or corrosion, etc. Lubrication on these components should be applied when necessary. Typical power transmission components requiring attention are as follows:

- shaft;
- gears/gear box;
- chain and sprocket wheel; and
- belt and pulley.

(i) *Climber*

Every climber should be checked to ensure that there is no deformation, leakage of lubrication or excessive wear. The connections to the working platform should be free from any dislocation, looseness or cracks. The wire rope inlet to the sheave groove of every climber should be checked to ensure that there is no foreign object or loose material. The whole sheave groove should be checked for the presence of excessive wear, deformation or cracks.

(j) *Other safety devices*

Safety devices such as overload detection devices or secondary brakes should be checked to ensure that their components are in position and without any patent defect.

(k) *Functional / Operational Tests*

Having physically inspected the components of the suspended working platform, the competent person should check for any obstructions along the travel of the platform and the roof car, if applicable. Functional/operational test on the following items should then be proceeded with in accordance with the manufacturer's instruction.

- all mechanisms involving the lifting, lowering, slewing, transversing, luffing and telescoping;
- the service brake;
- the emergency stop;
- the manual descend facility;
- the communication system;
- the wire rope reeler;
- all limit switches (such as top limit switch and low limit trip-bar, etc);
- other safety devices such as anti-tilt devices; and
- the automatic safety devices (usually provided on temporary suspended working platforms).

During the functional/operational test, special attention should be paid to the smooth running of the moving parts and the noise given out therefrom particularly that from the gearbox.

For the functional/operational test of each automatic safety device, it is important to note that a tilt test should be conducted to ensure that the maximum inclination of 1:4 (i.e. 14 degrees to the horizontal) is not exceeded.

4.3 Daily Inspection

4.3.1 In addition to the weekly inspection, all the suspension ropes and safety ropes are required under the SWPR to be inspected by a competent person prior to commencement of daily work.

4.3.2 To ensure the continued safe use of the suspended working platform, it is strongly recommended that at the beginning of each shift or working day, a competent person (or the operator, if competent for the purpose) should carry out an inspection on other components having a direct bearing on the safety of the suspended working platform as well. Typical areas requiring attention should include the following:

- electrical system and components;
- lifelines and safety belts;
- anchorage and support;
- wire ropes; and
- functional/operational tests.

Detailed inspection process of each of these areas should be the same as that for weekly inspection. Please refer to sub-paragraph 4.2.3.

4.4 Other Regular Inspection

4.4.1 In many cases, manufacturers also require other regular inspections such as inspection after a certain number of working cycles, monthly/quarterly inspections on some components. Typical example is the clearance between the brake discs and linings. These inspections are intended to determine the need for repair or replacement of parts as required to maintain suspended working platforms in serviceable condition insofar as safety is concerned. Reference should be made to the manufacturers' instruction and maintenance manuals.

4.5 Competence of Person Engaged in Inspection

4.5.1 Inspection of suspended working platforms shall be carried out by a competent person who normally should be a mechanic or may be an operator if he is competent for the purpose. A competent person is regarded as competent if he is well trained and possesses adequate knowledge and practical experience in handling the similar type of

suspended working platform. He should be able to detect and assess defects and potential hazards that could limit the safe performance of the suspended working platforms. As he is usually required to operate the suspended working platform during the inspection, he should therefore hold a valid certificate under the SWPR.

4.5.2 A competent person should be fully familiar with and apply the following aspects of knowledge and skill:

- the operation or use of the suspended working platform that he inspects;
- the location and function of safety devices, master switches, on-off switches;
- the safety rules, precautions, servicing and overhaul requirements, and limitations as defined in the instruction and maintenance manual of the suspended working platform that he inspects;
- the content and application of the SWPR;
- the content and application of the Code of Practice;
- the skill of using hand tools, machine tools, measuring instrument and testing devices to conduct simple functional checks;
- the maintenance record of the suspended working platform that he inspects; and
- the safe system of work to take care of himself and of other persons working with him during the inspection.

4.6 Report by Competent Person

4.6.1 The use of an inspection checklist is strongly recommended for carrying out the inspection of the suspended working platform. A checklist, clearly listing out all inspection items, definitely systematizes and facilitates the inspection work.

4.6.2 It is mandatory that the owner of a suspended working platform shall keep records of maintenance. A log book, among other things, is strongly recommended so that the competent person can record all defects and comprehensive findings noted during the inspection, and details of all modifications, repairs and maintenance. The logbook should bear the suspended working platform's brand name, model, serial number and year of manufacture, etc.

4.6.3 The competent person shall issue a certificate in the approved form (Form 1) to record the state of a suspended working platform after the weekly inspection. A statement whether the suspended working platform is in safe working order shall be entered. (Regulation 19(1) of the SWPR) He should deliver the certificate to the owner of the suspended working platform as soon as possible.

4.6.4 The owner and/or the person in control of the suspended working platform should be notified as soon as possible if it was found not in safe working order. This will facilitate appropriate action can be taken to repair or replace the suspended working platform. The potentially dangerous suspended working platform should also be withdrawn from use immediately. A warning notice should be attached to the suspended working platform as well.

5 Test and Thorough Examination

5.1 Coverage of Test and Thorough Examination

5.1.1 Every suspended working platform shall be load tested and thoroughly examined by a competent examiner within certain period or under certain specified conditions as prescribed under the SWPR. The objective of such a 'test and examination' is to ensure the suspended working platform so tested and examined is of good design, good mechanical construction, made of strong and sound materials, free from any defect, in the correct configuration and condition in accordance with the manufacturer's instruction and maintenance manual, and to demonstrate that it is structurally sound and fit for its intended use.

5.1.2 The following paragraphs give advice for different parts of suspended working platforms and recommendations on how 'test and examination' should be carried out. It should be noted that the advice given is not exhaustive and is not intended to relieve a competent examiner of his statutory responsibilities for the thoroughness of his examination.

5.1.3 Thorough examination includes detailed physical examination of the state of individual items/components and operational/functional tests to check the functions of various operating and safety systems of the suspended working platform. The purpose is to identify any problems that are likely to affect the integrity. The physical examination is usually facilitated by hammer test so that concealed defects can be revealed and physical measurement so that dimensional tolerances and configuration are within the limits as specified in the manufacturer's specifications or relevant standards.

5.1.4 A 'test and thorough examination' is basically composed of the following steps:

- verification of the design and construction;
- examination and testing of the electric system and components;
- physical examination of mechanical components/parts;
- functional/operational testing; and
- re-examination.

5.2 Verification of Design and Construction

5.2.1 Before the actual 'test and thorough examination' is carried out on a suspended working platform, sufficient information and documents should be made available for the use of the competent examiner so as to ensure the design, construction and assembly of the complete installation as well as individual items/components are in accordance with the manufacturer's specifications and the Code of Practice. The information and documents should include:

- the manufacturer's instruction and maintenance manual;
- the maintenance records;
- accident record;
- test certificates (destruction tests or overload tests) for each type of wire ropes (including rope terminations and tying in wires), chain, lifting gear and safety devices incorporated if they have been separately tested elsewhere due to the impracticability of testing on site; and
- test certificates (type tests) for the components/parts of the suspended working platform.

5.2.2 It should be noted that the following documents, if they have not been included in the manufacturer's instruction and maintenance manual, should also be obtained:

- drawings showing the dimensions of the main components of the suspended working platform;
- information on the materials used;
- information about the capabilities of the main components of the suspended working platform;
- information on instructions for verification of the installation or assembly before use; and
- circuit diagrams.

5.3 Examination and Testing of Electrical System & Components

5.3.1 As far as reasonably practicable, thorough examination on the electrical system and components should be carried out first so as to ensure the suspended working platform is electrically safe for further examination/test. It should be noted that physical examination and electrical testing should be carried out by a registered electrical worker registered under the Electricity Ordinance (Cap. 406) to ensure that:

- the installation is properly protected from earth fault, short circuit and electrical overloading;
- the connection to the source of electricity supply is proper and safe;
- the electrical parts and the electric cables/wiring are in good order; and
- the electric cables/wiring are properly laid and protected against damages.

5.4 Physical Examination of Mechanical Components/Parts

5.4.1 A physical examination on the remaining parts/components of the suspended working platform should then be carried out and should include, but not limited to, the following, if applicable:

(a) *Anchorage and Support*

Every component for fixing or anchoring the suspended working platform such as holding-down bolts, tie-back ropes/beams, turn-buckles, bracings/ledgers and stiffeners/paddings including roof fixing should be thoroughly examined to ensure that they are in proper position, securely tightened and free from cracks, corrosion, excessive wear, dislocation or deformation.

It should be noted that bolts used for anchoring rails to the roof should have a minimum diameter of 16 mm.

The structure for supporting the suspended working platform such as luffing/telescoping jibs, davit arms, monorail, outriggers, parapet clamps and parapet hooks should also be checked to see whether there are any visual cracks, deformation, corrosion or dislocation.

Where the suspended working platform is counterbalanced by counterweights, it is important to ensure that there are sufficient counterweights and they are in proper and secured position. Loose materials such as sand or aggregates should not be used as counterweights. If the counterweights are portable, they should have their weights permanently and distinctly stamped, engraved or embossed on them. (Regulation 7(b) of the SWPR)

(b) *Working Platform*

Every structural member and joint of the working platform should be checked to ensure that it is free from wear, corrosion, visual cracks, bents or dislocation. Rubber wall rollers, safety locking pin and wire rope reeler, if provided, should also be checked to ensure they are properly connected to the platform and without defects. The platform should also be checked to ensure no projections or sharp edges which could cause injury.

It should also be verified that the following specific requirements are complied with:

- the working platform is at least 440 mm wide (Regulation 8(a) of the SWPR);
- except for the provision of drainage holes, the working platform is closely boarded, planked or plated (Regulation 8(b) of the SWPR). Any gap in the working platform does not exceed 6 mm in width;
- the working platform is 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 the SWPR); and

- the working platform is 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 the SWPR).

(c) *Wire Ropes & Rope Terminations*

(i) *Test Certificates*

There are certain test requirements concerning the wire ropes, lifting gear such as chains or shackles, and wire rope terminations. It is the duty of the competent examiner to ensure that they are tested in accordance with the Code of Practice. Where the above tests are not conducted at the test site on the day of test and thorough examination, the competent examiner should ensure that they have been tested properly and the test certificates are available for verification. He should also verify that the types of wire ropes used are those specified by the manufacturer. Besides, special attention should also be drawn to the recommended rope life assigned by the manufacturer.

(ii) *Condition of Wire Ropes*

Typical factors creating visible change in rope condition such as the number of broken wires and their position, surface wear, excessive stretching, inequality in rope tension, inequality in diameter and internal conditions such as internal corrosion should be examined in details. The competent examiner should decide the degree of wear that can be tolerated and the stage at which replacement becomes necessary. Besides, the wire rope must be discarded and immediately replaced when any of the following condition is revealed (Regulation 23 of the SWPR):

- in any length of 10 diameters, the total number of visible broken wires exceeds 5% of the total number of wires in the rope;

- there is any kink or distortion in the rope; or

- there is on the rope any marked sign of wear or corrosion.

Besides, the correct degree of lubrication should also be considered. Excessive lubrication should be immediately rectified as slip may occur between the rope and the traction sheave.

(iii) Condition of Rope Terminations

The competent examiner should ensure that the rope terminations or anchorages are fitted in accordance with the manufacturers' instructions. They should be closely examined for signs of deterioration or wear. The fitment of detachable terminations such as wedge sockets and grips should be checked for security and it should be noted that broken wires can occur at these terminations.

(d) *Drums, Winches and Pulleys*

Drums, winches, pulleys, sheaves and rollers should be examined for the presence of any excessive wear, scoring, undersized groove, deformation or cracks. Particular attention should be paid to the rope bearing surfaces. Measurement should be taken to ensure their pitch circle diameters are not less than 19 times the diameter of the rope. Pulleys and rollers should, as far as reasonably practicable, be checked to ensure that they are free to rotate. Attention should also be paid to the rope winding condition on the drums and the condition of coiling aids (if applicable) to ensure no looseness, misalignment, cross-coiling or uneven winding. The rope anchorage should also be checked for any looseness or corrosion.

(e) *Roof Trolley and Rail/Trackway*

The housing of the trolley unit should be examined for any signs of corrosion or damage. Attention should be paid to the guarding for the equipment or moving parts, and the protection bars for preventing feet being trapped, to ensure that they are in correct position and in good condition. The counterweights attaching to the trolley unit should be examined to ensure that they are in position and in good condition. The guide rollers/flanged wheels of the trolley unit should be examined for any signs of crack or deformation. The audible warning device if

provided should be checked to ensure that it is in good condition. The end stops to prevent the trolley unit leaving the rail/trackway should be examined to ensure that they are in position and in good condition. Particular attention should also be paid to the rails and their connection to the roof structure to ensure that they are free from wear, corrosion, visual cracks, bents or dislocation.

(f) *Power Transmission Mechanism*

The components of the power transmission mechanism such as shaft, gears, chain and sprocket wheel or belt and pulley should be examined to ensure that there is no excessive wear and tear, misalignment, dislocation, visual cracks or corrosion, etc. The lubrication condition on these components should be checked if applicable. Where the power transmission components are enclosed or concealed, the enclosure or cover should as far as practicable be removed so as to allow the condition to be rectified.

(g) *Primary Brake*

The brake linings or discs of the braking system should be examined to ensure there is no patent defect. Measurement should be taken to verify that they are within the limits as recommended by the manufacturer's specification.

(h) *Climbers*

Unless there are justifications and evidence to indicate that the drive chains or reduction gear are in good condition and free from excessive wear, ***opening up examination*** should be carried out as far as practicable. Physical measurement should then be conducted to verify that the drive chains or reduction gear are within the limits as recommended by the manufacturer's specification.

Every climber should be checked to ensure that there is no deformation or excessive wear. The connections to the working platform should be free from any dislocation, looseness or cracks. The wire rope inlet to the sheave groove of every climber should be checked to ensure that

there is no foreign object or loose material. The sheave groove should be checked for the presence of excessive wear, deformation or cracks.

(i) *Lifelines and Safety Belts*

All lifelines should be checked to ensure that they are properly and independently secured to permanent structures of the building and that they do not pass over sharp edges. The competent examiner should verify with the design and carry out a pull-out test on each structural anchor with an axial pull-out force of 5 kN to confirm the soundness of the fixing.

The lifelines should also be checked for the presence of any signs of excessive wear and tear, deformation or distortion. Safety belts/safety harnesses together with their arresting devices should be checked to ensure that they are in good condition.

5.5 Functional/Operational Testing

5.5.1 Having finished the physical examination of components/parts and there is no deficiency or irregularity, functional/operational testing should then be conducted. It is very important that **the working platform should be positioned as close as possible to the ground or landing level during the test.**

5.5.2 To ensure the reliability, accurate test weights should also be used. They should comply with the following requirements:

- weights of proven accuracy within +/- 1.0%;
- weights proven on a weighbridge, the weighbridge has been calibrated within the last 12 months;
- weights suspended from a calibrated weighing device, the weighing device has been calibrated within the last 12 months, and

- weights should be made up of concrete/metal blocks/plates, preferably with markings to show their actual weights. Under no circumstances should reinforcement bars, wooden planks or live load be used as test weights.

5.5.3 *No Load Functional/Operational Tests*

A no load test is conducted first before the suspended working platform is put into a loaded condition. This is an essential step to ensure the suspended working platform is basically sound to take up other functional tests under loaded conditions. In some cases, the physical examination of certain components/parts can only be conducted when the suspended working platform is put into operation. Typical examples are: the portion of wire ropes on the external wall for a temporary suspended platform; and the ropes and their bearing surfaces on the drums. It should be borne in mind that a functional/operational test with no load should be carried out first before riding on the suspended working platform for carrying out the physical examination.

The functional/operational test (with no load) should cover the following:

- all mechanisms involving the lifting, lowering, slewing, transversing, luffing and telescoping;
- the braking system;
- the emergency stop;
- the manual descend facility;
- the communication system;
- the wire rope reeler;
- limit switches (such as low limit trip-bar); and
- other safety devices such as anti-tilt devices.

It is important to ensure the operator assisting the functional/operational test shall hold a valid certificate under the SWPR.

5.5.4 Functional/Operational Tests of Other Safety Devices

(a) Secondary Brakes

It should be noted that every secondary brake should be tested before it is put into use for the first time and at intervals not exceeding 1 year thereafter. The test should be carried out with the secondary brake built into the suspended working platform. The competent examiner should ensure that the brake does operate at the rated overspeed and the distance of drop is less than 50 cm.

Reference should be made to the manufacturer's instruction and maintenance manual for the testing procedure including the amount of overload for the test.

Where proper testing cannot be performed on the test site, the initiating device of the secondary braking system should be removed and sent to a workshop where proper testing facilities are provided for testing. If the test is not conducted by the competent examiner himself, he should ensure that the test has been conducted by other registered professional engineer and a test certificate from him has been obtained. The competent examiner responsible for the overall examination and testing of the suspended working platform has a duty to ensure that the initiating device has been properly reinstalled.

(b) Automatic Safety Devices

It should be borne in mind that every automatic safety device, among other things, must have been designed to serve the following purposes:-

- supporting the working platform in time in case of the breaking of the corresponding suspension rope; and
- preventing the working platform from further tilting before it has tilted to an angle of 14° in case of a slow or rapid slippage of the corresponding suspension rope caused by the failure of the climber or winch.

A tilting test and a drop test should therefore be carried out:-

- During the tilting test, the competent examiner should ensure that the maximum inclination of 1:4 (i.e. 14 degrees to the horizontal) is not exceeded when each end of the working platform is lowered.
- It should be noted that every automatic safety device should be drop-tested before it is put into use for the first time and at intervals not exceeding 1 year thereafter unless it is of a sacrificial type. The test should be carried out with the automatic safety device built into the suspended working platform. The competent examiner should ensure that the distance of drop is less than 30 cm.

Reference should be made to the manufacturer's instruction and maintenance manual for the testing procedure including the amount of overload for the test.

Where proper testing cannot be performed on the test site, the whole suspended working platform or the automatic safety devices after being removed should be sent to a workshop where proper testing facilities are provided for testing. If the test is not conducted by the competent examiner himself, he should ensure that the test has been conducted by other registered professional engineer and a test certificate from him has been obtained. The competent examiner responsible for the overall examination and testing of the suspended working platform has a duty to ensure that the automatic safety devices been properly reinstalled.

Where the automatic safety devices are of sacrificial type, special attention should be paid to the manufacturer's instruction for testing and examining such type of automatic safety devices. It is also important for the competent examiner to ensure the type test certificate is still valid and the conditions and limitations specified by the manufacturer is being taken into consideration before he certifies the automatic safety devices to be in good working order.

(c) Overload Detection Devices

The tripping limit of overload detection devices may differ from one type of suspended working platform from the others. Reference should therefore be made to the manufacturer's instruction and maintenance manual in considering the amount of overload for the functional test.

5.5.5 *Overload Tests*

An overload test should then be conducted to demonstrate that the load bearing components as well as the suspended working platform as a whole are structurally sound and fit for the intended use.

If the overload test is assisted by an operator, it is recommended that he should be the same operator who has assisted the no load functional/operational test.

The overload test comprises a *dynamic test* for verifying the performance of various mechanisms/components and a *static test* for verifying the stability and structural integrity of the installation. It should be noted that the amount of proof load required for each of these dynamic/static tests may differ from one design to another. Reference should therefore be made to the manufacturer's specifications. In case such specifications have not been provided, the procedure below should be followed:

(a) Dynamic test

The suspended working platform should be subjected to a proof load of 110% of the working load limit (WLL). Functional/operational test on the following items should then be carried out:

- all mechanisms involving the lifting, lowering, slewing, transversing, luffing and telescoping;
- the service brake;
- the emergency stop; and
- the manual descend facility;

(b) Static test

After the above items are found to be functioning properly, the suspended working platform should be subjected to a proof load of 150% of the WLL for carrying out the static test. The suspended working platform should be loaded for 15 minutes. After the removal of the load, no load bearing components of the suspended working platform should fail, deform or weaken.

5.6 Re-examination

5.6.1 It is important to note that an examination shall be conducted after the overload test with an aim to check whether there are any cracking, deformation or loosening of or damage to structural connections developed during the test. The objective of this re-examination is to ensure that the suspended working platform will still be structurally sound and stable for safe use until the next cycle of test.

5.6.2 Adjustment and tuning of overload protection devices, safety devices and limiting switches may also be required during the re-examination. Reference should be made to the manufacturer's specifications. Further functional/operational tests should be conducted to verify the correct operation of the suspended working platform. The items to be included are:

- all mechanisms involving the lifting, lowering, slewing, transversing, luffing and telescoping;
- the service brake;
- the emergency stop; and
- the manual descend facility.

5.7 Report by Competent Examiners

5.7.1 A competent examiner shall deliver the certificates (Forms 2 & 3) or relevant report to the owner of a suspended working platform within 28

days after load testing and thoroughly examining it. (Regulation 21(1) of the SWPR)

5.7.2 Should the competent examiner discover that the suspended working platform cannot be used safely unless certain repairs are carried out, he shall immediately inform the owner and deliver a report to him, with a copy of that report to the Commissioner within 14 days. (Regulation 21(2) of the SWPR)

5.7.3 Where the competent examiner concludes that the suspended working platform is safe but will require repairs before the next certificate will be required, he shall note that fact on the certificate and shall send a copy of it to the Commissioner. (Regulation 21(3) of the SWPR)

6. Thorough Examination

6.1 Coverage of Thorough Examination

6.1.1 Every suspended working platform shall be further 'thoroughly examined' within 6 months after it has been 'tested and thoroughly examined' in accordance with Chapter 5, even if the suspended working platform is in serviceable and good condition. The purpose of such a thorough examination is to identify any problems that may have developed since the last 'test and thorough examination' and are likely to affect the integrity, and to ensure the continued safe use of the suspended working platform before the next 'test and thorough examination'. The process of a 'thorough examination' is basically the same as that of a 'test and thorough examination, except that overload test and its subsequent re-examination is normally not required. In other words, a 'thorough examination' is basically composed of the following steps:

- verification of the design and construction;
- examination and testing of the electric system and components;
- physical examination of mechanical components/parts; and
- testing of various functions.

6.1.2 However, it should be borne in mind that whenever the suspended working platform is required to be overloaded during the thorough examination (such as a drop test or an overload detection device functional test is being performed), re-examination shall be conducted thereafter.

6.1.3 It is not uncommon that a competent examiner would prefer the carrying out of the overload test and re-examination as well, particularly for those suspended working platforms used in connection with construction work. The competent examiner should exercise his professional judgement to decide whether such overload test and re-examination are also required after the 'thorough examination' for the purpose of ensuring the suspended working platform is structurally sound and fit for its continued safe use before the next 'test and thorough examination'.

6.2 Report by Competent Examiners

6.2.1 A competent examiner shall deliver the certificate (Form 2) or relevant report to the owner of a suspended working platform within 28 days after thoroughly examining it. (Regulation 21(1) of the SWPR).

6.2.2 Should the competent examiner discover that the suspended working platform cannot be used safely unless certain repairs are carried out, he shall immediately inform the owner and deliver a report to him, with a copy of that report to the Commissioner, within 14 days. (Regulation 21(2) of the SWPR)

6.2.3 Where the competent examiner concludes that the suspended working platform is safe but will require repairs before the next certificate will be required, he shall note that fact on the certificate and shall send a copy of it to the Commissioner. (Regulation 21(3) of the SWPR)

7. Safe System of Work for Inspection, Thorough Examination and Testing

7.1 Elements of Safe System of Work

7.1.1 A safe system of work should be developed for ensuring the safety of personnel engaged in the job in addition to the carrying out of a good quality and accurate inspection, examination or test. The safe system of work should have all aspects of risk assessment, control measures, implementation and monitoring documented. This can provide a systematic and effective approach to ensure the safety of personnel as well as the reliability of the suspended working platform being inspected, examined or tested. The safe system of work should be worked out under the advice of a registered safety officer. Careful consideration should be given to the following elements:

- test site conditions;
- weather conditions;
- procedure and safety precautions ;
- competence of operator engaged in examination or test;
- use of information;
- emergency procedure; and
- administration of the safe system of work.

7.2 Test Site Conditions

7.2.1 When a suspended working platform is to be examined or tested in a workplace or inside a workshop, due consideration should be given to the condition of the site or premises where examinations or tests are to be conducted. Whenever possible, the suspended working platform should be examined and tested in a fenced off area or workshop where no other work activities are concurrently carried out and is cleared of other persons not involved. Notices prohibiting unauthorized entry should be posted.

7.2.2 The structure for supporting the suspended working platform should be structurally stable, and capable of withstanding the loads that would be applied to it. Care should be taken to ensure that the points of suspension are 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 surface or structure when testing of a suspended working platform is being conducted. The location where the test or examination is conducted should be of sufficient area and free from any obstruction to allow the unobstructed movement of the suspended working platform throughout the test or examination. During the load test or tilt test, the load should be kept close to the ground or the lowest landing level. Test personnel should be so positioned that they are unlikely to be injured should there be any mishap.

7.3 Weather Conditions

7.3.1 When a rainstorm, thunderstorm or strong wind warning signal is issued, inspection, examination or testing should not be carried out. Heavy rain or strong wind can impose significant load to the suspended working platform and may affect the visibility while lightening would endanger the personnel involved. Gusty wind may introduce an additional adverse effect on the stability of the suspended working platform and accident may happen to the personnel involved in the inspection, examination or testing. It should be noted that special safety precautions should be devised if inspection, examination and testing in such weather conditions could not be avoided. The limitation on wind speed for testing the suspended working platform should be obtained from the manufacturer.

7.4 Procedure and Safety Precautions

7.4.1 A proper procedure should be worked out to clearly define the sequence of inspection, examination or testing of a suspended working platform. The roles and responsibilities of individuals should be properly defined and clearly spelled out. It is important to note down all safety precautions from relevant codes of practice,

national/international standards and the manufacturer's instruction and maintenance manual, and if appropriate, incorporate them into the safe system of work. The proper procedure and safety precautions to manually handle heavy test weights should be addressed. As it usually involves working at height, relevant safety measures to prevent fall of persons should be adopted, including the provision of safe access and egress and personal protective equipment such as independent lifelines and safety harnesses, etc.

7.4.2 A briefing session to explain and highlight the procedure and precautions should be conducted before an actual load test or examination is carried out to ensure that every personnel is fully familiar with this topic.

7.5 Competence of Operator Engaged in Inspection, Examination or Test

7.5.1 The safe system of work should specify the competence of the operator who is engaged in inspection, examination or testing work. The operator should be familiar with the characteristics of the suspended working platform, the safety precautions to be adopted and the limitation of the suspended working platform for testing. He should be able to put the suspended working platform under control at any time during the inspection, examination or testing work.

7.5.2 The operator should hold a relevant certificate as required under the SWPR to qualify him in operating the suspended working platform. He should have a thorough understanding on the communication system with the competent examiner in operating the suspended working platform. If he is required to carry out examination and testing on the electrical system or parts, he should be a registered electrical worker registered under the Electricity Ordinance (Cap. 406).

7.6 Use of Information

7.6.1 Well preparation to gain the suitable information for an inspection, test and thorough examination is the first important step for the job. It should be noted that most of the information is contained in the manufacturer's instruction and maintenance manual. Other information needed for the right job should include:

- the Code of Practice;
- maintenance records;
- accident record;
- test certificates (destructive tests or overload tests) for each type of wire ropes (including rope terminations and tying in wires), chain, lifting gear and safety devices incorporated if they have been separately tested elsewhere due to the impracticability of testing on site; and
- test certificates (type tests) for the components/parts of the suspended working platform.

7.6.2 The following information, if they have not been included in the manufacturer's instruction and maintenance manual, should also be provided:

- drawings showing the dimensions of the main components of the suspended working platform;
- information on the materials used;
- information about the capabilities of the main components of the suspended working platform;
- information on instructions for verification of the installation or assembly before use;
- circuit diagrams; and
- the limitation on wind speed for overload testing.

7.7 Emergency Procedure

7.7.1 An emergency procedure should be developed and included in the safe system of work. The procedure should specify the equipment for handling malfunctioning of suspended working platforms and the assignment of personnel in charge of the emergency procedure. It is also important to secure medical assistance within the shortest possible time for medical treatment in case of a mishap.

7.8 Administration of the Safe System of Work

7.8.1 The safe system of work should be written in simple language. It should be passed to all personnel engaged in the inspection, examination or testing job. It should be properly executed and administered by a responsible person such as a registered safety officer, a competent examiner, a plant/factory manager or a site agent, who should also help to revise and update it from time to time to meet the demand of the industry.

References

1. Hong Kong Special Administrative Region
   The Factories and Industrial Undertakings (Suspended Working Platforms) Regulation, Chapter 59

2. Occupational Safety and Health Branch, Labour Department, Hong Kong Special Administrative Region
   Code of Practice for Safe Use and Operation of Suspended Working Platforms

3. Occupational Safety and Health Branch, Labour Department, Hong Kong Special Administrative Region
   Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems

4. American National Standard (ASME A120.1-1996)
   Safety requirements for powered platforms for building maintenance

5. Australian Standard (AS 1576.4-1991)
   Scaffolding
   Part 4: Suspended scaffolding

6. 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

7. British Standard (BS 5974:1990)
   Code of practice for Temporarily installed suspended scaffolds and access equipment

8. British Standard (BS 6037:1990)
   Code of practice for Permanently installed suspended access equipment

9. Canadian Standard (CAN/CSA-Z271-98)
   Safety Code for Suspended Elevating Platforms

10. European Standard (EN 1808: 1999)
Safety requirements on suspended access equipment –
Design calculations, stability criteria, construction - Tests

11. Health and Safety Executive, UK (Guidance Note GS 15)
General access scaffolds

12. Health and Safety Executive, UK (Guidance Note PM 30)
Suspended access equipment

13. Ministry of Labour, Republic of Singapore
Code of practice for Examination and test of suspended scaffolds for approved persons

14. National Association of Scaffolding Contractors, UK
Cradle riggers and users' guide to safe suspended platforms

15. Singapore Standard (CP 20:1999)
Code of practice for Suspended scaffolds

16. Suspended Access Equipment Manufacturers Association, UK
Guide to Permanent suspended access equipment, power or manually operated

17. Suspended Access Equipment Manufacturers Association, UK
Users' Guide to Temporary suspended access equipment

Useful Information

If you wish to enquire about this Guidance Notes or require advice on occupational safety and health, please contact the Occupational Safety and Health Branch of the Labour Department through:

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

Fax : 2915 1410

E-mail : enquiry@labour.gov.hk

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

Information on the services offered by the Occupational Safety and Health Council can also be obtained through hotline 2739 9000.

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