CODE OF PRACTICE FOR METAL SCAFFOLDING SAFETY

Occupational Safety and Health Branch
Labour Department

CODE OF PRACTICE

FOR

METAL SCAFFOLDING SAFETY

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

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1. Introduction

1.1 This Code of Practice for Metal Scaffolding Safety is issued by the Commissioner for Labour under Section 7A of the Factories and Industrial Undertakings Ordinance, Chapter 59. It provides practical guidance for the compliance with the requirements set out in Sections 6A & 6B of the Factories and Industrial Undertakings Ordinance and the requirements of the Construction Sites (Safety) Regulations regarding the safety in metal scaffolding. In this Code, metal scaffolding refers to scaffolding with metal components as structural skeleton. The advice contained in this Code should not be regarded as exhausting those matters that need to be covered by the relevant safety legislation. Compliance with this Code of Practice does not confer immunity from relevant legal requirements.

1.2 This Code of Practice has a special legal status. Although failure to observe any provision of this Code is not 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 the relevant safety and health legislation under the Factories and Industrial Undertakings Ordinance.

1.3 Metal scaffolding can be used for different purposes in different construction activities. In Hong Kong, it is commonly used as the supporting scaffolding in a falsework system. Collapse of falsework due to reasons such as insufficient strength to carry the imposed loads or inadequacy in design and construction frequently occurs and has inflicted heavy casualties to workers working on it. In order to prevent collapse of falsework on construction sites, this Code of Practice also highlights good practices that have frequently been overlooked.

1.4 Section 5 of this Code of Practice has given technical guidance that should be followed in respect of metal scaffolding safety. If in any special situation where such requirements need to be modified, the stability and strength of the scaffolds should be justified by recognized engineering principles and national/ international standards or provisions so that equal or even higher safety standards can be achieved.

1.5 The statutory provisions summarized or referred to in this Code of Practice are the provisions in force as at 1 January 2013.

2. Interpretation

Unless otherwise defined in this Code of Practice, the terms used in this Code of Practice have the same meaning as those in the Factories and Industrial Undertakings Ordinance and the Construction Sites (Safety) Regulations, and

2.1 'FIUO' is the abbreviation for the Factories and Industrial Undertakings Ordinance, Chapter 59.

2.2 'CSSR' is the abbreviation for the Construction Sites (Safety) Regulations, subsidiary legislation of the Factories and Industrial Undertakings Ordinance.

2.3 'competent person'

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

(a) appointed for that purpose by the contractor required by the CSSR to ensure that the duty is carried out by a competent person; and

(b) by reason of substantial training and practical experience, competent to perform the duty.

2.3.2 As a general guidance:

(a) **'*substantial training and practical experience*'** of a competent person in respect of metal scaffolding refers to a person

(i) who has satisfactorily completed a full-time formal training in metal scaffolding works organized by the Construction Industry Council Training Academy (CICTA) or other similar metal scaffolding training courses/programmes and possesses an experience of 4 years or more in metal scaffolding works (inclusive of experience under the formal training period); or

(ii) who has at least possessed a higher certificate in civil/structural engineering or other similar disciplines and has satisfactorily completed a metal scaffolding training course/programme organized by the CICTA or other similar metal scaffolding training courses/programmes and possesses an experience of 1 year or more in metal scaffolding works (inclusive of experience under the formal training period); or

(iii) who has satisfactorily passed the trade test on metal scaffolding of the CICTA and possesses an experience of 4 years or more in metal scaffolding works (inclusive of experience under the formal training period),

and has the ability to read and understand the scaffolding plan, design drawings, specifications and method statement of the scaffolding work in order to competently supervise the scaffolding work and certify that the scaffolding is in safe working order. He should also be capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary or hazardous to employees.

(b) A competent person should be appointed in writing and should have authorization to take prompt corrective measures to eliminate existing and predictable hazards mentioned above.

2.4 'trained workman'

A trained workman in respect of metal scaffolding refers to a scaffolder who is responsible for on-site erection, addition, alteration and dismantling of metal scaffold under the immediate supervision of a competent person, and has satisfactorily completed a formal training in metal scaffolding works equivalent to any of those mentioned for a competent person or has satisfactorily passed the intermediate trade test for metal scaffolder of the CICTA and possesses at least 1 year of experience in metal scaffolding works (inclusive of experience under the formal training period). This Code of Practice also recognizes scaffolders who are registered skilled, semi-skilled, skilled (provisional) or semi-skilled (provisional) workers under the Construction Workers Registration Ordinance (Cap. 583) for the trade of metal scaffolder as trained workmen.

2.5 'Form 5' is a form approved by the Commissioner for Labour for the purposes of Regulation 38F(1) of the CSSR. A sample of the form is at Appendix I.

2.6 'ladder' includes a folding step-ladder.

2.7 **'place of work'** means any place which is used by any person for the purposes of

(a) construction work; or

(b) any work activities arising from, or in connection with, construction work,

and includes any place to which such a person has access whilst at work.

2.8 A **'professional engineer'** means an engineer of structural or civil discipline. He should be a corporate member under the constitution of the Hong Kong Institution of Engineers or equivalent and should have adequate training and experience, and be able to justify how and why the scaffold he designed can safely resist the imposed loads in accordance with recognized engineering principles.

2.9 **'safety belt'** includes a safety harness.

2.10 **'scaffold'** means any temporarily provided structure on or from which persons perform work in connection with operations or works to which the CSSR apply, and any temporarily provided structure which enables persons to obtain access to or which enables materials to be taken to any place at which such work is performed, and includes any working platform, gangway, run, ladder or step-ladder (other than an independent ladder or step-ladder which does not form part of such a structure) together with any guard-rail, toe-board or other safeguards and all fixings, but does not include a lifting appliance or a structure used merely to support such an appliance or to support other plant or equipment.

3. Principal safety and health legislation relating to safe metal scaffolding in Hong Kong

The following is a summary of the statutory provisions in relation to safe metal scaffolding under the Factories and Industrial Undertakings Ordinance and its subsidiary legislation and the Occupational Safety and Health Ordinance. It is advisable to refer to the relevant Ordinances and regulations for full details of the statutory provisions summarized in this part or referred to in other parts of the Code.

3.1 General duties provisions under FIUO

Sections 6A and 6B of the Ordinance impose general duties on proprietors and persons employed with regard to the health and safety at work in industrial undertakings. In a construction site, these provisions do not only bind the principal contractor of the site. Subcontractors who are employers and who have management or control of construction activities within the site are also regarded as proprietors and are therefore bound by Section 6A. Besides, with regard to metal scaffolding works, workers using metal scaffolds and scaffolders, who are employed to work in the site are also bound by Section 6B.

3.1.1 Section 6A(1)

The general duties imposed on the proprietor of an industrial undertaking are to ensure, so far as is reasonably practicable, the health and safety at work of all persons employed by him at the industrial undertaking.

3.1.2 Section 6A(2)

These general duties extend to include five specific areas:

(a) The proprietor shall provide machinery, equipment, appliances and other plant that are, so far as is reasonably practicable, safe and without risks to health and must maintain them in that condition. He must also ensure that the systems of work are safe and without risks to health.

(b) The proprietor shall make adequate arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances.

(c) The proprietor shall provide such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of all persons employed by him. The information to be provided should include information about the hazards in the workplace and the necessary precautions to be adopted.

(d) The proprietor shall ensure that, so far as is reasonably practicable, any place of work under his control is kept safe and without risks to health. This requirement covers not only buildings, but also includes, for example, open sites and temporary structures such as scaffolds. The proprietor shall also ensure, so far as is reasonably practicable, the provision and maintenance of means of access to and egress from the workplace that are safe and without risks to health.

(e) The proprietor shall provide and maintain for all persons employed by him a working environment that is, so far as is reasonably practicable, safe and without risks to health.

3.1.3 Section 6B(1)

The general duties imposed on every person employed at an industrial undertaking while at work are as follows:

(a) The person employed shall take reasonable care for the safety and health of himself and of other persons who may be affected by his acts or omissions at work.

(b) Also, he shall co-operate with the proprietor or other persons so far as is necessary to enable them to perform or comply with the safety duties or requirements imposed on them by the Ordinance.

3.2 Construction Sites (Safety) Regulations

The CSSR are to protect workmen in the construction industry. These regulations lay down legal requirements to ensure the safety, health and welfare of workmen on construction sites. In respect of scaffolding safety, the contractors/workmen are subject to the requirements of the following regulations:

3.2.1 Regulations 38A and 38AA

These regulations specify general provisions for ensuring safety of places of work, safe means of access to and egress from places of work and that no person gains access to any place on the site where any hazardous conditions are present.

3.2.2 Regulation 38B

This regulation requires that adequate steps such as the provision, use and maintenance of working platforms, etc. shall be taken to prevent any person from falling from a height of 2 metres or more.

3.2.3 Regulation 38C

This regulation requires the provision of safe scaffolds, ladders, etc. and ensures their use where work cannot be safely done on or from the ground or from part of a permanent structure.

3.2.4 Regulation 38D

This regulation requires that all the scaffolds, ladders, etc. shall be so designed, constructed, maintained and every part thereof so securely supported or suspended as to ensure that they are stable. Besides, all such scaffolds, ladders, etc. shall be made of suitable and sound materials of sufficient strength.

3.2.5 Regulation 38E

This regulation requires that only trained workmen with adequate experience and under the supervision of a competent person shall erect, alter or dismantle scaffolds.

3.2.6 Regulation 38F

This regulation requires that a scaffold shall not be used unless it has been inspected by a competent person:

(a) before being taken into use for the first time;

(b) at regular intervals not exceeding 14 days immediately preceding each use of the scaffold;

(c) after any substantial addition, partial dismantling or other alteration, exposure to weather conditions likely to have affected its strength or stability or to have displaced any part,

and a report has been made by the person carrying out the inspection on Form 5, which includes a statement to the effect that the scaffold is in safe working order.

3.2.7 Regulation 38H

This regulation requires the use of safety nets and safety belts when it is impracticable to provide safe scaffolds.

3.2.8 Regulation 38I

This regulation requires that any workman who has been provided with a safety belt shall wear the safety belt and keep it attached to a secure anchorage.

3.2.9 Regulation 48

This regulation requires that suitable safety helmets shall be provided for every workman; and all reasonable steps shall be taken to ensure that no workman remains on site unless he is wearing a suitable safety helmet.

3.2.10 Regulation 49

This regulation requires that scaffolding materials and waste materials, tools and other objects, shall not be thrown, tipped or shot down from height. Where proper lowering by lifting appliances or gear is impracticable or demolition is being carried on, steps shall be taken to protect workmen from being hit by falling debris.

3.2.11 Regulation 52

This regulation requires that all platforms, gangways, etc. shall be kept clear of any loose materials that are not required for immediate use.

3.2.12 Third Schedule to the CSSR

This schedule relates to the protection of any person from falling from a height of 2 metres or more. (See Appendix II for details)

3.3 Issue of improvement notice and suspension notice under the Occupational Safety and Health Ordinance

3.3.1 Section 9

This section empowers the Commissioner to serve on an employer or an occupier of premises where a workplace is located an improvement notice requiring the rectification of contravention against safety legislation within a specified period.

3.3.2 Section 10

This section empowers the Commissioner to serve on an employer who is responsible for, or an occupier of, premises where a workplace is located a suspension notice requiring suspension of an activity or use of premises or of any plant or substance where there is an imminent risk of death or serious bodily injury.

4. Managing safety and health at metal scaffolding work

A safety management system and a safe system of work should be developed, implemented and maintained for the safety and health at work of workers. Further reference should be made to the Factories and Industrial Undertakings (Safety Management) Regulation. Among other things, the following actions should also be taken into account:

4.1 Design and initial planning

A construction project should be designed with safety in mind. This approach makes it possible to eliminate or minimize the work hazards by proper planning and design of the methods of construction, sequences of activities, coordination, etc.

4.1.1 During the design of a metal scaffold, attention should be paid in the following areas:

(a) The safe scaffold and its erection/alteration/dismantling for all different stages of construction should be designed and planned well beforehand.

(b) The safe method of scaffolding devised should be kept under continual review.

(c) The strength and stability of the scaffold throughout all stages of scaffolding should be ensured.

(d) The strength of scaffolding members such as tubes and couplers should be ensured. Reference should be made to the procedures laid down in relevant standards of the International Organization for Standardization or equivalent procedures for their sampling and mechanical testing.

(e) Realistic assessment of loadings on the scaffold at all work stages should be made. In considering the wind load on the scaffold, reference should be made to the Code of Practice on Wind Effects in Hong Kong, 2004 (Buildings Department).

(f) Safe access to and egress from the working places should be provided.

(g) Effective bonding system to earth should be provided to the scaffold.

(h) Additional features such as attachment points for ladders, working platforms, guard-rails and toe-boards should be provided for the protection of workers using the scaffold. Safety nets and safety belts should also be provided for the protection of scaffolders.

(i) Scaffolding components/materials/equipment should be handled, lifted, stored, stacked and transported safely.

(j) The time when the scaffold would be erected and dismantled should be decided in the design and planning stage. The scaffold should be dismantled as soon as it is no longer required to be used.

4.1.2 Specification for scaffolding contract document:

(a) Specification for scaffolding contract document should incorporate particular requirements and essential information for the scaffolding work to be planned and implemented safely. (For example, the provision of design drawings and method statement; phasing of work - particularly with other contractors; periodic maintenance and repair of scaffold.)

(b) Special requirements relating to compliance with safety legislation should be highlighted and, where appropriate, these items should be included in the Bills of Quantities.

(c) Depending on the size of the project and/or the complexity of the work involved, tenderers for the scaffolding work should be required to submit an outline scaffolding plan at tendering stage, giving sufficient information to demonstrate their intended safe system of work.

4.1.3 Coordination and communications:

(a) There should be close liaison between all relevant parties even at the design and planning stage.

(b) Effective lines and systems of communication should be devised for each stage of the scaffolding work and a person should be assigned to maintain effective communication.

4.1.4 Initial planning:

(a) Site considerations and risk assessment

Potentially hazardous site features and other aspects likely to impair safe scaffolding should be identified. The risk arising from each individual hazardous event should be evaluated according to its probability and consequence. The following special conditions of the site should be taken into account:

(i) The existence of overhead electric power lines.

(ii) The existence of overhead signboards or projections, particularly those in the urban areas.

(iii) The existence of buried services, including underground electric cables, gas or other fuel pipelines.

(iv) The existence of storage tanks.

(v) Restricted access to, and onto the site.

(vi) Restricted space for erection, manoeuvring, storage and, if required, for on-site pre-assembly or fabrication.

(vii) Low ground bearing pressures that may be due to, for example, made ground or existing underground services or structures.

(viii) The proximity and condition of other buildings and premises that may by itself or so-induced special wind effect (for example, funnelling effect) affect the planned method of scaffolding.

(ix) The shape and the structure of the building.

(x) The juxtaposition of the public and the site.

(xi) The activities of other contractors.

(xii) The existence of noxious gases, chemicals, fluids or dust emitted from processes on or around the site.

(xiii) The proximity of the site to seashore where the strength of the scaffolding may be affected by seawater.

(b) Preliminary method statement

The preparation of a preliminary method statement is an important part of planning for a safe system of work in scaffolding. Where appropriate, a preliminary method statement should include:

(i) the arrangements for coordination and the responsibilities and authority of supervisory personnel during scaffolding work;

(ii) the scaffolding sequences including erection and dismantling;

(iii) the methods of ensuring stability with due consideration of future construction activities (for example, trench work, external building services /facilities installation);

(iv) the detailed scaffolding work method which should ensure that the work could be carried out safely;

(v) the construction tolerance;

(vi) the assessed maximum allowable loading (includes vertical and lateral loads) on the scaffold/working platform;

(vii) the provisions to prevent falls from height, including safe means of access and egress and safe places of work;

(viii) the protection from falls of materials, tools and debris, and the provision of catch-fans and protective screens at the scaffold;

(ix) the provision of suitable plant, tools and equipment;

(x) the arrangements for delivery, stacking, storing and movement on site for scaffolding components, materials and equipment;

(xi) the details of site features, layout and access; and

(xii) the contingency arrangements.

4.2 Selection of subcontractor for metal scaffolding work

4.2.1 If a subcontractor is to be engaged in metal scaffolding work, whether he would make adequate provisions for safety and health should be an important selection consideration. Selection criteria should also include the ability of the subcontractor in providing a good scaffolding plan.

4.2.2 During the process of selection, the subcontractor should be required to submit an outline scaffolding plan, giving preliminary information to demonstrate the intended safe system of work. Depending on the complexity of the project, the outline scaffolding plan should briefly describe items such as safety organization, communication, monitoring, equipment, facilities, emergency procedures, accident reporting, and accident investigation procedures.

4.2.3 After the subcontractor has been appointed, he is required to finalize a detailed scaffolding plan on the basis of the outline scaffolding plan if any, for agreement in writing. The detailed scaffolding plan should spell out the ways and means to carry out work safely and effectively in order to fulfil the objective of protecting workmen at work. The detailed scaffolding plan should also be incorporated into the safety plan of the main project.

4.3 Site management and procedures

4.3.1 Managing for safe erection/alteration/dismantling

Safe working methods and practices on site should be ensured as follows:

(a) Preparation and use of a detailed method statement

The extent of detail in a detailed method statement will depend upon the size and/or complexity of the work, with a simple job requiring a simple method statement and repetitive tasks being covered by standard sheets. Preliminary method statement produced at the planning stage should be developed into a detailed method statement that should be incorporated into the detailed scaffolding plan. The whole method statement should be reviewed and updated as necessary so that it remains current. It should be distributed to all those concerned with the supervision of scaffolding work.

(b) Thorough and active contract coordination both on and off site

Coordination and liaison between parties should be maintained throughout the job. Any changes in previously agreed procedures must be verified by the person responsible for coordination as being safe before they are implemented. Matters that will contribute to safe scaffolding work on site, including the availability of information, plant and manpower, and the quality and supply of materials should also be coordinated.

(c) Implementation and maintenance of effective communications

To ensure that precautions for safe scaffolding outlined in the method statement are followed, lines of communication should be clearly designated, with the responsibility for implementing the method statement well defined.

(d) Contingency plan for adverse weather conditions

Weather conditions that could have an adverse effect on the scaffolding work such as rain, high wind, lightning or typhoon, and those causing poor visibility, such as fog, mist or glare should be constantly monitored.

If a decision is made to stop work, then measures should be taken to maintain the stability of the scaffold and the plant, equipment and works erected on the scaffold. Also, all personnel should be safely and efficiently evacuated from the scaffold. After the adverse weather, the scaffold should be inspected and certified in safe working order by a competent person and all the plant, equipment and works erected on the scaffold should be checked and confirmed to be in order before work is to be restarted.

(e) Provision of suitable staff

No scaffold shall be erected on the site or substantially added to, altered or dismantled except under the immediate supervision of a competent person and by trained workmen possessing adequate experience of such work (Regulation 38E of the CSSR). Training should be a continuing process with on-the-job instruction and formal training sessions provided as appropriate (refer to Section 4.6).

(f) Provision of protective equipment

Protective equipment that is necessary and appropriate for the work should be provided. Examples of protective equipment are: safety helmets, safety nets and safety belts with suitable anchorage.

4.3.2 Preparing the site and the work

(a) Plans and drawings should be checked for matters relating to scaffolding safety before work is to be started.

(b) The need to exclude other personnel from scaffolding areas when scaffolding work is in progress should be considered.

(c) Site inspection should be conducted to check the physical conditions, the hazards involved and other special features.

(d) The ground condition should be made firm, level and suitable.

(e) The maximum safe loading (includes vertical and lateral loads) imposed on the scaffold should be assessed, and strictly adhered to.

(f) The scaffolding members should be checked for their fitness before despatching to the site. Defective materials should be prohibited to be used and should be removed from site as soon as possible. During their stay on site pending for removal, they should be properly labelled to show that they are defective and should not be used.

(g) A suitable place should be provided at the site for storage of scaffolding members and the associated materials, tools or equipment. Also, they should be properly stacked and tied to prevent accidental displacement and collapse. The storage area should be clearly shown on the site plans.

(h) Documents such as scaffolding plan, method statement, design drawings and specifications of the scaffold, etc. should be made available to all parties concerned in good times.

4.4 Working places and access

4.4.1 Working platform of scaffold

(a) A method statement for construction of a working platform should be devised. Please refer to Section 4.3.1 (a) on method statement.

(b) Guard-rails and toe-boards shall be installed at edges where persons are liable to fall from height. The guard-rails shall have adequate strength and be securely fixed. The height of a top guard-rail shall be between 900mm and 1 150mm above the platform. The height of an intermediate guard-rail shall be between 450mm and 600mm above the platform. The height of a toe-board shall be not less than 200mm (Third Schedule to the CSSR).

4.4.2 Safety net

Provision of a workplace without risk of falling should always be the first consideration. However, if this is not practicable, safety nets and safety belts shall be used (Regulation 38H of the CSSR). Reference should be made to national/international standards or provisions for the standards of safety nets and safety belts.

4.4.3 Safety belt

In all the circumstances of the case, if it is impracticable to provide safety net, wearing of safety belt with effective anchorage system is required as the last resort for fall prevention (Regulation 38H of the CSSR). Further reference should be made to the Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems prepared by the Labour Department. It is strongly recommended that, when a choice of safety belt is possible, a safety harness incorporating buttock straps, as distinct from a general purpose safety belt, should be used.

4.4.4 Provision of catch-fan and protective screen

(a) At least a sloping catch-fan at not more than 15m vertical intervals to give a minimum horizontal projection coverage of 1 500mm should be provided. The sloping catch-fan should consist of timber boarding and a layer of galvanized metal sheeting, both of adequate thickness to capture and retain falling objects.

(b) A suitable receptacle should be provided within each catch-fan to trap falling objects. The weight of the receptacle should not affect the stability of the catch-fan.

(c) The sloping catch-fan and receptacle should remain in place until all works are completed.

(d) On the face of the scaffold, suitable protective screen of fire retardant material should be provided to confine falling objects. If tarpaulin is being used as protective screen, its fire retardant characteristic should meet the requirements of BS 5867-2:2008 (Type B performance requirements) or other equivalent national/ international standards or provisions.

4.5 Monitoring safety performance

4.5.1 Requirements on safety and health, particularly those relating to compliance with safety legislation, are advisable to be incorporated into the conditions of contract for engagement of subcontractor for metal scaffolding work or other subcontractors using the scaffold.

4.5.2 Regular records on the safety conditions of the scaffolding should be kept. Such records should consist of detailed information on work hazards, precautions taken, accident analysis and recommendations. These records should be constantly reviewed for hazard identification and improvement.

4.5.3 Workmen’s feedback on the safety conditions of the site should be encouraged and as far as possible documented.

4.5.4 A monitoring system should be developed, implemented and maintained on site for checking the safety performance of the subcontractor for metal scaffolding work or other subcontractors using the scaffold against the requirements mentioned in Section 4.5.1.

4.6 Training of metal scaffolders

4.6.1 The objective of training is to increase the efficiency of workers and to improve safety performance in erecting, altering, maintaining and dismantling scaffolds. The importance of ensuring that workers who erect, alter, maintain and dismantle scaffolds are fully competent is obvious, but the degree of skills which are required differ according to the duty to be performed. There is a great span of proficiency and experience required. Properly controlled training is therefore vital for safety and it would eventually attract a better type of man to make a career in the industry. Before training of the scaffolders is to be considered, they should be physically fit for the scaffolding work first.

4.6.2 Training of scaffolders needs to relate to basic site safety, familiarity with everyday hazards and the requirements for a safe place of work. In general, training for scaffolders should start at ground level, where basic skills can be acquired, and when scaffolders are proficient, using those skills at increasing height would be appropriate. Training should continue after basic skills have been acquired to ensure that scaffolders are familiar with improvements in techniques, the use of newly developed equipment/materials, and to ensure that safe methods of work continue to be used.

4.6.3 When a new scaffolder is employed, the management should ascertain the previous safety training of him, and should not assume that any scaffolder has a particular skill or training without seeing some proof or demonstration. Induction training will be needed to explain such matters as the company's safety policy/organization, company safety rules, accident reporting requirements, etc. Besides, training/instruction would be necessary when the new scaffolder first starts on a project, to cover the particular requirements of the site such as emergency procedures, any special hazards and the safety aspects of the scaffold.

5. Technical requirements for safety in metal scaffolding

5.1 General requirements

5.1.1 Materials

(a) Sufficient material should be provided for and used in the construction of scaffolds.

(b) Scaffolding components should be of sound material, good construction, adequate strength and free from patent defects and should be properly maintained.

(c) Boards and planks used in the construction of working platform should be straight-grained and free from large knots, dry rot, wormholes and other dangerous defects. Where necessary, they should be protected against splitting.

(d) These boards and planks should be unpainted so that any defects are readily visible.

(e) Timber scaffold boards and their permitted tolerances should comply with BS 2482 or other equivalent national/international standards or provisions.

(f) All scaffolding components should comply with BS 1139, BS EN 39, BS EN 74, BS EN 1004 and BS EN 12810 or other equivalent national/international standards or provisions. Hot dipped galvanized, painted or unprotected tube may be used in scaffolding structures. Unprotected tube should generally not be used in water and particularly not in marine structures. If used in such conditions, tubes should be thoroughly cleaned afterwards, carefully inspected, e.g. for signs of excessive corrosion and only returned to stock if suitable.

(g) Tube ends should be free from distortion, corrosion, splits, laminations, surface flaws and undue rust. Used tubes should be free from cracks, splits and excessive corrosion (for example, corroded steel tube should be wire brushed for checking) and be straight to the eye. The ends of load-bearing tubes should be cut cleanly and squarely with the axis of the tube and should not show excessive

wear. Sections of tube, which have been deformed or creased by abuse, should be cut out and discarded. Where tubes have become thin or split at the ends, these should be cut off and the cuts should be at right angles to the axis to the tube.

(h) The safe working loads for individual couplers and fittings should comply with BS EN 12811 or other equivalent national/ international standards or provisions. Special attention should be paid to the use of joint pins because they cannot bear any tension. All couplers and fittings should be free from rust and distortion, worn threads and damaged bolts and should be maintained in lubricated condition. The nuts should be run on their bolts to ascertain that they have a free-running fit. Spanners and podgers should have lengths as recommended by the coupler manufacturer.

(i) Regarding the loads on working platforms, all decking units of working platforms should have adequate strength to meet the recommendations for the appropriate duty of that specified in the following table:

Minimum Imposed Loads			
Duty	Use of platform	Distributed load on platform	Concentrated load to be applied on plan over any square with a 300mm side and at the end portion of a cantilever
Inspection and very light duty	Inspection, painting, stone cleaning, light cleaning and access	0.75 kN/m^2	2 kN
Light duty	Plastering, painting, stone cleaning, glazing and pointing	1.5 kN/m^2	2 kN
General purpose	General building work including brickwork, window and mullion fixing, rendering, plastering	2 kN/m^2	2 kN
Heavy duty	Blockwork, brickwork, heavy cladding	2.5 kN/m^2	2 kN
Masonry or special duty	Masonry work, concrete blockwork and very heavy cladding	3 kN/m^2	2 kN

Scaffold boards of working platforms should be cleaned on return from a construction site prior to stacking. They should be stacked flat and raised from the ground by cross battens. The end hoops or other means of end protection should be replaced or refixed as necessary. Boards with split ends should be cut down to form boards of reduced length. Boards should be inspected after each job. Any boards showing signs of ill-treatment, abuse, decay or excessive warp should be discarded. Damaged or suspect sections should be cut off and destroyed. Care should be taken in the use of boards. Any over stressing (for example, that caused by impact loading) likely to cause unseen damage should be avoided. They should not be used as ramps or platforms over long spans, nor should they be put on the ground where vehicles or other loads can be put on them. Boards, which show evidence of vehicle tyre marks, should be destroyed. Where boards are treated for fire retardant purposes, care should be taken to select a process, which would minimize the loss of board strength.

5.1.2 Support for metal scaffold

(a) The stability of the ground or supporting structure should be justified by recognized engineering principles.

(b) The ground or supporting structure for a scaffold should be adequate to carry and dispose the load imposed both locally at each standard and, in general, to carry the design loads of the scaffold without undue settlement.

(c) The ground on which a scaffold is constructed should be solid, levelled and rammed to give a hard surface, and should be strong enough to keep the scaffold upright. Soil should be compacted or consolidated and as far as practicable, water be drained off.

(d) Hard surface: on surfaces such as steel and concrete where there is adequate hardness and thickness to prevent the scaffolding tubes from penetrating into the surface, the standards can be placed directly on the surface but preferably to be placed on a base plate.

(e) Pavements and other surfaces of intermediate hardness: on surfaces such as hard asphalt, timber and flooring, where there is a possibility of the standards deforming the surface, base plates or metal packing plates should be used at the bottom of the standards.

(f) Other surfaces: on soil, ash, hoggin, gravel, soft asphalt and any type of flooring or paving which would be penetrated by a standard with a base plate beneath it or if there is doubt about the surface, there should be a further spreading of the load by a sole plate of timber or other suitable material.

(g) The sole plate area beneath one standard should be at least $0.1m^2$ with the least dimension of 219mm, and if the sole plate is of timber, it should be not less than 35mm thick. Where the ground is soft or has been disturbed, the sole plate area should be not less than $0.17m^2$ when individual sole plates are used.

(h) The ground or soil beneath the sole plate should be well compacted and free from irregularities, which would make the sole plate unstable or poorly bedded.

(i) On sloping supports, the base of the scaffold should be effectively prevented from sliding. An appropriately shaped wedge should be inserted to the void between each standard's base plate and the sloping support to ensure tightness and verticality. To resist lateral loads, the base of the scaffold should further be adequately anchored to the sloping support.

(j) The supports for a scaffold should be maintained in an adequate condition as described in this section during the life of the scaffold.

5.1.3 Cast-in and drilled-in anchorages used as ties

(a) Cast-in anchorage

In some cases, it is possible to 'build in' scaffold ties into the fabric of the building during construction. A variety of screwed plates, sockets and nuts are available for setting into concrete during pouring, in a similar manner to formwork anchors, for subsequent use as scaffolding ties. The appropriate bolts should be welded to scaffolding tubes or scaffolding fittings for use as tie attachments. Alternatively, the bolts may be used directly to attach this type of fitting. Ring bolts may also be used.

(b) Drilled-in anchorage

A variety of expanding anchor sockets are available for fixing into holes drilled into hardened concrete. The attachments are similar to cast-in anchors. Care should be taken that the facade material is a structural material and not a surface cladding with little or no strength. Anchor sockets and ring bolts rely on an expanding wedge to secure the anchor into the pre-drilled hole. As such, overtightening should be avoided to prevent damage of the base material of the pre-drilled hole. Torque wrenches or other special tools supplied by the manufacturers should be used to fix the anchors, the ring bolts or other devices inserted and tightened by hand. Drilled-in anchorages should be tested before use.

(c) Anchorages should be tested to ensure that they are of sufficient strength. They should be tested in accordance with BS 5080 or other equivalent national/international standards or provisions.

5.1.4 Erection/addition/alteration of metal scaffold

(a) Metal scaffolds shall be erected, added to, or altered by trained workmen under the immediate supervision of a competent person. (Regulation 38E of the CSSR)

(b) Work should be started from the bottom level to the top level and from the interior part to the exterior part.

(c) The standards of the scaffolds should be plumbed.

(d) The width of any working platform of the scaffold shall be not less than 400mm. (Third Schedule to the CSSR)

(e) Every working platform shall be closely planked, boarded or plated, or of open metal work without any interstice exceeding 4 000mm^2. (Third Schedule to the CSSR)

(f) Every board or plank forming part of a working platform shall be of sound construction, adequate strength and free from patent defects (Third Schedule to the CSSR). The plank should be straight-grained, sound and free from irregular knots, dry rot, worm holes, cracks and other defects affecting its strength. Also, the board should be sound and free from cracks and other defects affecting its strength.

(g) Every board or plank forming part of a working platform shall be not less than 200mm in width and not less than 25mm in thickness or not less than 150mm in width when the board or plank exceeds 50mm in thickness. (Third Schedule to the CSSR)

(h) Every board or plank forming part of a working platform shall not protrude beyond its end support to more than 150mm unless it is sufficiently secured to prevent tipping. It shall rest on at least 3 supports unless, taking into account the distance between the supports and the thickness of the board or plank, the conditions are such as to prevent undue or unequal sagging. (Third Schedule to the CSSR)

(i) Every side of a working platform shall be provided with suitable guard-rails. The height of a top guard-rail shall be between 900mm and 1 150mm above the platform. The height of an intermediate guard-rail shall be between 450mm and 600mm above the platform (Third Schedule to the CSSR). (See Figures 1 and 2 for details)

(j) Toe-boards and end toe-boards shall be suitably fixed to all working platforms and shall have a minimum height of 200mm (Third Schedule to the CSSR). They should be placed inside the standards. (See Figures 1 and 2 for details)

(k) Space between platform and wall of a building or structure should be as small as practicable. Guard-rails should be provided if there is a risk of falling from height.

(l) Working platforms should be cleared of debris like concrete waste.

(m) Working platforms should not be overloaded and the load should be evenly distributed.

(n) No shock loading on the platforms should be allowed.

(o) The scaffold should be effectively braced to ensure stability of the whole structure.

(p) The bracings should extend from the base to the top of the scaffold.

(q) If electrical equipment such as power hand tools or electric installation including lighting is to be used on the scaffold, they should be of proper design and installation to prevent electrical hazard.

(r) Where a scaffold is erected adjacent to a road or pathway, overlay or screen nets must be erected to envelop the scaffold for the protection of person or vehicular traffic against falling objects.

(s) Safe access to and egress from place of work should be provided for the scaffolders and the users of the scaffold. One way of providing a safe access to and egress from a scaffold is to provide a safe gangway between the existing building/structure and the scaffold. Access and egress provided should be used and no climbing along the standards/ledgers of the scaffold should be allowed.

(t) When a scaffolder or workman has to work in a place where it is impracticable to erect a safe working platform or to provide safe access and egress, the use of safety nets and safety belt attached to a secure anchorage point or an independent lifeline throughout the work is required. Scaffolding members should not be used for anchorage purpose. Further reference should be made to the Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems prepared by the Labour Department.

(u) Particular attention should be drawn in the manual handling of heavy metal scaffolding components.

(v) Scaffolding members should not be used as supports for lifting appliances unless the scaffold has been designed for such purpose.

5.2 Tubular Scaffolds

They are constructed in tubes and couplers for the purpose of providing working platforms. Each scaffold should be constructed in accordance with the design and drawings of professional engineer. Recommendations for the design, construction and use of various types of scaffolds can be found in BS EN 12811 or other equivalent national/international standards or provisions. All tubes, couplers and fittings should comply with BS 1139, BS EN 39, BS EN 74, BS EN 1004 and BS EN 12810 or other equivalent national/international standards or provisions. When other tubes or materials are used, structural calculations should be carried out using the properties of the tubes or materials used and the structures assembled so that equal or even higher safety standards than the aforesaid standards can be achieved. In order to calculate the height of a tubular scaffold, the table in Section 5.1.1(i) and the following table should be made reference to:

Duty	Max. number of platforms	Commonly used widths using 225mm boards	Max. bay length (m)
Inspection and very light duty	1 working platform	3 boards	2.7
Light duty	2 working platforms	4 boards	2.4
General purpose	2 working platforms + 1 at very light duty	5 boards or 4 boards + 1 inside	2.1
Heavy duty	2 working platforms + 1 at very light duty	5 boards or 5 boards + 1 inside or 4 boards + 1 inside	2.0
Masonry or special duty	1 working platform + 1 at very light duty	6 to 8 boards	1.8

Note: (a) The boards are timber scaffold boards of nominal cross sections 38mm x 225mm. Decking units of other types or dimensions but with equal or greater strength can also be used.

(b) The normal lift height for works such as brickwork is 1.35m, and for walk-through scaffolds is 2.0m. For greater lift height or different loading conditions, reference should be made to the design criteria in BS EN 12811 or other equivalent national/ international standards or provisions.

The following subsections highlight some essential safety requirements for some special types of tubular scaffolds made of steel. A tube made of steel should have a yield stress not less than 235N/mm^2, and should have an outside diameter of 48.3mm and a wall thickness of 4mm.

5.2.1 Independent tied metal scaffold

It should consist of a double-row of standards with each row parallel to the building (See Figure 1 for details). The inner row should be set as close to the facade of the building/structure as is practicable. The distance between the lines of standards should be the minimum necessary to accommodate the required boards and toe-boards forming a working platform. The standards should be connected with ledgers parallel to the building/structure and fixed with right angle couplers and with transoms fixed to the ledgers with putlog couplers to give the required platform widths.

(a) Standards

(i) The joints in standards should be staggered. Joints in standards of scaffolds tied to a building/structure should be made with either joint pins or sleeve couplers.

(ii) For scaffold that is free standing or projecting above the level of a building/structure or otherwise subject to forces that would produce tension in the standards, the standards should be joined in manner capable of resisting the applied tension.

(iii) No more than three out of the four standards at the corner of any bay should have joints in the same lift except in the case of the bottom 6.5m of a scaffold where an extended base lift is necessary for pedestrian access or other reason.

(iv) Where any of the standards in a scaffold are at a level lower than the remainder of the standards, the extension downwards should be stiffened by horizontal tubes, in two directions at right angles and fixed at lift heights (i.e. the vertical intervals at which standards are linked to one another).

(v) Where access for the public is required under the first lift, a height of up to 2.7m is permissible, provided that the load in the standards does not exceed the maximum permissible axial stresses and loads for the steel scaffold tubes.

(b) Ledgers

(i) Ledgers should be fixed to standards with right angle couplers and should be horizontal except that a foot lift may follow the slope of the ground at the base of a scaffold. For this situation, the transoms should be attached to the standards and the ledgers to the transoms.

(ii) Joints in ledgers should be made with sleeve couplers or expanding joint pins. Joints in ledgers on the same lift and in adjacent lifts should not normally occur in the same bay.

(iii) When guard-rails are to remain permanently in place, the absence of a joint in the guard-rail in any bay may be accepted as giving sufficient continuity to the scaffold to permit joints in the ledgers above and below it in the same bay.

(iv) Where joints are required, they should be positioned at a distance not greater than 1/3 of the span between adjacent standards.

(v) In the case of curved scaffolds, fittings other than right angle couplers may be used to join the ledgers to the standards provided that they are of adequate strength or otherwise supplemented by a right angle check coupler. Besides, for large radius curves, separate scaffolds with platforms of the same height may be used.

(c) Transoms/putlogs

(i) The length of transoms/putlogs should vary according to the intended use of the scaffold.

(ii) Transoms should be extended inwards and outwards for the purpose of butting the face of the building and fixing the longitudinal bracing.

(iii) Transoms should be fixed to the inside and outside ledgers with right angle or putlog couplers.

(iv) Boarded lifts: The spacing of transoms/putlogs for boarded lifts should be in accordance with the followings:

Nominal Thickness of Board (mm)	Max. Span between Transoms/ Putlogs (m)	Min. Overhang (mm)	Max. Overhang (mm)
38	1.5	50	150
50	2.6	50	150
63	3.25	50	150

(v) Non-boarded lifts: Transoms/putlogs for non-boarded lifts should be fixed at one per pair of standards, including the pair at each end of the scaffold, and should be fixed within 300mm of the standard. On scaffolds of a height more than 50m, the transoms on unboarded lifts, when fixed at the frequency of one transom per pair of standards, should be fixed to the ledgers or standards with right angle or other suitable couplers provided they are capable of sustaining a safe working slip load of 5kN.

(d) Working platform

Safety requirements for a working platform are the same as described in Section 5.1.4. Other requirements are as follows:

(i) Any group of boards across the width of the scaffold should be of the same length, with all boards of the same thickness.

(ii) The spacing of the transoms to support the boards should vary according to the thickness and length of the boards as specified in Section 5.2.1 (c)(iv).

(iii) The ends of a working platform should extend beyond the end of the wall or working face by a distance of 600mm when work is to be carried out up to the end of the wall.

(iv) Gangways and working platforms should preferably be horizontal but may slope at an inclination of up to 1 vertical to 4 horizontal without stepping laths. At slopes steeper than this they should be provided with stepping laths to provide a firm foothold.

(v) Ladders or other suitable means should be provided so as to enable workers to gain access to and egress from one platform to another.

(e) Stair/ladder access to and in scaffolds

Stair and ladder towers should be constructed with one side common with the outside of the scaffold. Bracings should be fixed to the remaining sides except in the bays through which access and egress is required. The superimposed loading adopted in calculations should be not less than $2kN/m^2$ for all landings and stairs in stair towers and ladder towers.

(i) Every sloping ladder should stand on a firm and level base and be supported only by the stiles. The stiles should be securely fixed to the scaffold by lashings or by other attachments at the top.

(ii) Ladder should be set at an angle of 4 vertical to 1 horizontal.

(iii) Ladders should project at least 1.05m above the top landing with the landing rung level with or slightly above the level of the landing. Ladders should not be extended by lashing two lengths together.

(iv) The vertical distance between two successive landings should not exceed 9m. The landings should be provided with access holes for the user which should not exceed 500mm in width and should be as small as practicable in the other direction.

(v) Where practicable, the ladder access to the scaffold should be with its own ladder tower fixed to the outside of the main scaffold.

(vi) Both ladder towers and stair towers should be fully decked at the landings. Toe-boards should be provided at the landings.

(vii) Every landing and every side of a stair shall be provided with suitable guard-rails of adequate strength. The height of a top guard-rail shall be between 900mm and 1 150mm. The height of an intermediate guard-rail shall be between 450mm and 600mm. (Third Schedule to the CSSR)

(viii) The gaps in the decking to allow access and egress from lift to lift up the ladder or steps should be as small as practicable. Short boards necessary to complete the decking round the access hole should be tied down and supported at the correct centres.

(ix) Every gangway or run in the scaffold shall either be closely boarded, planked or plated, or is a platform consisting of open metal work having interstices none of which exceeds 4 000mm^2 in area. (Third Schedule to the CSSR)

(x) Every side of the gangway or run shall be provided with suitable guard-rails of adequate strength. The height of a top guard-rail shall be between 900mm and 1 150mm. The height of an intermediate guard-rail shall be between 450mm and 600mm. (Third Schedule to the CSSR)

(f) Ties

(i) When a working lift (i.e. the assembly of ledgers and transoms forming a horizontal level of a scaffold) is required at 2m height and no firm part of the building/structure has been constructed to attach a tie, scaffold should be temporarily stabilized by raking tubes or other means. Such tubes should also be fixed during dismantling if low level ties are impracticable.

(ii) In the situation where ties may be temporarily removed, they should be maintained at such a frequency that there is always one for every 25m^2 of scaffold area and they should be reasonably evenly distributed over the scaffold surface, both horizontally and vertically.

(iii) Ties which will not be removed during the use of a scaffold should be inserted and maintained at a frequency of one for every 40m^2 of the scaffold surface and should be reasonably evenly distributed over the scaffold face area, both horizontally and vertically.

(iv) The spacing of lines of ties should not exceed 8.5m, either horizontally or vertically, but at the same time individual ties should still be within the area rule above. Where the building/structure surface permits a staggered arrangement of ties, this should be adopted in preference to a rectangular pattern.

(v) The tie tube should be horizontal or sloping downwards away from the building.

(vi) At the point where the attachment of the tie tube to the building/ structure is made, the building/structure should be strong enough to resist the forces applied to it.

(vii) Ties should preferably be attached to both the inside and outside ledgers or standards and, if possible, at a point not more than 300mm from a braced standard.

(viii) The attachment of the tie tube to the scaffold should preferably be next to pairs of standards which are ledger braced, as near to a node point as possible.

(ix) The couplers for ties set at an angle to the building/structure should be swivels. The couplers for ties set at right angles to the building/structure and horizontally should be right angle couplers or another such arrangement of couplers which gives similar or adequate strength.

(x) Where wire or banding ties are used, they should be turned round a node point of the scaffold or otherwise prevented from slipping along the ledger or standard by fixing safety couplers beside the point of attachment.

(xi) Each tie should comprise an anchorage to the structure served and tying member connecting this anchorage to the scaffold. If a single anchorage is not strong enough to provide a safe working capacity of 6.25kN, two or more should be used or the design reconsidered.

(g) Bracings

Bracings should be provided to stiffen the scaffold. The plane to be braced should, wherever practicable, be divided into a complete series of triangles by braces. These should be fixed as close as possible to intersections. A check should be made on the reduction in strength of the scaffold where a brace has to be omitted or where it cannot be fixed within 300mm of an intersection.

Ledger bracing:

(i) Ledger bracing should be on alternate pairs of standards. Any pair of standards, which are ledger braced, should be made into a complete series of triangles.

(ii) When the bay length is 1.5m or less, the ledger bracing may be fixed to every third pair of standards.

(iii) The ledger bracing should be fixed from ledger to ledger with right angle couplers when the lift is not to be boarded but may be fixed to the standards using swivel couplers.

(iv) The ledger bracing on boarded lifts should be from under the outside ledger of a boarded lift down to the inside ledger of the lift below so as to avoid the toe-board.

(v) The ledger bracing from the inside ledger to the guard-rail level of the lift below may be used provided that every pair of standards is so braced instead of every alternate pair.

(vi) In scaffolding over footpaths, the ledger bracing may be omitted from the lowest lift provided the lengths of the standards in the lift are not in excess of 2.7m. When the height of the lowest lift is in excess of 2.7m, a knee brace should be inserted across the top corner of the lowest lift, commencing at approximately 1.8m from the ground. One such knee brace should occur on every pair of standards and be fixed with alternate slopes. On large scaffolds it is sometimes desirable to insert cross knee braces on every pair of standards, and a ledger should be fixed adjacent to where the knee brace meets the standard.

Facade bracing:

(i) Longitudinal bracing should be provided to all scaffolds in which the movement along the facade of the building/structure is not prevented by other means.

(ii) The longitudinal bracing should be achieved by tubes set at between 35° and 55° to the horizontal, reaching from bottom to top of the scaffold. There are three principal forms:

- individual tubes set in zig zag pattern, the top of a tube and the bottom of the next preferably being attached to the same transom;

- a continuous tube, extended as necessary to cover the whole scaffold, only possible for wider scaffolds;

- individual tubes as described in the first form above but all sloping the same way; the top of one is connected at a ledger/ standard intersection, and the bottom of the next is attached to the same pairs of standards.

In most situations, a combination of these should be appropriate. The bracing tubes should be connected either in the following two ways:

- to every lift of the extended transoms with right angle couplers; or

- to every standard with swivel couplers.

The first way above is to be preferred.

(iii) The brace assembly should be provided at intervals along the scaffold not exceeding 30m.

(iv) The longitudinal bracing should be fixed as near to the standards as possible.

(v) The longitudinal bracing should include the lower lift being started from the base of one of the outside standards. In the lower lift, when the bracing is started, a guard-rail should be placed through the braced bay to prevent people passing.

(vi) The joints in continuous diagonal bracing should be made by overlapping the two lengths of the tube by a distance of at least 300mm and joining them together with two parallel couplers. Or, the two tubes may be joined by a sleeve coupler or other coupler capable of sustaining the applied load.

Plan bracing:

(i) Plan bracing should be provided to all portions of a scaffold which are not otherwise stabilized against lateral distortion.

(ii) It may be joined by the same type of couplers used for longitudinal bracing and the same rules with regard to strength apply.

Couplers for fixing braces:

Right angle couplers should be used to fix braces to ledgers or transoms and swivel couplers should be used for the attachment to standards. Other couplers may be used provided that they are capable of sustaining a safe working load of 5kN.

(h) Erection tolerances

(i) Standards should be vertical to within ±20mm in 2m (subject to a max. total deviation of 50mm).

(ii) Bay length and width should be ±200mm on designated lengths, and level to within ±20mm in 2m (subject to a max. total deviation of 50mm).

(iii) Lift height should be ±150mm on the designated height.

(iv) Nodes should be equal to or less than 150mm between coupler centres.

5.2.2 Metal putlog scaffold

All the requirements are the same as described in Section 5.2.1 above with the following additional points to be observed:

(a) It should consist of a single row of standards parallel to the face of the building/structure and set as far away from it as is necessary to accommodate a working platform same as that required for a double-row metal scaffold, with the inner edge of the platform as close to the facade of the building/structure as is practicable. (See Figure 2 for details)

(b) All the standards should be connected with a ledger fixed with right angle couplers and the putlogs are fixed to the ledgers with right angle or putlog couplers.

(c) The blade end of the putlog tube should be placed horizontally on the brickwork/structure, etc. being built. But for the case of existing building/structure, the old putlog holes (if any) may be reused or others raked out, and the putlog blades may be inserted vertically.

(d) Sole plates and base plates should be used under each standard and their requirements are the same as described in Section 5.1.2 above.

(e) The scaffold should be tied into the building/structure at the manner as described in Section 5.2.1(f) above.

(f) Where a putlog is required for a board support to form a working platform and it is opposite to an opening in the building/ structure such as a window or doorway, etc., the inside end of the putlog should be supported on an underslung bridle tube spacing between adjacent putlogs.

(g) Longitudinal bracing should be required at intervals not exceeding 30m but ledger bracing is not required in the finished scaffold.

(h) The lift height should be no more than 1.35m.

(i) Tie tubes should be attached by right angle couplers to the ledgers or standards.

5.2.3 General free-standing metal towers

(a) These metal towers are free-standing structures which are self-supporting and do not depend totally on other structures for their rigidity or stability. There are mainly three types of such towers:

(i) Light duty access towers, stationary and mobile for use inside buildings (imposed load not greater than 1.5kN/m^2).

(ii) Light duty access towers, stationary and mobile for use in the open area (imposed load not greater than 1.5kN/m^2).

(iii) Heavy duty towers, such as camera towers and welding platforms (imposed load in excess of 1.5kN/m^2).

(b) Free-standing towers situated externally and likely to be subject to wind forces should be the subject of calculations for wind forces and overturning.

(c) All free-standing towers should be vertical and built on firm foundations. If on sloping ground, they should be prevented from slipping. Towers inside buildings should be on level floors or adequately compacted sub-bases.

(d) The towers should be adequately stiffened on all sides and in plan at every alternate lift, starting at the base lift of mobile towers.

(e) Access to and egress from the top of towers should be by stair/ ladder.

(f) The working deck should be of adequate thickness. If boarded with scaffold boards, the supports of the boards should comply with the recommendations of the table in Section 5.2.1 (c)(iv) and the boards, if short, should be prevented from sliding by battens nailed beneath the deck. The deck should be provided with toe-boards and guard-rails complying with the recommendations of Section 5.1.4. Generally, the deck should have at least one edge in the same vertical plane as one side of the tower base so that this edge can be placed up against the work to be done. The worker is thus not required to lean out over the guard-rail.

(g) All types of free-standing structures depend for their stability either on their self-weight or on additional guys, anchors, outriggers or kentledge. The factor of safety for scaffold structures, i.e. the ratio of the overturning moment to the stabilizing moment, should be not less than 1.5. The overturning moment is due to eccentric weight, imposed loads and environmental loads. The stabilizing moment is due to the self-weight, if suitably centered, added kentledge and the anchor, gut or strut forces, if any.

(i) Where kentledge is used, it should be fixed round the perimeter of the foot lift and a tube and fittings grid should be installed to receive and locate it. If castors are used, their capacity to take the extra load should be checked.

(ii) Where anchor is used, anchor capacities are dependent on ground conditions and reference should be made to the manufacturer for the type, number and location of anchors. There are four types of anchorage commonly used :

Cross tubes attached to the foot lift :

Temporary stability can be achieved by using cross tube anchors attached directly to the bottom of the structure. The forces involved should be calculated and the necessary number of anchors inserted. The necessary number of safety couplers should be added to the base frame of the structure and the tensions in the standards catered for by sleeve couplers and lapping where necessary. (See Figure 3a for details)

Driven tube anchors attached to guys :

Driven tube anchors should not be used on a down slope towards the structure. They can be used in clay, sandy or gravelly ground. Tubes should be 1.75m long and penetrate 1.25m into the ground. They should be fixed together with tubes and fittings connected with right angle fittings in preference to lashings. The tubes should be set at right angles to the guy. The guy should be attached at the bottom of the front tube and prevented from slipping up by a scaffold fitting. (See Figure 3b for details)

Screwed in flight anchors :

They should be set in line with the guy and should be screwed in using a short length of scaffold tube through the ring. They will not penetrate so deeply on an uphill slope towards the guy and allowance for this should be made. (See Figure 3c for details)

Plate and pin anchors :

Plate and pin anchors should be used where the ground is too stoney or has shattered rock, limestone or chalk near the surface. The pins should be driven in at right angles to the guy and the anchors should be set so that the guys are flatter than 40° to the horizontal. For square towers, a separate anchor should be provided for each corner. (See Figure 3d for details)

(iii) Guys for the metal towers should be of 10mm or 12mm diameter wire rope which should be attached to the scaffolding structure and to the ground tube or anchor by a single round turn and three bulldog grips. The recommended safety factor for guy ropes is 3:1. No tensioning device should be pulled up too tightly since the force required to pull a wire guy tight results in very considerable tension being placed on the ground anchorage and the structure before it has been loaded with the wind forces. All the guys should be attached to node points of the scaffold structure.

(h) When metal towers are required to be a height exceeding the height to the least base dimension ratio recommended in Section 5.2.4 (a) to 5.2.4 (b) and Section 5.2.5 (a) to 5.2.5 (b) and a larger base cannot be built or extension buttresses cannot be fixed at the base, the tower should be constructed up to the maximum height allowed by the height to the least base dimension ratio and then tied, roped or guyed in four directions to the main structure which is being serviced. The tower may then be increased in height and should be additionally tied at levels of approximately every 6m.

(i) Operation of free-standing metal towers :

(i) The user should apply no horizontal force at any working deck, e.g. by hauling heavy ropes or cables, and should not lift significant loads up the outside of the tower or attach a gin wheel on a cantilever tube unless the tower is specifically designed for this purpose.

(ii) If large weights are to be hoisted to the top deck by block and tackle, adequate davits or brackets should be provided and the stability of the tower calculated for the suspension reaction at the top block which might be twice the lifted weight. If the towers are rectangular, the lifting tackle and ladders should be on the shorter side.

(iii) Mobile towers should only be used on even ground, never on a slope which is sufficient to allow them to run away. Castors should normally be kept locked except when the tower is being relocated. When used on surfaces which have a cross fall and/or a longitudinal fall, the user should be particularly careful to see that the brakes are on at all times other than whilst moving the tower. If there is any doubt as to the adequacy of the brakes, the wheels should be chocked.

(iv) No worker or heavy material should be permitted on any mobile scaffold during its movements. The force to achieve resiting should be applied at the base.

5.2.4 Stationary metal towers

This is one of the commonly used free-standing metal towers in Hong Kong. There are different requirements when being used within and outside buildings:

(a) Within buildings:

The height limit of these towers is achieved by restricting the ratio of the height to the least base dimension. Within buildings there are no environmental loads, but nevertheless some tendency to overturn a tower may occur from raising weights outside its base area, wrongful application of force at the top and normal operations on the top deck. To cater for this overturning moment, the height to least base dimension ratio should not be greater than 4. The height is measured from the floor to the level of the working deck or top lift whereas the least base width is the dimension, centre to centre, of the shortest side of the tower if it is rectangular.

(b) Outside buildings:

(i) The height to the least base dimension ratio for stationary towers outside buildings without special means of anchoring should not be greater than 3.5.

(ii) Stationary towers outside are usually exposed and are therefore subject to wind forces. Towers, even with a height to the least base dimension ratio less than 3.5, are unstable in locations exposed to high winds. For these circumstances, the wind forces should be calculated and the tower restrained by kentledge or guys to give a factor of safety against overturning of 1.5 in any direction.

(iii) Besides, when the ground is soft, sole plates should be used and the tower should be maintained in the centre of the sole plate by the use of substantial nails or other means. When the ground is sloping, the sole plates should be dug in flat.

5.2.5 Mobile metal towers

This is also one of the commonly used types of free-standing metal towers in Hong Kong. They are fitted with castors at the bottom of the standards. The castors should be of the swivel type and fixed to the standards of the scaffold so that they cannot fall off if the leg is out of contact with the ground (See Figure 4 for details). There are different requirements when being used within and outside buildings:

(a) Within buildings:

The height to the least base dimension ratio should be limited to 3.5.

(b) Outside buildings:

(i) The height to the least base dimension ratio should not be greater than 3. When in use in exposed situations, the scaffold should be tied to the building it is serving.

(ii) When a scaffold is used in location exposed to high winds, the wind forces should be calculated and the scaffold restrained by kentledge or guys etc., to give a factor of safety of not less than 1.5. Also the capacity of the castors to take the extra load should be checked.

No more than one working platform should be permitted on all mobile metal scaffold at any one time.

5.3 Proprietary scaffold systems

5.3.1 A proprietary scaffold system comprises a complete set of prefabricated components of unique design, capable of erection without any other components. It will be necessary for the manufacturer of the system to provide a complete set of instructions, compatible with this Code and sufficient to ensure the safe erection and use of the scaffold. Plane frame scaffolds and modular scaffolds are the most commonly used proprietary scaffold systems in Hong Kong. When using a proprietary type scaffold system, the scaffold system should be designed by professional engineer making reference to the manufacturer's instructions and in accordance with recognized engineering principles or other national/international standards or provisions. Reference should also be made to Section 5.4 of this Code. An independent checking professional engineer should be arranged to cross-check the design and the erected scaffold when the case is warranted. As a general guidance, the following safety procedures should be taken into account:

(a) The scaffold should be erected in accordance with professional engineer's design in which reference should also be made to the manufacturer's recommendations or national/international standards or provisions. However, the professional engineer should avoid using two or more standards in one single design.

(b) Regarding the strength of steel elements and frame scaffold, sampling tests, loading tests and mechanical tests (for example, yield stress, tensile strength, compressive strength, elongation, bend and buckling tests), reference should be made to the procedures laid down in relevant standards of the International Organization for Standardization or equivalent procedures.

(c) Design involving structural steel should be in accordance with the Code of Practice for the Structural Use of Steel issued by the Buildings Department or other equivalent national/international standards or provisions.

(d) The height limit of each proprietary scaffold system should be checked. When the number of stages of scaffold increases, the strength of the scaffold would be reduced.

(e) Rusting of scaffold members would reduce the strength of the scaffold. Therefore, attention should be paid to the severity of rusting of scaffold members. When deciding the strength reduction factor, reference should be made to relevant national/ international standards or provisions.

(f) The scaffold should be levelled until proper fit can easily be made. Frames or braces should not be forced to fit.

(g) Each frame or panel should be effectively braced to restrain from lateral movement. All brace connections should be made secure in accordance with the manufacturer's recommended procedures.

(h) A mixed structure of different proprietary systems should not be used.

(i) When there is any deviation from the standard scaffold, or when sheeting or fan is added, or when other changes are made which will vary the structural loading or arrangement of the scaffold, professional engineer should be consulted well beforehand.

(j) The tying and its attachment to appropriate points on the scaffold should be arranged in accordance with the design.

(k) Suitability of the support should be checked against those requirements mentioned in Section 5.1.2.

5.3.2 Plane frame scaffolds

(a) This type of scaffolds is commonly used for access to ceiling, soffits, walls and columns for carrying out light work, for examples, plastering, painting, conduit installation, cleaning and similar operations. Each scaffold comprises an arrangement of vertical frames and bracings supporting closely boarded working platforms at required levels.

(b) The design and loading of plane frame scaffolds should be in accordance with Section 5.1 of this Code. The height of a vertical frame is normally 1.7m to 2m (depending on the type of the frame used) to give adequate headroom for passage. The height limits of the free-standing plane frame scaffolds and tied plane frame scaffolds should follow professional engineer's design.

(c) A plane frame scaffold system mainly consists of the following components:

(i) Ties

- It is essential for all plane frame scaffolds to be securely tied either to surrounding walls, columns or such similar structures throughout the length and height to prevent the scaffolds from movement, tipping into or away from the wall and structure.

- The ties should be located not more than one bay from the ends of the scaffold and thereafter at intermediate spacing of not more than 3 bays or 7.5m apart, whichever is the lesser. The ties should be as far as practicable be fixed at staggered positions at every two lifts.

- The ties should be perpendicular to the longitudinal plane of the scaffold and where it is not practicable, the deviation from the perpendicular should not exceed 15^{o}. Every tie should be capable of withstanding tensile or compression force applied along the length of the tie.

- Besides, corner-ties are also necessary to maintain the stability of plane frame scaffolds. (See Figure 5 for details)

(ii) Bracings

- Each plane frame scaffold should be effectively braced to restrain from lateral movement. Cross bracing should be of such length as to square and align vertical members while diagonal bracing should be braced at about 45° to the horizontal. (See Figure 6 for details)

- The scaffolds should also be braced horizontally at intervals of not more than every five lifts. The joints for the bracings should be continuous or lapped. All the brace connections should be made secure.

(iii) Joints

A joint tube is an internal fitting for joining two standards end to end. A joint tube should be self-centring so that equal length of the tube can be embedded into each of the standards. When uplift may occur, plane frames should be locked together vertically by pins/bolts & nuts. (See Figure 7 for details)

(iv) Flip locks

Flip locks should be installed at upright position so as to prevent the cross bracing from detaching out of the standards. (See Figure 6)

(v) Base plates

Legs of the plane frame scaffold should be set on adjustable base plates or plain bases on foundations adequate to support the maximum designed vertical and horizontal loads. The erected scaffold should be plumbed and levelled. (See Figure 6)

(vi) Fork-heads

A fork-head is a U-shaped assembly at the top of a standard for bearers of formwork to rest on. Fork-heads should not be used as base plates in supporting the scaffold.

(vii) Castors

A castor is a swiveling wheel secured to the base of a vertical member for the purpose of mobilizing the scaffold. All scaffold castors should be designed for strength and dimension to support the designed working load. Castors should be provided with a positive wheel and swivel lock, or equivalent means, to prevent movement and rotation while the scaffold is in place. Castor stems should be secured in the scaffold to prevent them from accidentally falling out at any time.

(d) Safety requirements relating to the boards or planks forming a working platform, guard-rails and toe-boards of a working platform, access to and egress from a scaffold, etc. for prevention of falls are the same as described in Section 5.1.4. (See Figure 8 for details)

5.3.3 Modular scaffolds

(a) Modular scaffolds are mainly made of tubes, angle steel, I-beams, channels, steel columns, etc. Most systems of modular scaffold are composed of standards with preformed connectors welded at intervals along their length to which ledgers are fixed with a proprietary clamping or wedging arrangement. (See Figure 9)

(b) Each scaffold should be constructed in accordance with the design and drawings of professional engineer. If there is any need to deviate from the original design and drawings, the scaffold should be re-designed by professional engineer.

(c) A modular scaffold system mainly consists of the following components:

(i) Standards

They come in a variety of lengths and have preformed connectors welded at fixed distances along their length. A spigot arrangement or socket is provided at one end of the standard for extension purposes.

(ii) Ledgers

They are in varying lengths with connectors welded to each end. The connection is made when the wedge, cup or bolt is hammered or screwed tight.

(iii) Transoms

They are generally made to support scaffold boards or stagings. The ends of the transoms are connected to the standards in the same way as the ledgers. Some systems might require intermediate transoms to support the boards or stagings.

(iv) Bracings

Bracings in each direction are made to fit the different bay sizes. Some systems use standard tubes and fittings for bracings.

(v) Scaffold boards

They are also called stagings and come in a variety of lengths, thicknesses and widths. Decking is seldom interchangeable as each system is designed to sit exactly on the narrow lip of the transom. Scaffold boards are often made from steel with a slip resistant surface and pre-drilled drainage holes. These systems allow for the attachment of proprietary toe-boards.

(vi) Ties

Ties are generally formed in tube and fittings.

(vii) Adjustable base plates

They are essential and care should be taken to establish their safe working loads and whether they are designed for heavy or light duty use.

(d) These scaffolds all employ different patented locking devices (wedges, locking pins, etc.) and are designed to different specifications. It is therefore difficult and sometimes dangerous to interchange one system with another. As such, there should not be a mixing of two different systems in one scaffolding system.

(e) It is vital that specific instruction, training or an erection handbook be provided for the workmen erecting any modular scaffold. Users should pay strict attention to their loading capacities and methods of erection published in the manufacturer's instructions. There is no common specification for modular scaffolds.

5.3.4 Required information from the manufacturer

(a) As there are differences in the strength of scaffolding materials and loading capacity of each proprietary scaffold system, reference should be made to the technical data, laboratory test results, instructions and procedures supplied by the manufacturer. Technical data listing all those components used in the scaffold system together with their technical specifications and laboratory test results for every batch of scaffolding materials from the manufacturer should also be required. The test results include:

(i) permissible axial stress for new and used materials;

(ii) modulus of elasticity;

(iii) safe working loads for scaffolding fittings; and

(iv) properties of couplers and other components.

(b) The manufacturer should be required to provide erection instructions to the scaffold taking into consideration requirements for tying and bracing. For example, the instruction should describe additional tying and bracing arrangements that are needed when the scaffold crosses large openings or extends beyond the facade. The manufacturer should also be required to provide instructions relating to special measures to be taken when normal design is deviated.

(c) The following information should also be required:

(i) A means of identification, e.g. a plate containing information about the manufacturer and the scaffold. The plate should be displayed in prominent positions on the scaffold.

(ii) The class of the scaffold, which should be in accordance with the permitted loading and number of platform(s) that may be loaded.

(iii) The permitted height, if appropriate, for different conditions.

(iv) The weight and basic dimensions of components.

(v) The instructions for the erection and dismantling of the scaffold including identification of components required for the purposes.

(vi) The instructions regarding the maintenance of components whilst in use and in storage.

5.4 Falsework

Falsework is a temporary structure used to support a permanent structure while the latter is not self-supporting. In Hong Kong, falsework is commonly used to support formwork for in-situ concrete construction, and from time to time, workers have to work on or in the vicinity of the falsework. Total or partial collapse of falsework may lead to serious accidents. Inadequate design, defective or sub-standard materials, faulty setting out, inadequate supervision and procedural inadequacies such as improper loading and dismantling are the common causes of their collapses.

The design, construction, use and dismantling of falsework should comply with BS 5975 or other equivalent national/international standards or provisions. The falsework should be designed by professional engineer and when the case is warranted, an independent checking professional engineer should be arranged to cross-check the design and the erected falsework. The followings highlight the good practices sometimes overlooked in order to prevent collapse of falsework on construction sites in Hong Kong:

5.4.1 Engineering considerations

(a) The framing of structural members and details of construction should be justified in accordance with recognized engineering principles to meet the loads to which the falsework may be subjected. The loads include vertical loads and lateral loads, and the common ones are given below:

Vertical Loads from:

(i) Self-weights.

(ii) Permanent works to be supported.

(iii) Impact due to placing permanent works (e.g. free fall of wet concrete).

(iv) Construction operations: A minimum of 1.5kN/m^2 should be allowed for the operations.

(v) Temporary storage of materials.

(vi) Traffic loads.

(vii) Plant: The operating loads should include the weight of plant, dynamic effects and vibration effects.

(viii) Induced wind loads.

(ix) Uplift loads due to wind and floatation.

Lateral Loads from:

(i) Wind loads.

(ii) Hydrostatic pressure: It may come from wet concrete or an external source.

(iii) Lateral earth pressure.

(iv) Differential movements of supports such as ground movements.

(v) Vibration effects such as those due to concrete vibrations, concrete pumping operations or piling operations nearby.

(vi) Flowing current.

(vii) Unsymmetrical distribution of vertical loads, such as effects due to unbalanced concrete placing.

(viii) Unsynchronized jacking of permanent works against falsework.

(ix) Sway of falsework.

(x) Buckling of props.

(xi) Eccentricity of vertical loads due to construction deviations, especially for falsework on sloping ground.

(xii) Dynamic effects from plant and equipment.

(xiii) Casting up of concrete against existing works.

(xiv) Discontinuity in the soffit formwork.

(b) The minimum lateral loads should be taken as the greater of:

(i) the most adverse combination of the above lateral loads; or

(ii) 2.5% of the vertical loads taken as acting at the points of contact between the vertical loads and the supporting falsework.

(c) Each falsework member should be designed for the most adverse combination of vertical loads and lateral loads. The reduction of permissible axial stress for used materials and the reduction in strength with the increase in the number of stages of scaffold should be considered.

5.4.2 Structural steel works

(a) Use structural steel in accordance with the Code of Practice for the Structural Use of Steel issued by the Buildings Department or other equivalent national/international standards or provisions.

(b) Steel hollow sections exposed to the weather should have walls not less than 4mm thick, unless protection against corrosion is effectively provided and maintained.

(c) Steel members of hollow sections are often used repeatedly. As some damage is expected after each cycle of use, they should be inspected prior to reuse and be discarded if found unsatisfactory. For reused members, an allowance for strength reduction should be considered.

5.4.3 Lateral stability

(a) The key to keep falsework safe is the provision of adequate lacing and bracing to prevent the falsework from buckling or sway.

(b) Lacing are horizontal members connecting props together to reduce the unsupported length of the props. They may behave as struts or ties, and help to transmit lateral forces to bracing members.

(c) Bracing generally are inclined members connecting lacing members and props. They transmit lateral forces to the foundations.

(d) Lacing and bracing must be recognized as critical members in falsework. They should be adequately provided in compliance with recognized engineering principles. They should be clearly shown in the drawings in the three principal directions to illustrate professional engineer's intentions. Undue movement due to lateral forces, torsion or impact forces should be prevented. A properly planned loading sequence will alleviate torsional effects.

(e) If possible, the falsework should be tied back to stiff parts of completed permanent structures to enhance lateral stability.

(f) The framing of falsework should give a robust and stable structure, especially for falsework near vehicular traffic. The structure should be designed and constructed so that it is not unreasonably susceptible to effects of impacts or vibrations. Damage to small areas of a structure should not lead to collapse of major parts of the structure. To avoid accidents, adequate headroom, lighting, warning signs and signals, and impact protection measures should be provided.

5.4.4 Cantilever members

(a) The end portion of a prop protruding beyond a lacing member should be considered as a cantilever member unless adequate means is used to brace the end portion. Such end portion often occurs at the top or at the base of a prop.

(b) If a prop has an extensible portion at the end, the joint between the extensible portion and the prop itself allows a little angular movement. Such movement constitutes a weak point in the falsework. Unless otherwise justified by recognized engineering principles, the extensible portion should be adequately laced and braced at the end where the extension exceeds 300mm.

5.4.5 Fastenings to concrete or masonry

All fastenings to concrete or masonry for structural uses should be designed in accordance with recognized engineering principles and the manufacturer's recommendations. The construction details and instructions for use should be clearly specified in the drawings and specifications.

5.4.6 Lacing, bracing & wedging

Falsework will not be safe without adequate lacing, bracing and wedging. Workmen should not be permitted to install lacing, bracing or wedging in favour of their own decisions. All the details shown in the drawings and specifications should be followed.

5.4.7 Test on falsework equipment

(a) In Hong Kong, much of the falsework equipment in use is of proprietary design that has been purchased or hired. Detailed information, such as that provided by the manufacturer, is of great importance in inspecting such equipment if the inspection is to be carried out by those not familiar with its usage. Very often, technical information relating to the performance of such material has been compiled from test carried out during the

development of the equipment. It is desirable that test procedures for similar systems or components should be standardized in such a way as to make the critical properties comparable. Worldwide accepted methods of test for falsework equipment such as those laid down in BS 5507 and BS EN 1065 can be used by manufacturers in compiling the necessary design data.

(b) Where the strength of a manufactured component cannot be ascertained by applying design criteria recommended in this Code, testing should be carried out at the prototype stage of development in order to obtain results, including ultimate behaviour, on which design data for the component or system can be based.

5.4.8 Loading sequence/pattern

(a) Sequence of placing loads on the falsework including loads due to temporary storage and prestressing should be planned and taken into account in the design.

(b) The sequence of placing permanent works such as wet concrete should comply with professional engineer's intentions expressed in the drawings and specifications. If such a sequence has not been specified, advice on the loading sequence should be sought from the professional engineer. If the professional engineer considers that no specific sequence is needed, then the sequence of working should be planned by spreading the loads evenly on the falsework. Uneven distribution of loads, such as out-of-balance effects due to unsynchronized jacking of permanent works against the falsework by more than one jack may lead to uplifting or instability.

(c) Concrete pouring by crane, skip, barrow, dumper or pumping produces impact forces. The free fall should not exceed 0.5m unless otherwise permitted by professional engineer. Heaping of wet concrete within a small area should be avoided. Unless otherwise permitted by the professional engineer, equipment for concrete pumping should not be fastened to the falsework.

5.4.9 Undue movement of falsework

The works under construction should be suspended immediately when any undue movement of the falsework occurs. In addition, the falsework should be labelled to show that it is unsafe and should not be used. Investigation on the causes of the undue movement should be carried out immediately by competent person with the help of the drawings and specifications. If any doubt still exists, the competent person should immediately seek professional engineer's advice.

6. Inspection, maintenance and dismantling of metal scaffolding

6.1 Inspection and maintenance of metal scaffolds

6.1.1 The scaffold shall not be used on a construction site unless the scaffold has been inspected by a competent person before being taken into use for the first time and at regular intervals not exceeding 14 days immediately preceding each use. (Regulation 38F of the CSSR)

6.1.2 The scaffold shall not be used on a construction site unless the scaffold has been inspected by a competent person after any substantial addition, partial dismantling or other alteration. (Regulation 38F of the CSSR)

6.1.3 The scaffold shall also be inspected by a competent person since exposure to weather conditions likely to have affected its strength or stability or to have displaced any part (Regulation 38F of the CSSR). Such weather conditions would be heavy rain, storm, etc. affecting its strength and stability.

6.1.4 The competent person should check the strength and stability of the scaffold and ascertain whether it is safe for workers to stay on or it needs to be repaired. Inspection may be done more frequently depending on the usage and conditions of the scaffold.

6.1.5 Defects found during the inspection should be rectified immediately. The scaffold shall not be used unless a report has been made in Form 5, which specifies the location and extent of the scaffold on the site and includes a statement to the effect that the scaffold is in safe working order, by the competent person carrying out the inspection referred to in Sections 6.1.1, 6.1.2 and 6.1.3 above (Regulation 38F of the CSSR). The Form 5 should be displayed in prominent positions on the scaffold.

6.1.6 For unsafe scaffolds, effective measures should be taken to prohibit their use. They should be marked to show that they are unsafe and should not be used.

6.2 Dismantling of metal scaffolds

6.2.1 The dismantling work shall be done by trained workmen under the immediate supervision of a competent person. (Regulation 38E of the CSSR)

6.2.2 Sufficient time should be allowed for the dismantling work to be conducted safely.

6.2.3 The scaffold to be dismantled should be checked for its strength and stability beforehand.

6.2.4 No components, which endanger the stability of the remaining structure, should be removed. Unless necessary precautions have been taken, all the ties and bracings should remain secured in positions.

6.2.5 If dismantling has reached the stage at which a critical member has to be removed, for example, a tie or a brace, the stability of the structure should be assured by fixing a similar or otherwise adequate member in place lower down before the member to be taken out is removed.

6.2.6 All the stacked materials and debris placed on the scaffold should be removed.

6.2.7 Dismantling sequence should be planned and that sequence of dismantling sections of the scaffold should be logical and determined with due consideration of the scaffolders' safety. Dismantling work should be carried out according to the plan. Because changes may have been made in a scaffold structure during its working life, it is not safe to assume that dismantling can be carried out in the reverse order to the erection. The scaffold, especially its tying and bracing, should be inspected prior to dismantling. Also, the procedure of dismantling should be orderly and planned and should proceed generally from the top in horizontal sections.

6.2.8 If the scaffold is defective, it should be made good before dismantling commences.

6.2.9 Scaffolds should not be dismantled in vertical sections from one end towards the other unless special consideration is given to ties and bracings.

6.2.10 A scaffold might have been temporarily stabilized during construction by rakers that have been subsequently removed. If the level of the lowest tie point is high, temporary rakers or other structurally adequate means of supports should be built up from the ground to achieve stability of the partly dismantled scaffold.

6.2.11 Safe access to and egress from the place of work should be provided for the scaffolders.

6.2.12 The scaffold to be dismantled should be fenced off at the ground level/ public area to prevent persons entering the work area and warning notices should be posted up in the vicinity.

6.2.13 Steps shall be taken to ensure that scaffolding materials are not thrown, tipped, or shot down from a height where they are liable to cause injury to any person on or near the construction site; and where practicable, properly lowered in a safe manner by means of a lifting appliance or lifting gear (Regulation 49 of the CSSR). Scaffolding materials should include the tubes, the scaffold boards or planks, the metal couplers for scaffolding purposes, etc.

6.2.14 All materials should be lowered to the ground and not stored on the scaffold. In the case where the pavement is not to be obstructed and scaffolding materials have to be stored on the lowest lift awaiting collection, this lift should be stiffened and fully braced or propped by rakers, by using the materials recovered from the upper lifts.

6.2.15 Every scaffolder involved in the dismantling work at height should wear safety belt attaching to suitable and sufficient anchorage and suitable fixings, for example, the provision of an independent lifeline that extends from an independent anchorage point to which a lanyard of a safety belt is attached using a fall arresting device. Scaffold members should not be used for anchorage purpose. Whenever practicable, safety nets for fall protection of scaffolders should be used. Further reference should be made to the Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems prepared by the Labour Department.

6.2.16 All the trades on the site should coordinate and collaborate closely with the contractor engaging in scaffold dismantling work regarding the safety precautions necessary during various stages of the work.

Appendix I

A Sample of Form 5

僱主或承建商姓名或名稱
Name or Title of Employer
or Contractor ....
....
....

建築地盤地址
Address of Site ....
....
....

開始施工日期
Work Commenced Date
....

表 格 五
FORM 5

[規例第 38F(1)條]
[reg. 38F(1)]

建築地盤(安全)規例
棚 架
每十四日一次或在其他場合執行的檢查結果報告
本表格乃由勞工處處長爲施行建築地盤(安全)規例第 38F(1)條而認可

Construction Sites (Safety) Regulations

SCAFFOLDS
REPORTS OF RESULTS OF FORTNIGHTLY OR OTHER INSPECTIONS

Form approved by the Commissioner for Labour for the purposes of regulation 38F(1) of the Construction Sites (Safety) Regulations

有關棚架的說明或所在地點 Description or location (1)	檢查日期 Date of inspection (2)	檢查結果 註明該座棚架是否處於安全操作狀態 Result of inspection State whether the scaffold is in safe working order (3)	檢查者簽署及職階 Signature and designation of person who made the inspection (4)

任何合資格檢驗員或合資格的人，如向承建商交付他明知有任何要項屬虛假的證明書或報告，即屬犯罪；一經定罪，可處罰款二十萬元及監禁十二個月。
Any competent examiner or competent person who delivers to a contractor a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of $200,000 and to imprisonment for 12 months.

CSSR-F5

Appendix II

Third Schedule to the Construction Sites (Safety) Regulations - Requirements with which certain safety equipment must comply

1. Width of working platforms, gangways and runs

(1) Subject to subsections (2) and (3), the width of any working platform, gangway or run shall be not less than 400 millimetres.

(2) Subject to subsection (3), the width of any gangway or run used for the movement of materials shall be not less than 650 millimetres.

(3) Where it is impracticable by reason of limitations of space to provide a working platform, gangway or run of the width required by subsection (1) or (2), then, in lieu of complying with that subsection, the working platform, gangway or run shall be as wide as is reasonably practicable.

2. Working platforms, etc. to be closely boarded, etc.

(1) Subject to subsection (2), every working platform, gangway and run shall be closely boarded or planked.

(2) Subsection (1) shall not apply to a working platform, gangway or run

(a) consisting of open metal work having interstices none of which exceeds 4 000 square millimetres in area; or

(b) the boards or planks of which are so secured as to prevent their moving and so placed that the space between adjacent boards or planks does not exceed 25 millimetres.

if there is no risk of persons below the platform, gangway or run being struck by materials or articles falling through the platform, gangway or run.

3. Boards and planks in working platforms, gangways and runs

Every board or plank forming part of a working platform, gangway or run shall

(a) be of sound construction, adequate strength and free from patent defect;

(b) be of a thickness capable of affording adequate security having regard to the distance between the supports and be not less than 200 millimetres in width and not less than 25 millimetres in thickness or not less than 150 millimetres in width when the board or plank exceeds 50 millimetres in thickness;

(c) not protrude beyond its end support to a distance exceeding 150 millimetres unless it is sufficiently secured to prevent tipping;

(d) rest securely and evenly on its supports; and

(e) rest on at least 3 supports unless, taking into account the distance between the supports and the thickness of the board or plank the conditions are such as to prevent undue or unequal sagging.

4. Coverings for opening

Every covering provided for an opening shall be

(a) so constructed as to prevent the fall of persons, materials and articles; and

(b) clearly and boldly marked as to show its purpose or be securely fixed in position.

5. Height of toe-boards, etc.

The height of a toe-board or other similar barrier shall be not less than 200 millimetres.

6. Height of guard-rails

Subject to section 7, the height of a guard-rail above any place of work on a working platform, gangway, run or stairway shall be

(a) in the case of a top guard-rail, not less than 900 millimetres and not more than 1 150 millimetres;

(b) in the case of an intermediate guard-rail, not less than 450 millimetres and not more than 600 millimetres.

7. Exception to section 6

Section 6 shall not apply to a working platform on a bamboo scaffold if the platform is protected by not less than 2 horizontal bamboo members of the scaffold spaced at intervals between 750 millimetres to 900 millimetres.

8. Temporary removal, etc. of guard-rails, etc.

(1) Guard-rails, toe-boards and barriers may be removed or remain unerected for the time and to the extent necessary for the access of persons or the movement of materials or other purposes of the work concerned, but shall be replaced or erected as soon as practicable after the expiration of that time.

(2) Toe-boards shall not be required for stairs.

Appendix III

Reference

1. BS 1139 – Metal scaffolding

2. BS 2482 – Specification for timber scaffold boards

3. BS 5080 – Structural fixings in concrete and masonry

4. BS 5507 – Methods of test for falsework equipment

5. BS 5867 – 2 – Fabrics for curtains, drapes and window blinds

6. BS 5975 – Code of Practice for temporary works procedures and the permissible stress design of falsework

7. BS EN 39 – Loose steel tubes for tube and coupler scaffolds

8. BS EN 74 – Couplers, spigot pins and baseplates for use in falsework and scaffolds

9. BS EN 1004 – Mobile access and working towers made of prefabricated elements

10. BS EN 1065 – Adjustable telescopic steel props

11. BS EN 12810 – Façade scaffolds made of prefabricated components

12. BS EN 12811 – Temporary works equipment

13. Code of Practice for the Structural Use of Steel, 2011 (Buildings Department, Hong Kong)

14. Code of Practice on Wind Effects in Hong Kong, 2004 (Buildings Department, Hong Kong)

15. Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems (Labour Department, Hong Kong)

16. A Guide to Practical Scaffolding 'The Construction and Use of Basic Access Scaffolds' (Construction Industry Training Board, South Australia)

17. Singapore Standard CP 14 – Code of practice for scaffolds

Figure 1: Independent tied metal scaffold

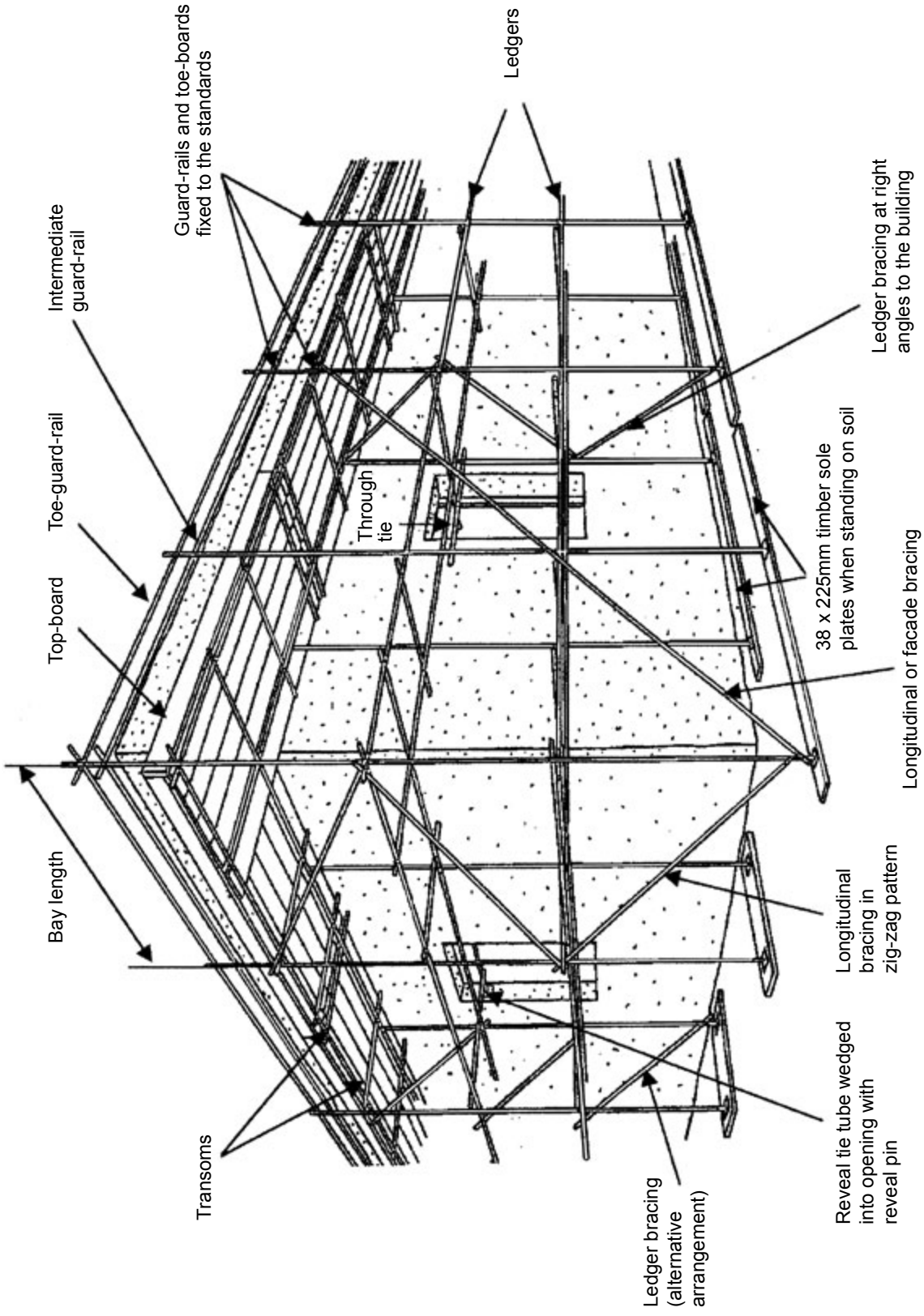


Figure 2: Metal putlog scaffold

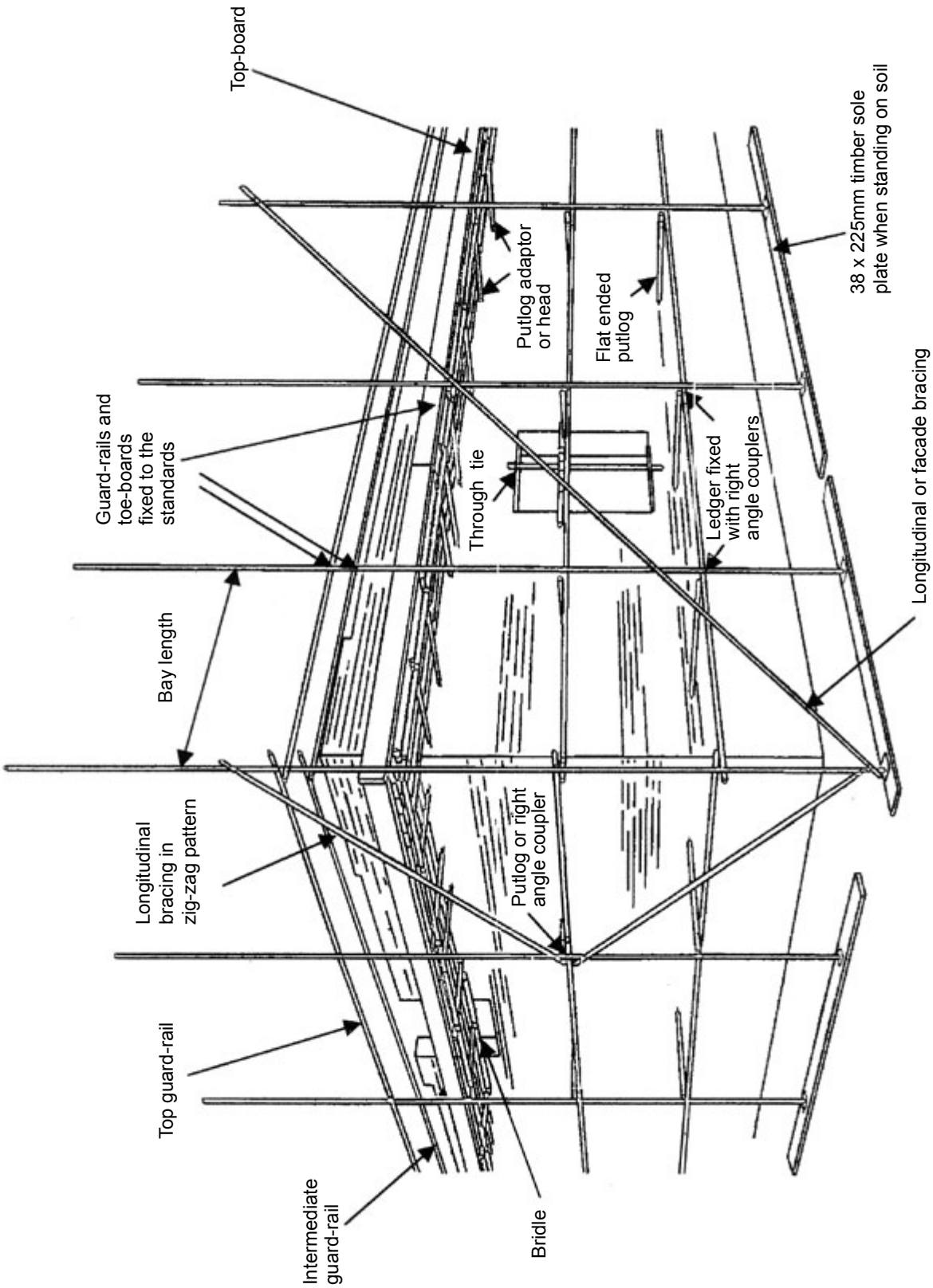
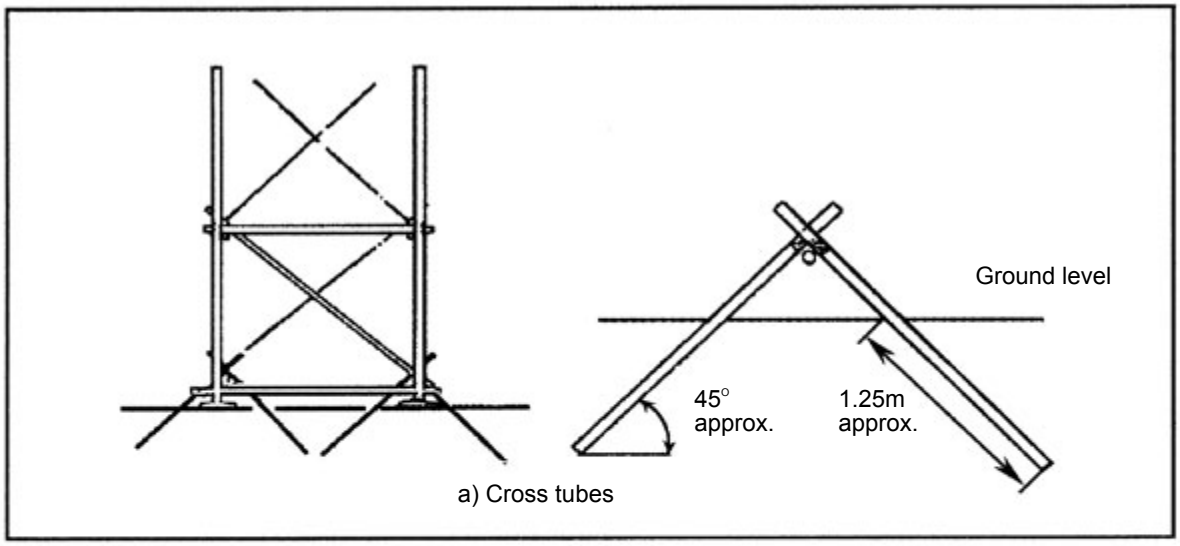
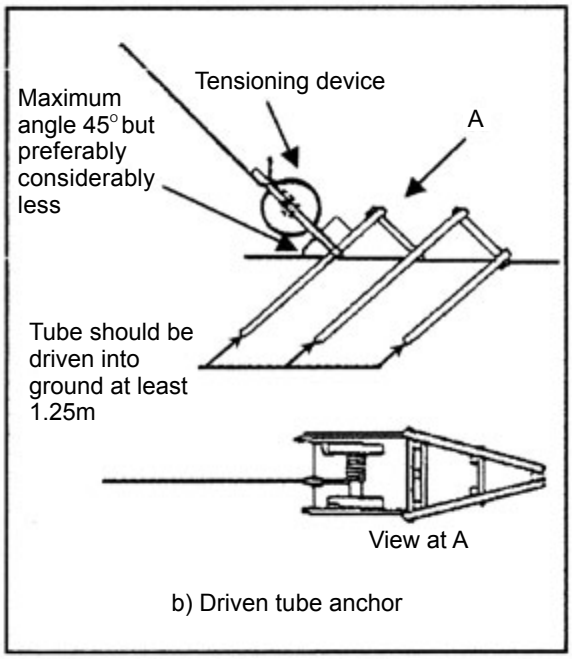


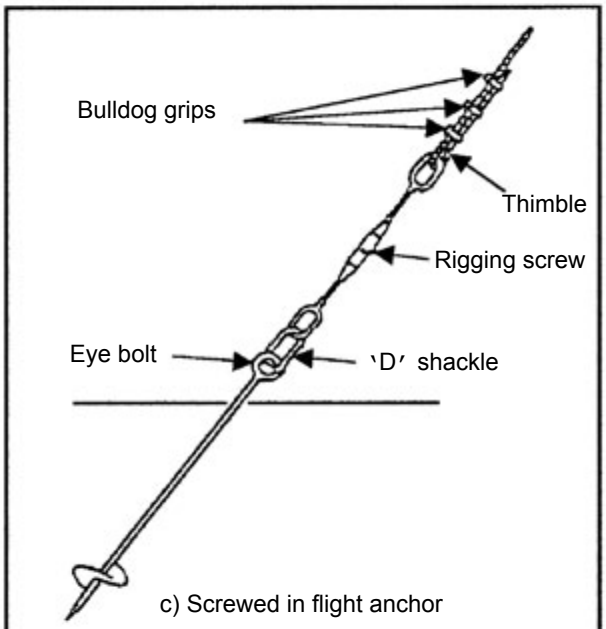
Figure 3: Anchors



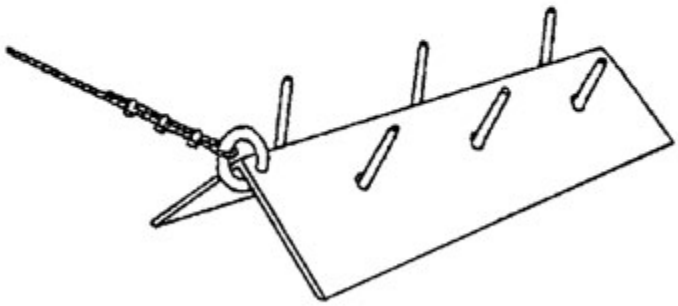
a) Cross tubes



b) Driven tube anchor

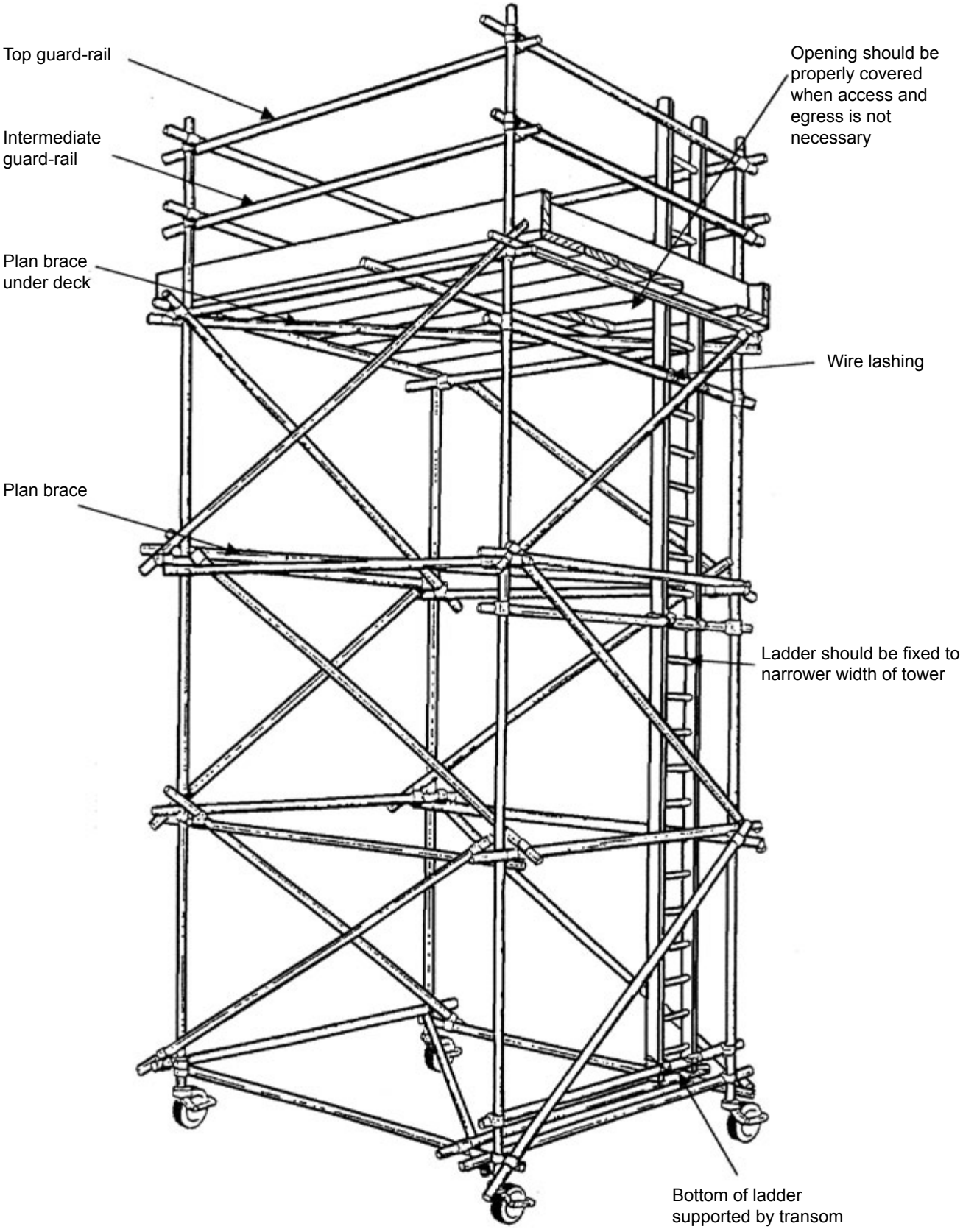


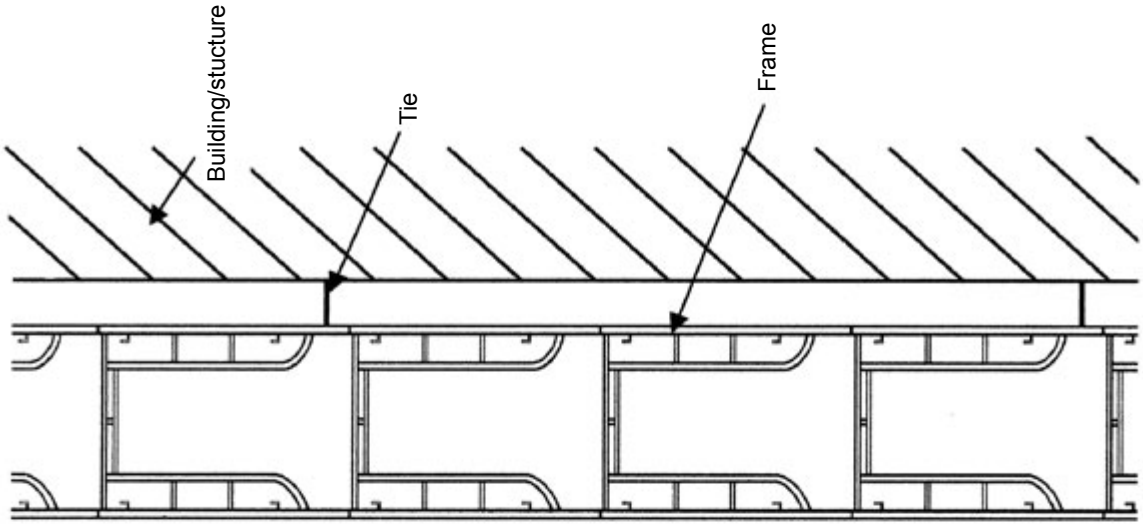
c) Screwed in flight anchor



d) Plate and pin anchor

Figure 4: Mobile access tower





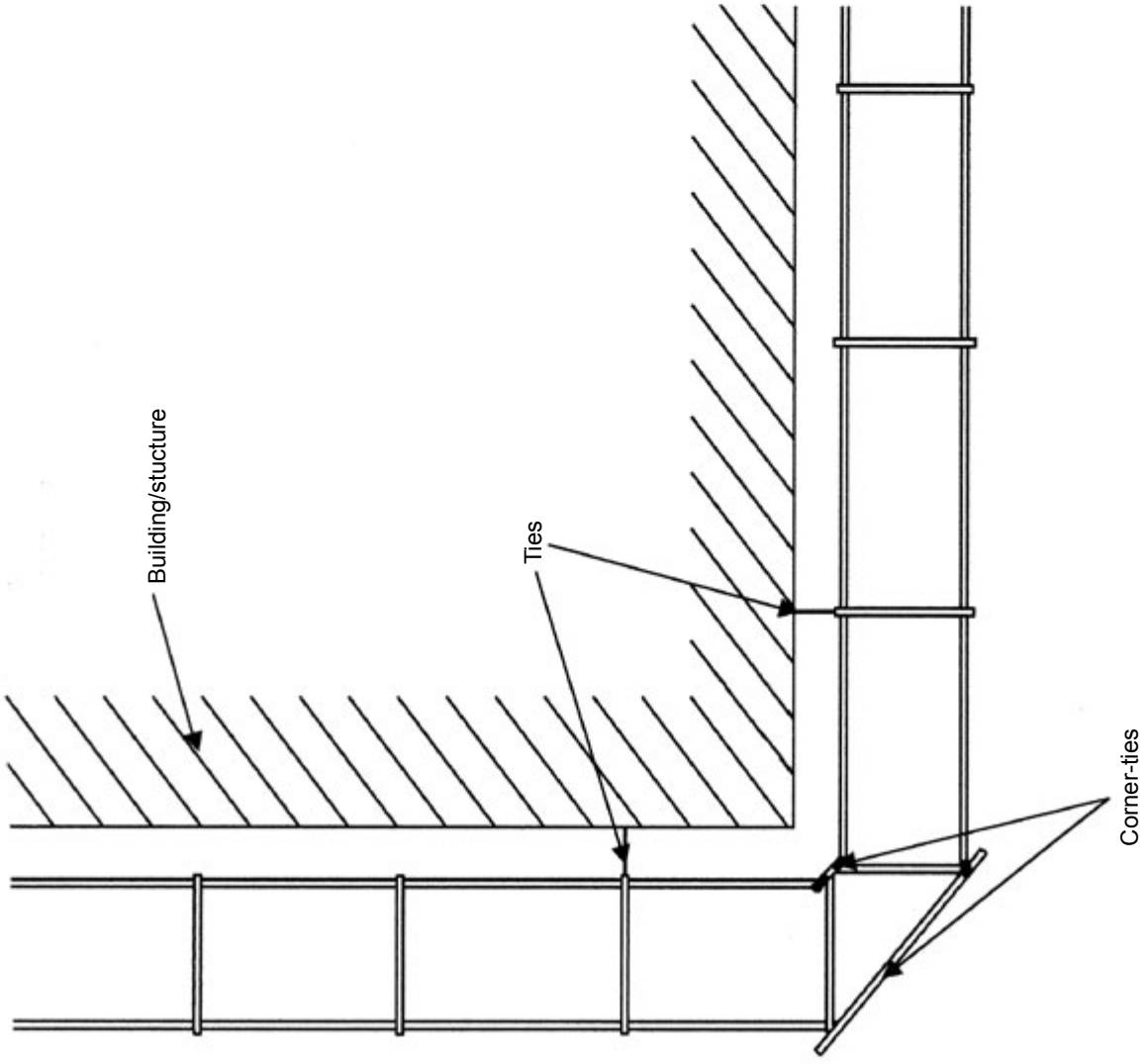


Figure 5: Ties

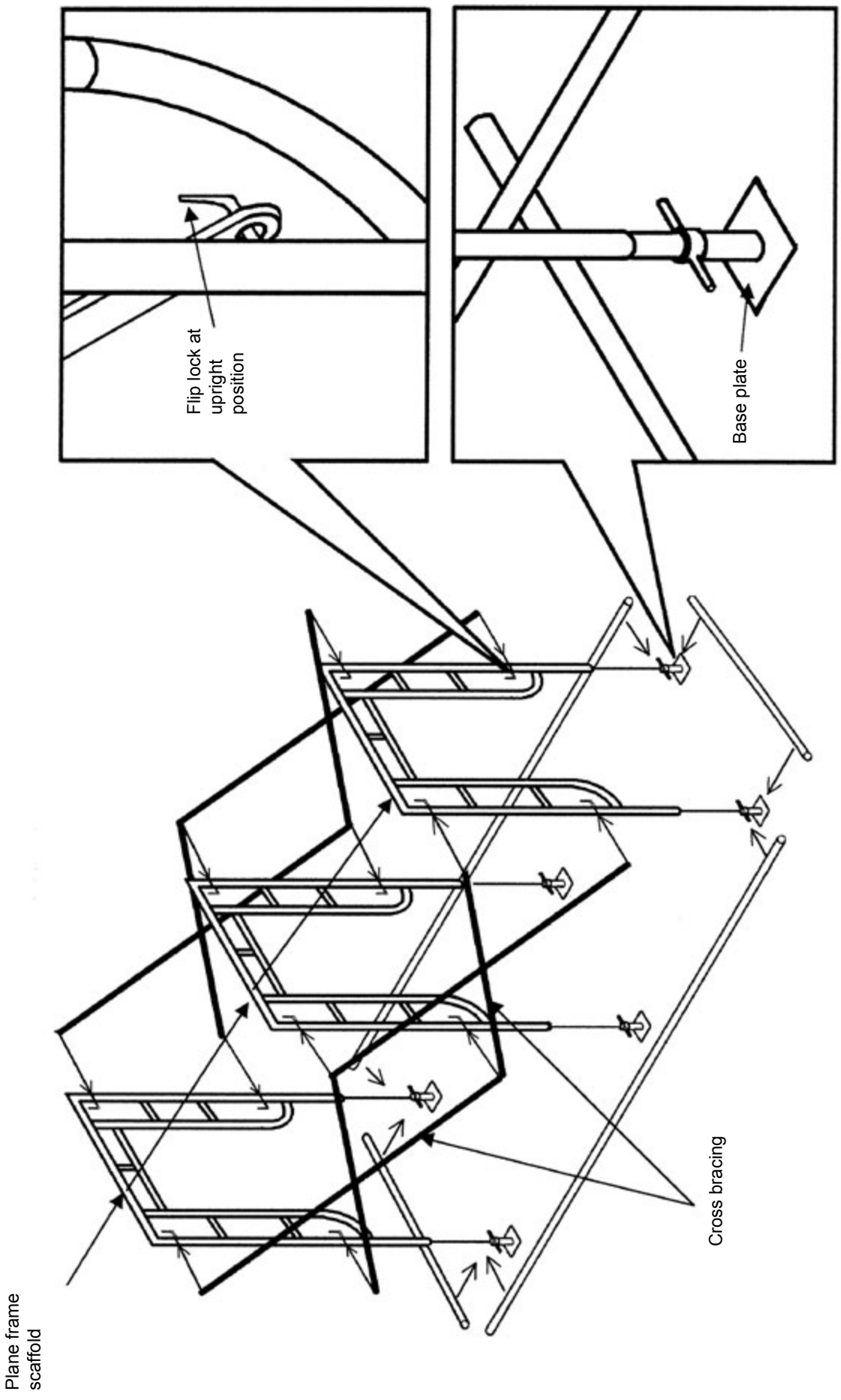


Figure 6: Bracing, flip lock and base plate

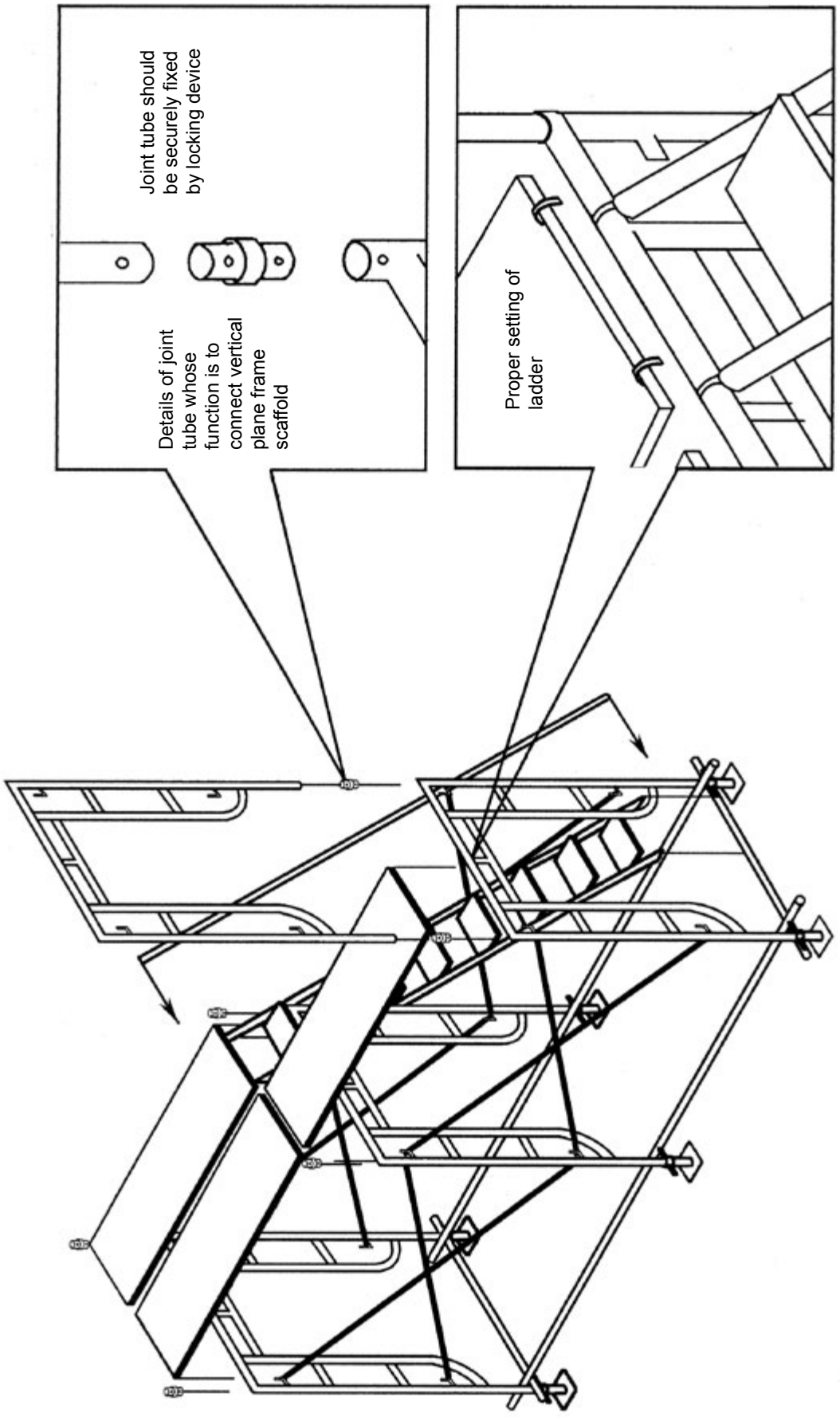
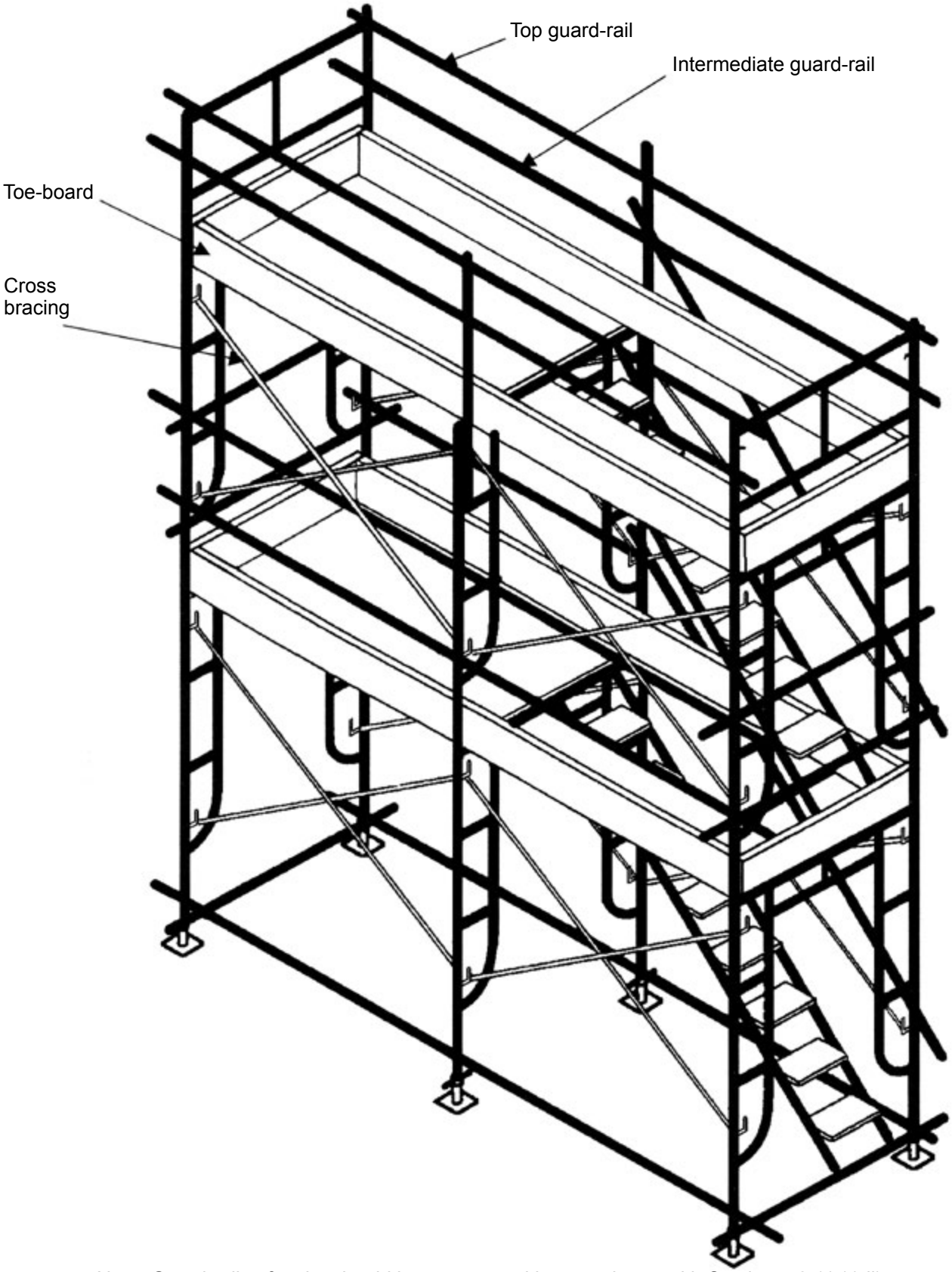


Figure 7: Connection of scaffold

Figure 8: Layout of plane frame access scaffold



Note: Guard-rails of stairs should be constructed in accordance with Section 5.2.1(e)(vii)

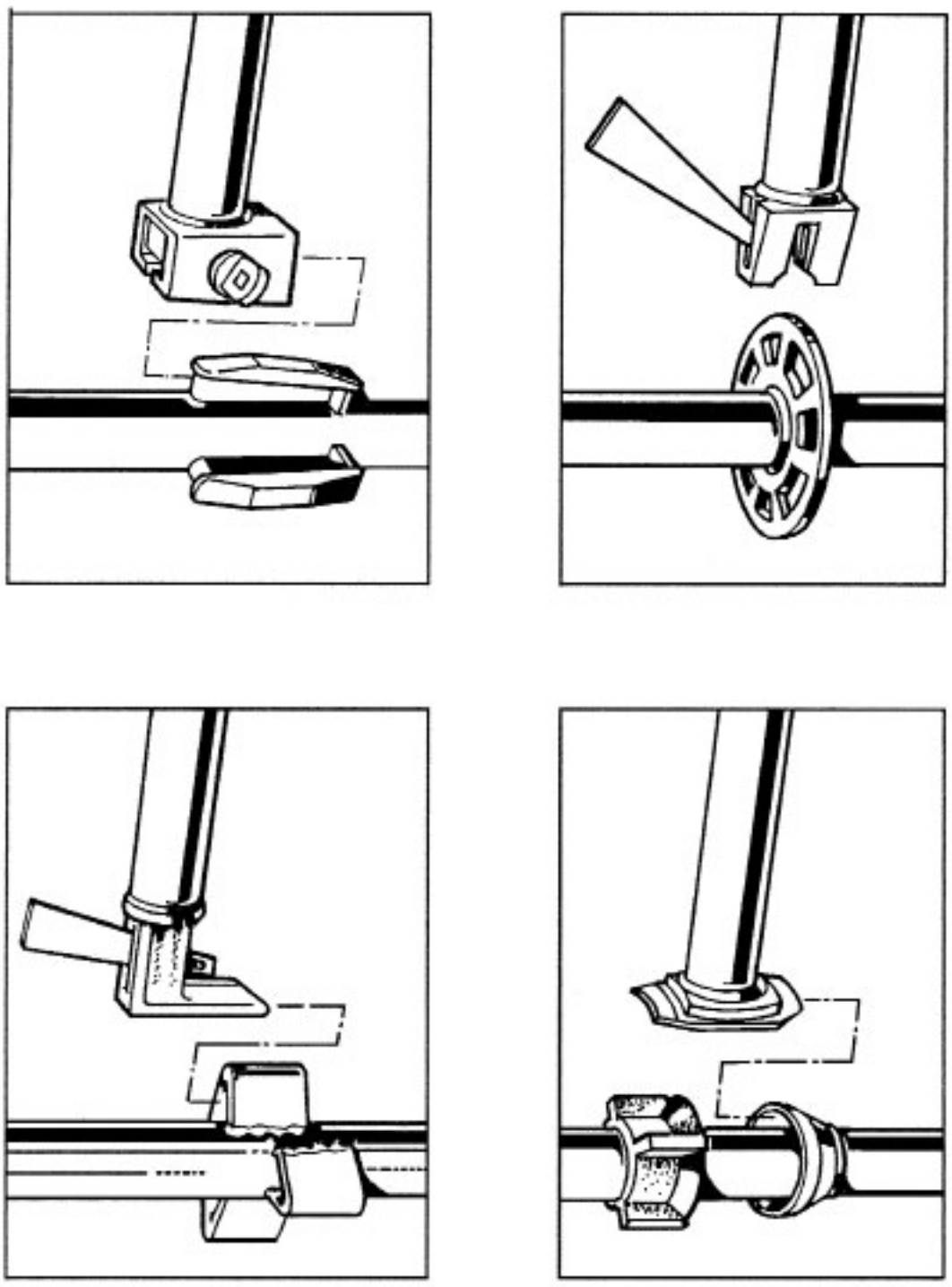


Figure 9: Some types of proprietary clamping or wedging arrangement

Enquiry

If you wish to enquire about this Code of Practice 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 also be found by visiting our Home Page on the Internet. Address of our Home Page is http://www.labour.gov.hk.

Complaints

If you have any complaints about unsafe workplaces and practices, please call the Labour Department's Occupational Safety and Health complaint hotline at 2542 2172. All complaints will be treated in the strictest confidence.

Occupational Safety and Health Branch
Labour Department

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