



BS 5973:1981

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Code of practice for
**Access and working scaffolds and
special scaffold structures in steel**

(Formerly CP 97 : Parts 1 and 3)

Code de bonne pratique pour les échafaudages d'accès et de travail et pour les
charpentes d'échafaudage spéciales en acier

Richtlinie für Zugangs- und Arbeitsgerüste sowie besondere Stahlrüstungen

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Foreword

In CP 97 : Part 1 and Part 3 it was intended to cover all types of construction in metal scaffolding. It has now been decided to publish separate codes of practice for falsework and for suspended scaffolds. This code combines the recommendations of CP 97 : Parts 1 and 3, with the exception of those dealing with falsework, and contains additional information. CP 97 : Part 1 and Part 3 are withdrawn on publication of this code.

This code has been prepared on a broader interpretation of the rules for design and construction, so that they can be applied to the very numerous variations of scaffolds which inevitably occur. It has been extended to include guidance on procedures for construction and dismantling, on the stability of scaffolds during various stages of these operations and on the responsibilities of users of scaffolding. Recommendations are included for the inspection of scaffolds and some guidance is given on prefabricated scaffold systems.

This code gives only general guidance and does not cover the innumerable circumstances resulting from the diversity of building facades and variety of purposes for which scaffolding is required.

Effective training of scaffolders is possibly the most essential factor in preventing accidents amongst both scaffolders and those who use scaffolds. The Construction Industry Training Board (CITB), many firms in the industry and several safety groups organize a wide range of training courses, not only for scaffolders, but for chargehand scaffolders, site supervisors who may have to inspect scaffolds, general foremen and safety officers.

The importance of training was recognized in the report of a Subcommittee of the Joint Advisory Committee on Safety and Health in the Construction Industries entitled 'Safety in Scaffolding'*, which made recommendations for the training of scaffolders and for the issue of certificates of competence.

Such a certification scheme has now been developed and adopted by the large part of the industry covered by the agreements of the National Joint Council for the Building Industry, and the Civil Engineering Construction Conciliation Board. The scheme, known as the Construction Industry Scaffolders Record Scheme, is organized by the CITB, who run training courses in basic and advanced scaffolding and issue and control individual training record cards. Scaffolders are grouped into three categories, trainee, basic scaffolder and advanced scaffolder and before scaffolders can be classed as basic or advanced they must have completed the appropriate courses and have had specific minimum experience.

The scheme applies, at present, only to scaffolders who work on scaffolding more than 5 m (16.5 ft) high.

Participation in this scheme is not a legal requirement, but the scheme should lead to a general raising of the level of expertise throughout the industry. It is important to note that the legal requirements relating to the training of workers in the Health and Safety at Work etc., Act 1974 and to the competence and experience of scaffolders in the Construction (Working Places) Regulations 1960 apply to *all* scaffolding work.

This code of practice represents a standard of good practice. Compliance with it does not confer immunity from relevant legal requirements, including regulations and byelaws.

*Obtainable from HMSO.

British Standard Code of practice for

Access and working scaffolds and special scaffold structures in steel

Section one. General

1. Scope

This code of practice is a guide for the design, construction and use of common scaffolds in steel, normally used in construction, maintenance, repair and demolition work, excepting those for the support of permanent work, commonly referred to as temporary works or falsework, and suspended scaffolds. Recommendations for falsework may be found in BS 5975 and recommendations for suspended scaffolds may be found in BS 5974.

The recommendations of this code relate to steel scaffold tube of grade 13 steel with an outside diameter of 48.3 mm and a wall thickness of 4 mm. It is assumed that the tube and scaffold fittings, when new, comply with the requirements of BS 1139. However, the use in access scaffolding of tubes of other dimensions and strengths is not precluded by this code and 39.5 and 39.7.3 provide a limited amount of data on aluminium tube complying with the requirements of BS 1139. When other tubes are used, the structural calculations should be carried out using the properties of the tubes used and the structures, when assembled, should have similar characteristics to scaffolding constructed with the tube recommended in this code. Section six provides some technical data and guidance on calculations.

2. References

The titles of the standards publications referred to in this standard are listed on the inside back cover.

3. Definitions

For the purposes of this British Standard, the following definitions apply (see figures 1 and 2).

3.1 Types and dimensions of scaffolds and buildings

3.1.1 base lift. See foot lift (3.1.8).

3.1.2 bay. The space between the centre lines of two adjacent standards along the face of a scaffold.

3.1.3 bay length. The distance between the centres of two adjacent standards, measured horizontally.

3.1.4 building. A building or structure or other facade against which the scaffold is constructed.

3.1.5 height. The height measured from the foundation to the top assembly of ledgers and transoms (cf. lift height).

3.1.6 length. The length of a scaffold between its extreme standards, sometimes designated by the number of bays (cf. bay length).

3.1.7 lift. The assembly of ledgers and transoms forming each horizontal level of a scaffold.

3.1.8 foot lift. A lift erected near to the ground.

3.1.9 lift height. The vertical distance between two lifts, measured centre to centre.

3.1.10 lift head room. The clear distance between a platform and the tubular assembly of the lift above.

3.1.11 pair of standards. The standards forming the frame at right angles to the building.

3.1.12 normal facade. A facade which permits the fixing of through ties or non-movable ties.

3.1.13 abnormal facade. A facade which does not permit the fixing of through ties or non-movable ties.

3.1.14 scaffold. A temporarily provided structure which provides access, or on or from which persons work or which is used to support materials, plant or equipment.

3.1.15 free-standing scaffold. A scaffold which is not attached to any other structure and is stable against overturning on its own account or, if necessary, assisted by guys or rakers and anchors.

3.1.16 independent tied scaffold. A scaffold which has two lines of standards, one line supporting the outside of the deck and one the inside. The transoms are not built into the wall of the building. It is not free standing, being supported by the building (see figure 2).

3.1.17 putlog scaffold. A scaffold which has one line of standards to support the outside edge of the deck and utilizes the wall being built or the building to support the inside edge (see figure 1).

3.1.18 slung scaffold. A scaffold hanging on tubes, ropes or chains from a structure overhead. It is not capable of being moved or lowered.

3.1.19 suspended scaffold. A scaffold hanging on ropes which is capable of being suspended or raised and lowered.

3.1.20 width. The width of a scaffold measured at right angles to the ledgers from centre to centre of the uprights or interclear as stated. Sometimes designated by the number of boards within the uprights and the number beyond the uprights on extended transoms.

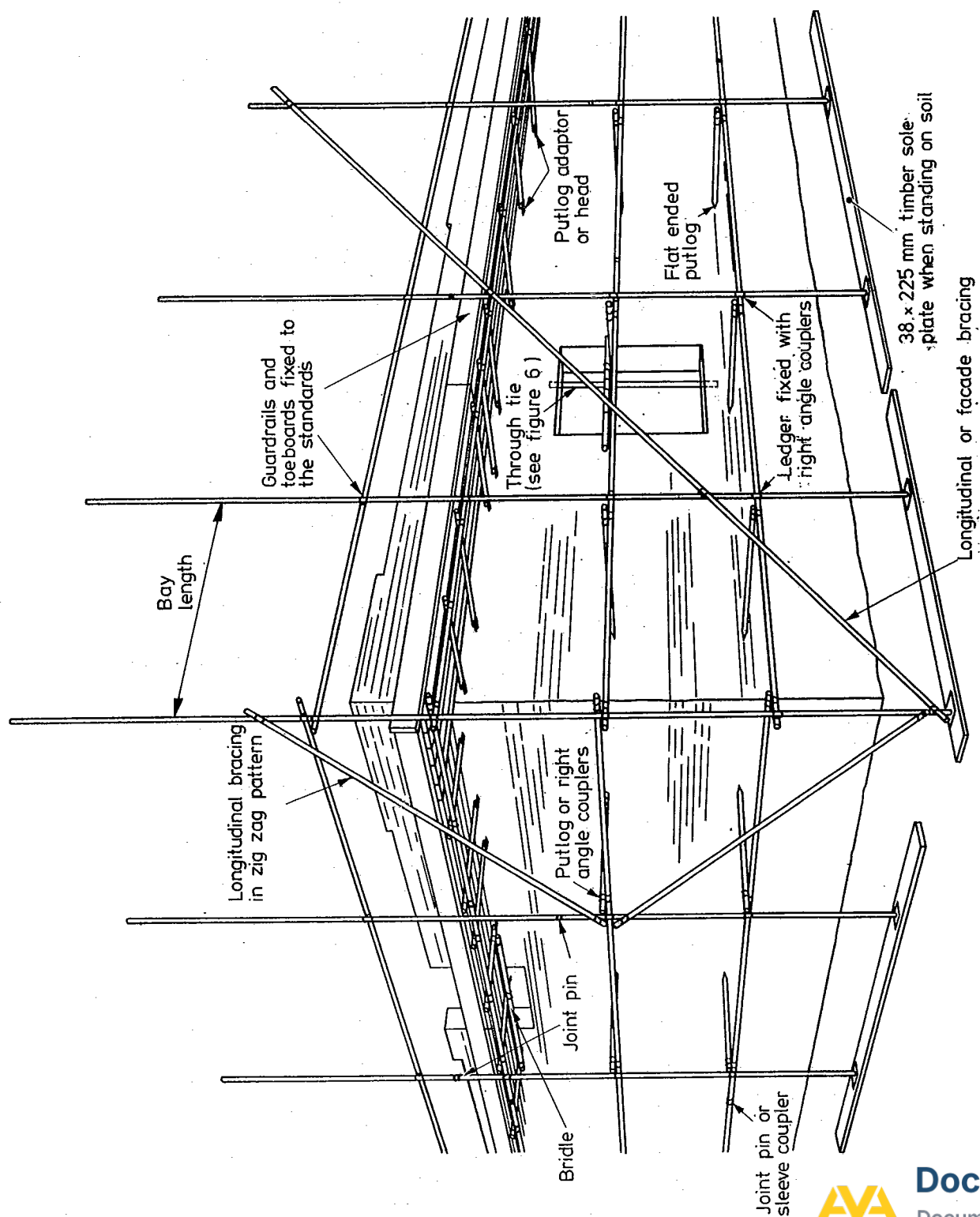
3.2 Tubular members and beams

3.2.1 brace. A tube placed diagonally with respect to the vertical or horizontal members of a scaffold and fixed to them to afford stability.

3.2.2 cross brace. See ledger brace (3.2.6).

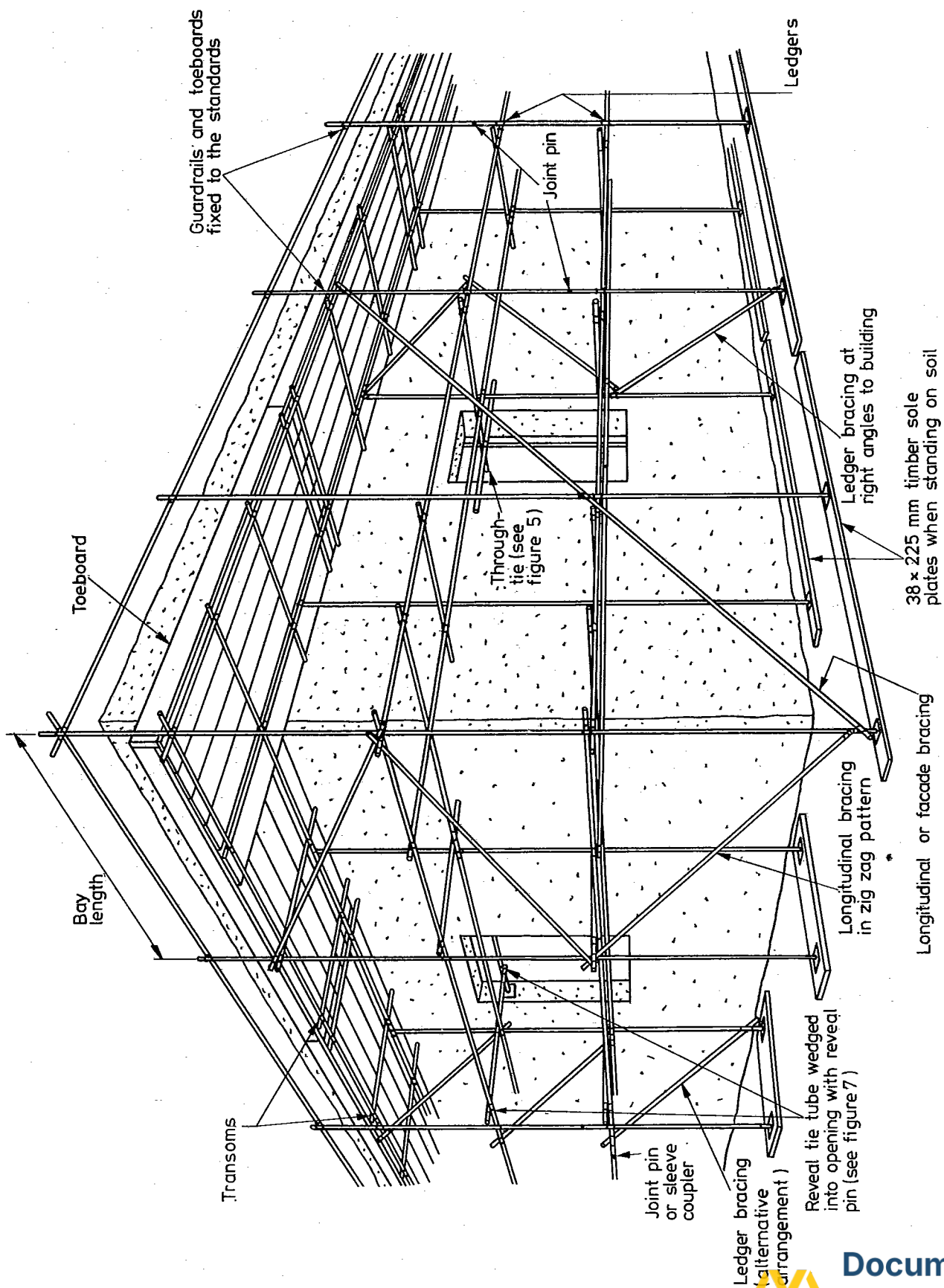
3.2.3 facade brace. A brace parallel to the face of a building.

- 3.2.4 face brace.** See facade brace (3.2.3).
- 3.2.5 knee brace.** A brace across the corner of an opening in a scaffold to stiffen the angles or to stiffen the end support of a beam.
- 3.2.6 ledger brace.** A brace at right angles to the building.
- 3.2.7 longitudinal brace.** A brace generally in the plane of the longer dimension of the scaffold, particularly in birdcages.
- 3.2.8 plan brace.** A brace in a horizontal plane.
- 3.2.9 transverse brace.** A brace generally in the plane of the shorter dimension of the scaffold.
- 3.2.10 bridle.** A horizontal tube fixed across an opening or parallel to the face of a building to support the inner end of a putlog transom or tie tube.
- 3.2.11 vertical bridle.** A vertical tube performing the same function as a bridle.
- 3.2.12 inside or outside bridle.** A bridle either inside or outside a building wall.
- 3.2.13 butt tube.** A short length of tube.
- 3.2.14 butting tube.** A tube which butts up against the facade of a building or other surface to prevent the scaffold moving towards that surface.
- 3.2.15 chord.** The principal longitudinal member(s) of a beam or truss.
- 3.2.16 chord stiffener.** A tube fixed at right angles to the chord of a prefabricated rafter, beam or truss for the purpose of preventing buckling.
- 3.2.17 guardrail.** A member incorporated in a structure to prevent the fall of a person from a platform or access way.
- 3.2.18 end guardrail.** A guardrail placed across the end of a scaffold or used to isolate an unboarded part.
- 3.2.19 guardrail post.** A puncheon supporting a guardrail.
- 3.2.20 ledger.** A longitudinal tube normally fixed parallel to the face of a building in the direction of the larger dimensions of the scaffold. It acts as a support for the putlogs and transoms and frequently for the tie tubes and ledger braces and is usually joined to the adjacent standards.
- 3.2.21 puncheon.** A vertical tube supported at its lower end by another scaffold tube or beam and not by the ground or on a deck.
- 3.2.22 purlin.** A tube secured to the rafters of a building and parallel to the ridge for the purpose of attaching the roof covering and to act as a top chord stiffener for the rafter beams.
- 3.2.23 putlog.** A tube with a flattened end, to rest in or on part of the brickwork or structure.
- 3.2.24 rafter and rafter beam.** A transverse tube, beam or truss in a building spanning across a roof or from the eaves to the ridge.
- 3.2.25 raker.** An inclined load-bearing tube.
- 3.2.26 reveal tube.** A tube fixed by means of a threaded fitting or by wedging between two opposing surfaces of a structure, e.g. between two window reveals, to form an anchor to which the scaffold may be tied.
- 3.2.27 sheeting rail.** A horizontal tube fixed to the verticals of a scaffold to support the sheeting.
- 3.2.28 spine beam.** A longitudinal main beam spanning from end to end of a roof at the ridge or eaves.
- 3.2.29 standard.** A vertical or near vertical tube.
- 3.2.30 tie or tie assembly.** The components attached to an anchorage or the building or framed around a part of it or wedged or screwed into it with a tie tube. Used to secure the scaffold to the structure.
- 3.2.31 bolted tie.** An assembly of nuts, bolts, anchors, rings or tubes fixed into the surface of a building.
- 3.2.32 box tie.** An assembly of tubes and couplers forming a frame round a part of a building.
- 3.2.33 lip tie.** An assembly of tubes forming an L or J shaped hook round an inside surface of a building.
- 3.2.34 double lip tie.** A lip tie which is a push/pull tie, i.e. has a cross tube on the back and front of the wall.
- 3.2.35 prop tie.** An assembly of telescopic props and/or scaffold tube jacked or wedged between the floors of a storey inside a building and including a tie tube.
- 3.2.36 push/pull tie.** A tie which only acts to prevent the scaffold moving either towards or away from the building, e.g. a reveal tie, a box tie, a double lip tie, a bolted tie with a tie tube.
- 3.2.37 movable tie.** A tie which may be temporarily moved for the execution of work (see 9.1.2).
- 3.2.38 non-movable tie.** A tie which will not be moved during the life of a scaffold, as agreed between the user and the scaffold erector (see 9.1.2).
- 3.2.39 reveal tie.** The assembly of a reveal tube with wedges or screwed fittings, and pads, if required, fixed between opposing faces of an opening in a wall together with the tie tube.
- 3.2.40 through tie.** A tie assembly through a window or other opening in a wall.
- 3.2.41 wire tie or band tie.** An assembly of a ring anchor and wire or steel banding used to tie the scaffold to the building.
- 3.2.42 tie tube.** A tube used to connect a scaffold to an anchorage.
- 3.2.43 transom.** A tube spanning across ledgers to form the support for boards or units forming the working platform or to connect the outer standards to the inner standards.
- 3.2.44 butting transom.** A transom extended inwards to butt the building to prevent the scaffolding moving towards the building.
- 3.2.45 needle transom.** A transom extending from or into a building.
- 3.2.46 sway transom.** A transom extended inwards in contact with a reveal or the side of a column to prevent the scaffold moving sideways (see figure 6).
- 3.3 Scaffold couplers and fittings**
- 3.3.1 base plate.** A metal plate with a spigot for distributing the load from a standard or raker or other load-bearing tube.
- 3.3.2 adjustable base plate.** A metal base plate embodying a screwjack.
- 3.3.3 board-clip.** A clip for fixing a board to a scaffold tube.
- 3.3.4 toeboard clip.** A clip used for attaching toeboards to tubes.
- 3.3.5 end toeboard clip.** A similar device to 3.3.4 for end toeboards.



NOTE: This drawing should be read in conjunction with the text.

Figure 1. Typical putlog scaffold



NOTE: This drawing should be read in conjunction with the text.

Figure 2. Typical independent tied scaffold

3.3.6 coupler. A component used to fix scaffold tubes together.

3.3.7 check coupler or safety coupler. A coupler added to a joint under load to give security to the coupler(s) carrying the load.

3.3.8 fixed finial coupler. A coupler to fix a tube across the end of another at right angles in the same plane, as in the handrail.

3.3.9 parallel coupler. A coupler used to join two tubes in parallel.

3.3.10 purlin, rafter or ridge coupler. Special angle or variable angle couplers for joining members in sheeted buildings and roofs.

3.3.11 putlog coupler. A coupler used for fixing a putlog or transom to a ledger, or to connect a tube used only as a guardrail to a standard.

3.3.12 right angle coupler. A coupler used to join tubes at right angles.

3.3.13 sleeve coupler. An external coupler used to join one tube to another coaxially.

3.3.14 supplementary coupler. Coupler(s) added to a joint to back up the main coupler taking the load when the estimated load on the joint is in excess of the safe working load of the main coupler.

3.3.15 swivel coupler. A coupler used for joining tubes at an angle other than a right angle.

3.3.16 swivel finial coupler. A coupler to fix a tube across the end of another in the same plane but at an angle, as the handrail to a staircase.

3.3.17 dowel pin. See spigot pin (3.3.34).

3.3.18 fittings. A general term embracing components other than couplers.

3.3.19 forkhead. A U-shaped housing for assembly on the end of a tube to accept bearers.

3.3.20 adjustable forkhead. A forkhead fitted with a threaded spindle and nut to give adjustable height.

3.3.21 rocking forkhead or swivel forkhead. A forkhead to accept bearers at a range of angles.

3.3.22 hop up bracket or extension bracket. A bracket to attach usually to the inside of a scaffold to enable boards to be placed between the scaffold and the building.

3.3.23 interlock pin. See spigot pin (3.3.34).

3.3.24 joint pin. An expanding fitting placed in the bore of a tube to connect one tube to another coaxially (see spigot).

3.3.25 putlog adaptor. A fitting to provide a putlog blade on the end of scaffold tube.

3.3.26 retaining bar. A strip or device fixed across the top of the decking to hold it down.

3.3.27 reveal pin. A fitting used for tightening a reveal tube between two opposing surfaces.

3.3.28 roofing clip or sheeting clip. A fitting for fixing roof or wall sheeting to tubes in structures without the need for holes in the sheeting.

3.3.29 sheeting hook. A threaded rod hook with a washer and a nut used for attaching sheeting to tubes.

3.3.30 sole plate. A timber, concrete or metal spreader used to distribute the load from a standard or base plate to the ground.

3.3.31 spigot. An internal fitting to join one tube to another coaxially (see joint pin).

3.3.32 expanding spigot. A spigot incorporating an expanding device (see joint pin).

3.3.33 fixed spigot. A spigot permanently fixed to the end of a scaffold tube.

3.3.34 spigot pin. A pin placed transversely through the spigot and the scaffold tube to prevent the two from coming apart.

3.3.35 sill. See sole plate (3.3.30).

3.3.36 tension pin. See spigot pin (3.3.34).

3.4 Other terms in general use

3.4.1 anchorage. Component cast or fixed into the building for the purpose of attaching a tie.

3.4.2 brick guard. A metal or other fender filling the gap between the guardrail and toeboard, and sometimes incorporating one or both of these components.

3.4.3 castor. A swivelling wheel secured to the base of a vertical member for the purpose of mobilizing the scaffold.

3.4.4 gin wheel or block. A single pulley for fibre ropes attached to a scaffold for raising or lowering materials.

3.4.5 going. The horizontal distance between the nosings of two consecutive steps of a stair or terrace, measured in a horizontal line.

3.4.6 guy anchor. A pin or tube driven into the ground at approximately 45° to the horizontal to provide an anchorage for a rope.

3.4.7 inside board. A board placed between the scaffold and the building on extended transoms, or a hop-up bracket.

3.4.8 jib crane. A small crane specially adapted for pivotal mounting to a scaffold tube.

3.4.9 kentledge. Dead weight, built-in or added to a structure to ensure adequate stability.

3.4.10 retaining boards. See brick-guard (3.4.2).

3.4.11 rise. The vertical distance between two steps of a stair or terrace.

3.4.12 scaffold board. A softwood board generally used with similar boards to provide access, working platforms and protective components such as toeboards on a scaffold (cf. scaffold unit).

3.4.13 scaffold or decking unit. The board(s) or unit forming the working platform.

3.4.14 sheeting. Horizontal, vertical or inclined sheets of material, such as corrugated metal or plastic sheet, attached to a scaffold in order to provide protection from the effects of weather or alternatively to protect the surrounding area from the effects of works being carried out from the scaffold structure.

3.4.15 skirt. A short portion of vertical sheeting usually adjacent to the edge of a roof to give extra protection to the area enclosed immediately under the roof.

3.4.16 toeboard. An upstand at the edge of a platform, intended to prevent materials or operatives' feet from slipping off the platform.

3.4.17 end toeboard. A toeboard at the end of a scaffold or at the end of a boarded portion of it.

3.4.18 working platform. The deck from which building operations are carried out.

4. Units

The standard units of measurement used in this code are those of the International System of Units (SI). For further information reference should be made to BS 3763 and PD 5686.

In this code the term 'weight' has only been used to describe the gravitational or downward force exerted by a body which is given in newtons*. In the past the term 'weight' has also been used to describe the 'mass' of a body which is given in kilograms.

5. Statutory requirements

Attention is directed to Acts, Byelaws, Regulations and any other Statutory Requirements relating to matters dealt with in this code. The equipment should comply with these regulations and requirements. Its performance, use, inspection, testing and maintenance should also be in accordance with the appropriate regulations.

Amongst others, the following requirements, current at the date of publication of this code, relate to access and working scaffolds and special scaffold structures in steel:

- (a) Health and Safety at Work etc., Act 1974;
- (b) Factories Act 1961;
- (c) SI 94 The Construction (Working Places) Regulations 1966;
- (d) SI 1580 Construction (General Provisions) Regulations 1961;
- (e) Construction (General Provisions) Regulations (NI) 1963;
- (f) Construction (Lifting Operations) Regulations (NI) 1963;
- (g) Construction (Working Places) Regulations (NI) 1963;
- (h) Highway Act 1971;
- (i) Public Health Act 1930;
- (j) London Building (Amendment) Act 1939;
- (k) Building (Scotland) Act 1959.

6. Equipment

6.1 General. All materials should, when new, comply with the requirements of the appropriate British Standards. Used materials which are in satisfactory condition may not always comply with the requirements of these standards. Due allowance has been made for this fact in this code.

The materials and components and their method of assembly should comply with the relevant statutory regulations. A list of the other British Standards which give details of materials and components which will satisfy the recommendations of this code are given in appendix A.

Section two makes recommendations on the care of the materials and on the degree of wear and tear which should not be exceeded if the materials are to be included in a structure which is intended to be in accordance with this code.

6.2 Steel tubes. Tubes are normally supplied with a maximum length of 6.40 m and are available in shorter lengths by request. They should comply, when new, with the requirements of BS 1139, which specifies the minimum properties, dimensions and tolerances (see 39.5).

Used tubes should be free from cracks, splits and excessive corrosion 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.

6.3 Couplers and fittings. Scaffold couplers and other fittings should, when new, comply with the requirements of the relevant British Standard. If they have characteristics which do not comply with the relevant British Standard, then account should be taken of this in the design and construction of the scaffolding. Fittings for which there is no standard should be used in accordance with the recommendations and data provided by the manufacturer or supplier.

6.4 Decking units

6.4.1 General. There are four groups of decking units, used to construct working platforms, as follows:

- (a) Timber scaffold boards of nominal cross sections 38 mm x 225 mm. (For strength data, see 39.6.)
- (b) Components of similar width to those in (a), but fabricated, for example, of laminated timber or metal, with equal or greater strength.
- (c) Timber boards of other thicknesses or greater width than those in (a).
- (d) Components of greater width than those in (a) and fabricated in various ways, such as platforms or lightweight staging.

All decking should have adequate strength to meet the recommendations for the appropriate duty of table 1. To ensure this, timber scaffold boards should comply with the requirements of BS 2482.

NOTE. Unless otherwise indicated, the use of the word 'board' in this document implies the decking described in (a) but the principles apply to all types.

6.5 Other equipment. It is recommended that all other equipment should, when new, comply with the requirements of the appropriate British Standard. Where there is no appropriate British Standard, the strength of materials used should comply with the recommendations and data supplied by the manufacturer.

7. Care of equipment

7.1 General. When not in use, equipment should be cleaned and protected from deterioration.

Materials which show excessive corrosion or deterioration should be discarded.

7.2 Tube. Hot dipped galvanized, painted or unprotected tube may be used in scaffolding structures. Unprotected steel 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.

Before painted tubes are used, the paint should be firm and dry.

Bent steel tube may be straightened by using a crow or a reeling machine. This operation should be carried out under competent supervision. Reeling should not be used to straighten bent aluminium scaffold tube.

As aluminium scaffold tube is heat treated, heat should not be applied to it by welding, flame cutting etc.,

unless this is carried out under the conditions recommended in CP 118.

*1 kN = 101.972 kgf = 224.809 lbf.

Table 1. Access and working scaffolds of tube and couplers

Duty	Use of platform	Distributed load on platforms	Max. number of platforms	Commonly used widths using 225 mm boards	Max. bay length
Inspection and very light duty	Inspection, painting, stone cleaning, light cleaning and access.	kN/m ² 0.75	1 working platform	3 boards	m 2.7
Light duty	Plastering, painting, stone cleaning, glazing and pointing.	1.50	2 working platforms	4 boards	2.4
General purpose	General building work including brickwork, window and mullion fixing, rendering, plastering.	2.00	2 working platforms + 1 at very light duty	5 boards or 4 boards + 1 inside	2.1
Heavy duty	Blockwork, brickwork, heavy cladding.	2.50	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	Masonry work, concrete blockwork, and very heavy cladding.	3.00	1 working platform + 1 at very light duty	6 to 8 boards	1.8

NOTE. The loads and number of loaded platforms and widths of scaffold from this table have been used in the calculations given in appendix B.

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

Corroded tube should be wire brushed and the extent of the corrosion assessed by an expert examiner. This examination may be carried out by eye and should have as its basis the observation of the surface characteristic of a tube which has lost about 10 % of its original minimum specified weight. All tubes failing this examination should be rejected.

7.3 Couplers and fittings. All couplers and fittings should be properly maintained and examined before use. The nuts should be run on their bolts to ascertain that they have a free-running fit.

Heat should not be applied to couplers and fittings, free parts, nuts or bolts.

Spanners and podgers should have lengths as recommended by the coupler manufacturer. Torque should not be applied to a coupler through an ill-fitting spanner.

7.4 Gin wheels and gin wheel ropes. Gin wheels should be maintained in a free-running condition with the shaft not turning in the side plates.

All ropes for use with gin wheels should be inspected at every change of job and, in any event, every six working months.

The identification tag and SWL (safe working load) tag should be replaced where necessary.

Ropes which have been used on stone cleaning contracts or in any location where there are aggressive chemicals, should be carefully inspected for deterioration.

7.5 Scaffold boards. Scaffold boards 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 may be cut down to form boards of reduced length. Boards with decay or other defects and warped boards should not be used.

Section two. Standard scaffolds

8. Description of access scaffolding

8.1 General. Putlog and independent tied scaffolds are generally as defined in 3.1 and shown in figures 1 and 2. They are constructed in tubes and couplers for the purpose of providing working platforms adjacent to the surfaces of buildings. Guardrails and toeboards should be provided on all working platforms on a scaffold.

8.2 Putlog scaffolds. A putlog scaffold consists of a single row of uprights parallel to the face of the building and set as far away from it as is necessary to accommodate a platform of four or five boards with the inner edge of the platform as close to the wall as is practicable.

The standards are connected with a ledger fixed with right angle couplers and the putlogs are fixed to the ledgers with right angle or putlog couplers.

The blade end of the putlog tube or putlog adaptor is normally placed horizontally on the brickwork being built. However, where putlog scaffolds are erected against an

existing brick wall for repointing, the old putlog holes may be reused or others raked out. In this case the putlog blades may be inserted vertically.

Sole plates and base plates are usually used under each standard. The same number of ties as for an independent tied scaffold applies, as detailed in clause 9.

Where a putlog is required for a board support and it is opposite an opening in the building such as a window or doorway, the inside end of the putlog should be supported on an underslung bridle tube spacing between adjacent putlogs, as shown in figure 6, which also shows a method of tying through these openings.

Longitudinal bracing is required, at intervals not exceeding 30 m but, unlike independent tied scaffolds, ledger bracing is not required in the finished structure.

For brickwork, the lift height should be about 1.35 m, although for certain types of masonry a lower lift height may be necessary.

8.3 Independent tied scaffolds. An independent scaffold consists of a double row of uprights, with each row parallel to the building. The inner row is set as close to the building as is practicable. The distance between the lines of uprights should be the minimum necessary to accommodate the required number of boards and toeboards.

A variation may be adopted in which the row of standards nearest to the building can be set back about 300 mm from the building face so that one of the boards of the platform can be laid between the inside row of standards and the building face.

The uprights should be connected with ledgers parallel to the building and fixed with right angle couplers and with transoms fixed to the ledgers with putlog couplers to give platform widths as given in 15.1 and table 2.

Sole plates and base plates should be used under each standard when so recommended by clause 11.

The scaffold should be tied into the building at the frequency detailed in clause 9.

Longitudinal bracing is required at intervals not exceeding 30 m. Ledger bracing is generally fixed to alternate pairs of standards.

8.4 Duty of scaffolds

8.4.1 Loading. Access and working scaffolds may be specifically designed and constructed for any particular distributed or point load and for a variety of purposes. If no load rating is quoted by the specifier, it is recommended that the selection is made from table 1. For platform loadings on access towers and other types of scaffold, reference should be made to the relevant clause in section five.

8.4.2 Maximum bay lengths. The bay lengths depend on the height and loading of the scaffold. Table 1 gives maximum bay lengths of scaffolds with single standards (see figures 1 and 2).

8.4.3 Lift heights. The normal lift height for brickwork is 1.35 m, and for walk-through scaffolds is 2.0 m. In certain circumstances lifts greater than 2.7 m are required and are admissible provided the load applied to the standard is not greater than the value given in table 14 for the appropriate height.

8.5 Calculations required for the construction of access scaffolding

8.5.1 General. Unsheeted access and working scaffolds may be constructed up to a height of 50 m without calculations provided that they are constructed in accordance with the recommendations of sections two and three, and that they do not carry greater loads nor have greater bay lengths than those given in table 1. A further recommendation is that they are not subjected to loading of materials by mechanical means, such as by rough terrain fork lift trucks.

All other forms of scaffold should be subject to design and calculation. Section five details special scaffolds which are the subject of calculation, and section six gives technical data for calculations of scaffolding heights and appendix B gives examples of the calculations.

8.5.2 Sheeted scaffolds. Where sheets are added to a scaffold, for instance for the protection of the public or where weather protection sheeting is attached to part of it for the benefit of the workmen using the scaffold, special consideration should be given to tie spacing. The scaffold may also need to be specially designed with consideration given to the additional wind forces (cf. 9.3).

When a temporary roof is to be fixed to the top of an access scaffold, the scaffold and its attachments to the building should be specially designed.

9. Tying scaffolding to building facades

9.1 General

9.1.1 Ties. Ties should be provided to resist inward and outward movement of the scaffold and, where possible, should be fixed in such a way that they will provide restraint additional to that obtained from the facade bracing.

The recommendations given in 9.1.2 to 9.1.4 refer both to putlog scaffolds and to independent tied scaffolds.

It is important to ensure that the strength of the building structure at the location of a tie is adequate to sustain the loads which will be transferred to it. This applies particularly to any proposed use of parapets or architectural features (e.g. rain-water pipes, balustrades, railings, as it is frequently found that the strength of such features is negligible.

9.1.2 Classification of facades and ties. The recommendations for the methods for tying access scaffolding in 9.2 to 9.8 generally refer to normal building facades. In circumstances where ties cannot be fixed to or through the facade, the facade should be regarded as abnormal and should be dealt with in accordance with the recommendations of 9.9.

Two classes of tied scaffold are considered.

- (a) Scaffold with movable ties.
- (b) Scaffold with non-movable ties.

In class (a) tied scaffolds, it is inevitable that an increased area of scaffold will be without ties when one is moved. Therefore the spacing of ties in circumstances where they may be temporarily moved should be closer than those which will not be moved. In putlog scaffolds, ties should be provided at the frequency of movable ties (see 9.2.1), and where appropriate, in accordance with 9.7.4.

9.1.3 First working lift. When a working lift is required at 1.35 m height, as in a putlog scaffold, or at 2 m height, as in an independent tied scaffold, and no firm part of the building has been constructed to attach a tie, a 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. Movement of the lower end should be prevented by a foot tie to the main scaffold or other suitable means.

9.1.4 Ties for small scaffolds without returns. When only two ties are required, it is preferable to place the ties towards the ends of a straight run of scaffold.

9.2 Ties for unsheeted scaffolds

9.2.1 Ties which may be temporarily removed. In the situation where ties may be temporarily moved, they should be maintained at such a frequency that there is always one for every 32 m² of scaffold area and they should be reasonably evenly distributed over the scaffold surface, both horizontally and vertically.

9.2.2 Ties which will not be moved. Ties which will not be moved during the use of a scaffold should be inserted and maintained at a frequency of one for every 40 m² of the scaffold surface and should be reasonably evenly distributed over the scaffold face area, both horizontally and vertically. For scaffolds greater than 50 m high, the tie spacing should be chosen by design but in any event should not exceed 40 m².

NOTE. These spacings may require modification when reveal ties are used (see 9.7.4).

9.3 Ties for sheeted scaffolds

9.3.1 Sheeted scaffolds in exposed locations. The recommendations given in 9.3.2 and 9.3.3 apply to scaffolds less than 25 m high in areas with a basic wind speed less than 46 m/s (see figure 31). In all other cases, special calculations should be carried out to assess the wind forces and the nature and spacing of ties to be used (see 39.10). Where these calculations indicate a closer spacing of ties than given in 9.3.2 and 9.3.3, this closer spacing should be used in the construction (see also 9.8.4).

9.3.2 Ties which may be temporarily moved. In the situation where ties may be temporarily moved, they should be maintained at such a frequency that there is always one for every 25 m² of scaffold area and they should be reasonably evenly distributed over the scaffold area, both horizontally and vertically.

9.3.3 Ties which will not be moved. Ties which will not be moved during the use of a scaffold should be inserted and maintained at a frequency of one for every 32 m² of the scaffold surface and should be reasonably evenly distributed over the scaffold face area, both horizontally and vertically.

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

9.5 Equivalent tying value of scaffold returns, buttresses and rakers. The stability of a scaffold may be achieved by means other than ties fixed to the surface of the building.

A single unjointed raking tube of up to 6 m in length, coupled at the top to the ledger at the second lift and tied back to the scaffold at the foot, may be considered

as equal to one tie. The raking tube should be external to the scaffold and at an angle of not more than 4 vertical to 1 horizontal (see also 9.8.2(d)).

The friction of the foundation of a scaffold may be regarded as providing adequate attachment of the lower 3 m of the scaffold.

Buttresses, either inside or outside of a scaffold providing they are of a width greater than that of the scaffold and are ledger braced, may be regarded as providing adequate attachment for a 3 m length of the scaffold on either side of the buttress.

Returns of scaffolds which are themselves effectively tied round the ends of building facades may be regarded as providing an adequate attachment of the scaffold to the facade for a 3 m length of the scaffold, measured from the corner.

9.6 Attachment of the tie tube to the tie point and the scaffold. The tie tube may be horizontal or sloping downwards away from the building. It should never slope upwards away from the building.

At the point where the attachment to the building is made, the building should be strong enough to resist the forces applied to it.

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

Where this hinders access along a platform, they may be attached to the inside ledger or upright only.

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

The couplers for ties set at right angles to the building and horizontally should be right angle couplers or another such arrangement of couplers which gives similar or adequate strength.

The couplers for ties set at an angle to the building may be swivels.

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 upright by fixing safety couplers beside the point of attachment.

9.7 Types of ties

9.7.1 Box ties. These ties (see figure 3) consist of an assembly of tubes and couplers arranged in the form of a square fixed around columns or other elements of the building, being wedged, where necessary, to resist both the inwards and outwards movement and give some degree of lateral restraint. Figures 3(b) and (c) show typical cases.

They should preferably be at the level of the scaffold lift and be joined to both the inside and the outside ledgers or uprights, unless this impedes free access through the scaffold, when they may be fixed to the inside upright, in which case they should be adequately attached to resist the loading.

9.7.2 Lip ties. Where it is not possible to use box ties, lip ties may be used (see figure 4). These consist of an L-shaped arrangement of tubes and couplers to hook the scaffold behind elements of the building. They do not resist inward movement of the scaffold and should be accompanied by an adjacent butting transom or have two cross tubes, neither do they resist sway and accordingly are improved in performance by the use of a

sway transom as shown in figure 4(d). Sway transoms should not be regarded as a substitute for facade bracing. Care should be taken that the strength of any building feature utilized is adequate, particularly if this is a parapet or similar structure.

Lip ties may also be used over sills and under lintels. In these cases, it is infrequent that the sill or lintel tie can be on a level with a lift of the scaffold and accordingly they may be fixed to the inside uprights only or to a bridle tube fixed to two inside uprights. They should be accompanied by adjacent butting transoms and sway transoms.

In certain circumstances it may not be possible to fit cross butt tubes to form lip ties. Right angle couplers may be used as stops, provided there is at least a 25 mm lap onto a suitable part of the building.

9.7.3 Through ties

9.7.3.1 Through ties for independent tied scaffolds.

Through ties (see figure 5) rely on a tube across the inside of an opening such as a window in a building.

The inside tube should preferably be placed vertically and rest on the floor so that it cannot slip downward, but it may be placed horizontally.

The tie tube should preferably rest on the sill for the same reason but it may be placed under the lintel.

Tie tubes attached to a horizontal tube across the inside of the window or opening should be as close to one of the edges of the opening as possible.

Where it is not possible to fix an outside tube, the adjacent transoms should butt against the outside surface of the wall.

9.7.3.2 Through ties for putlog scaffolds. When a putlog is required to support boards and it is opposite a window opening, a bridle tube is frequently placed near the wall across the adjacent putlogs on either side of the window. The putlog opposite to the window is fixed to this.

This arrangement can be extended to form a through tie (as shown in figure 6) by extending the putlog tube inwards and connecting it to a vertical or horizontal bridle inside the wall.

9.7.4 Reveal ties. In cases where it is impracticable to drill into the surface of a building for screw or anchor ties, when the quality of the fabric of the building is not known and where it is impracticable to open windows for tube and coupling ties, the attachment of the scaffold to these buildings should be made by reveal ties (see figure 7).

Opposing faces of a building surface, such as the two opposing sides of a window opening or alternatively the underside of the lintel beam and the sill if this is not sloping, may be used to make an attachment of the

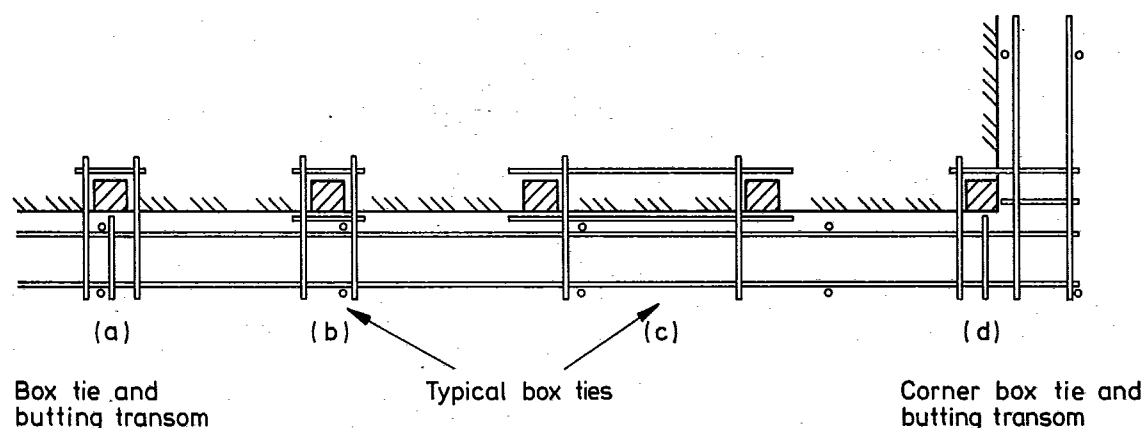


Figure 3. Plan of typical box ties

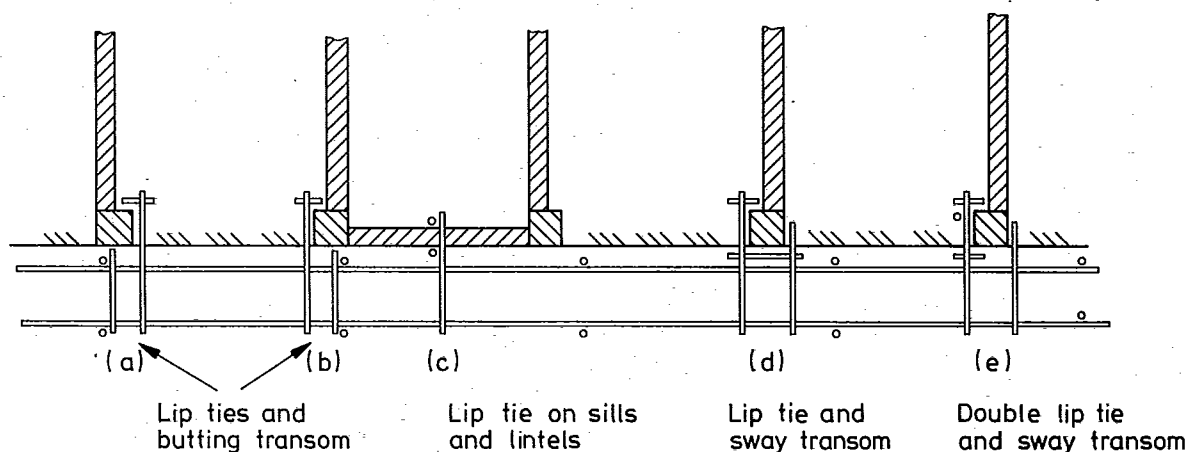
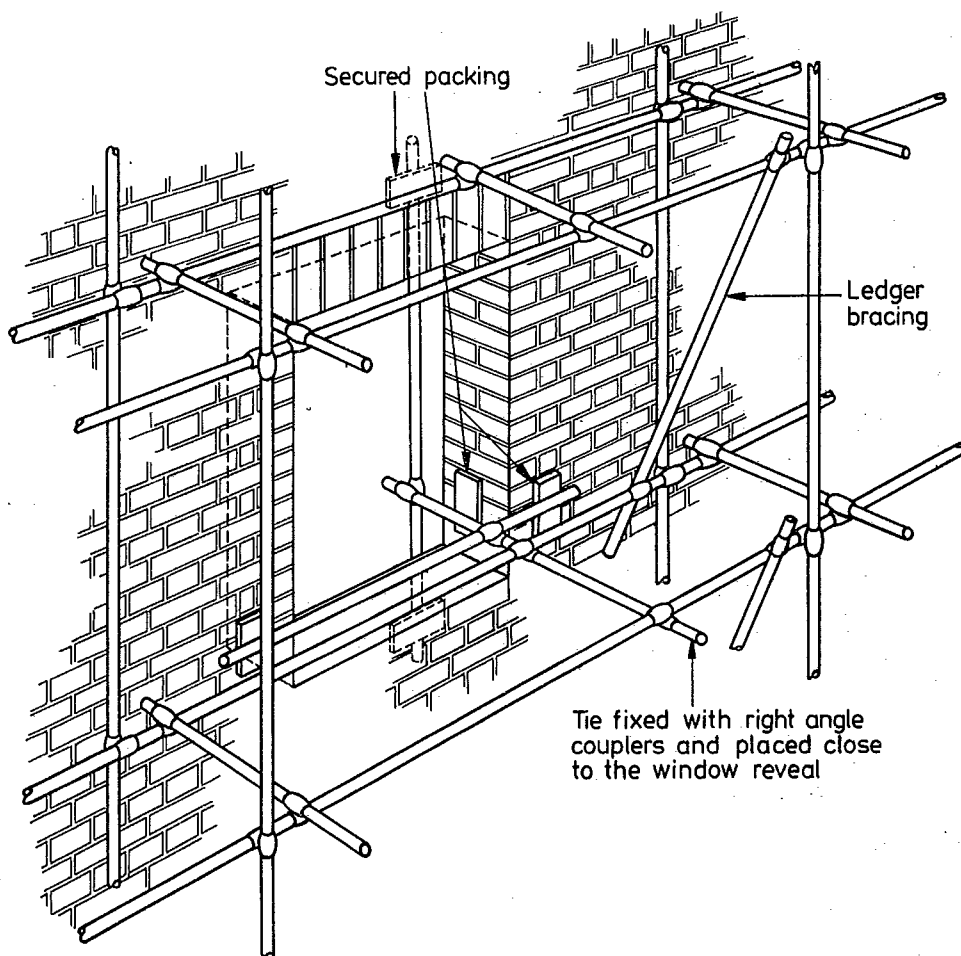


Figure 4. Plan of typical lip ties and sway transoms



NOTE. This drawing should be read in conjunction with the text.

Figure 5. Through tie for independent tied scaffold

scaffold to the building by means of a tube wedged or jacked tight between the opposing faces.

It is essential that the manner of wedging the reveal tube into the opening be firm and reliable and, if possible, positive rather than by friction, i.e. if the reveal tube can be fixed behind indentations or masonry features advantage should be taken of this.

For most building surfaces, the reveals are plain and parallel and should not be marked or damaged. For these, it is frequently necessary to place a packing between the ends of the reveal tube and the surface so that damage does not occur. The timber packs should be thin so as to reduce shrinkage (a thickness of 10 mm is ideal). It is not expected that they should spread the load over the surface of the reveal but that they should grip it and protect it at the same time. A 75 mm square area of wood is adequate.

As the preferred method, a reveal pin may be used at one end of the reveal tube. This consists of a small plate on which is mounted a threaded bar and nut. The assembly should be placed inside the bore of the reveal tube and the nut adjusted until the reveal tube is expanded into the opening, gripping it with considerable force.

The tie tube should be fixed to the reveal tube with a right angle coupler as near as possible to the end opposite to the reveal pin and in all cases within 150 mm of the face of the opening. It should also be fixed to the scaffold

in two places with right angle couplers (see figure 7) but other arrangements may also be satisfactory.

Reveal ties normally rely on friction and, being also usually packed with timber, should be checked for tightness by the user frequently during the life of the scaffold.

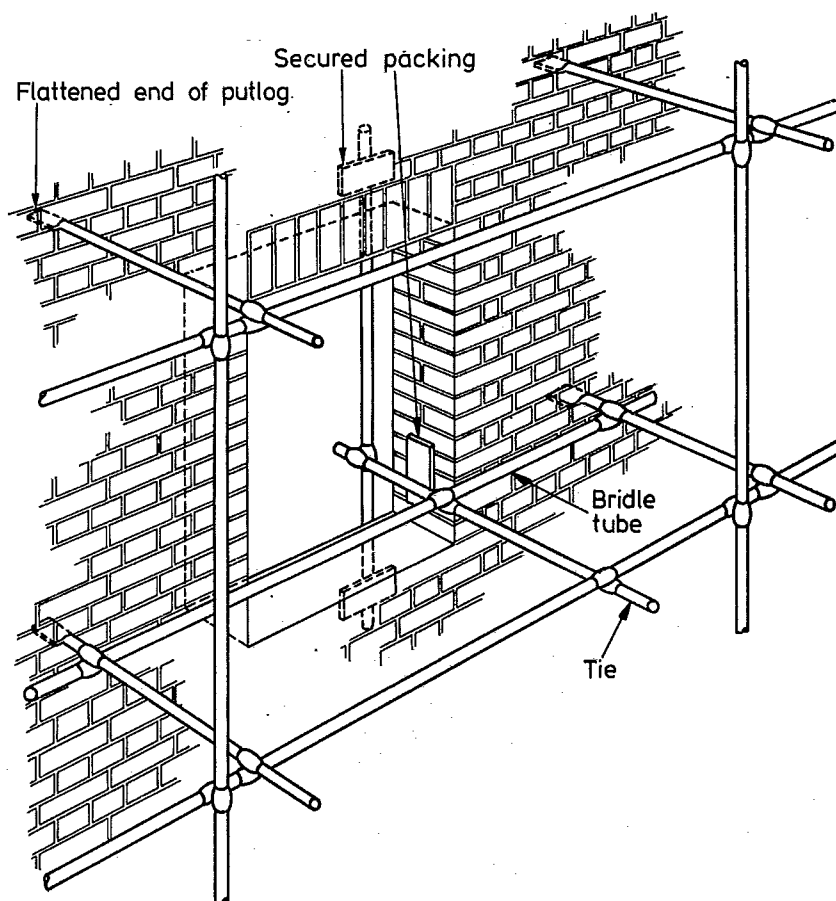
There are other methods of providing reveal ties, for instance by utilizing props and struts.

The reliance on reveal ties throughout a scaffold is undesirable although sometimes necessary. Ideally they should not be used for more than 50 % of the total number of ties. Where it is unavoidable that they comprise more than 50 % of the total number of ties in a scaffold, they should be provided at a frequency of one for every 22 m² of scaffold for the case described in 9.2.2. Where circumstances prevent the use of any through or anchor ties, the scaffold should be specially designed.

9.7.5 Tie tube adaptors. Tubes fitted with end plates (see figure 8) may be used when it is possible to drill the element of the building to which the tie is to be attached and fix the end plate to it with expanding bolts. On new work, cast-in sockets can be used.

The tube welded to the drilled end plate may be standard scaffold tube, or tube of 60.3 mm external diameter to receive standard scaffold tube inside it, the two tubes being fixed together with friction bolts.

Offset ties (such as shown in figure 8(d)) enable fixing of the scaffolding to the building so that the window



NOTE. This drawing should be read in conjunction with the text.

Figure 6. Through tie for a putlog scaffold on a bridle tube

frames can be placed between the tie tube and the column.

A variety of scaffold fittings and half fittings may also be suitably adapted, by securely welding on bolts or drilling bolt holes, to become satisfactory tie fittings.

9.7.6 Cast-in and drilled-in anchorages. A variety of screwed plates, sockets and nuts are available for setting into the concrete during pouring, in a similar manner to form-work anchors, for subsequent use as scaffold ties. The appropriate bolts should be welded to scaffold tubes or scaffold fittings for use as tie attachments. Alternatively, the bolts may be used directly to attach this type of fitting (see figure 8). Ring bolts may also be used.

A variety of expanding anchor sockets are available for fixing into holes drilled into hardened concrete or brickwork. The attachments are similar to cast-in anchors. When drilling into brickwork, the anchor should be placed in the solid core of the brick and not near its edges.

If the brickwork has been rendered, the location of the centre of the bricks should be found by drilling test holes and inspecting the location of the courses and brick ends through the holes. Care should be taken that the facade material is an integral structural material and not a surface cladding.

When intending to fix anchorages, data provided by manufacturers and based on tests carried out with substrates comparable to that being used may be used, applying a factor of safety of 2.0 on the average failure load quoted to determine the safe working load. Should the

cladding material be suspect, then one or other of the following methods of assessment should be used.

(a) *Method A.* A proof load of 1.25 times the design load should be adopted and at least 1 in 20 anchorages, subject to a minimum of 1 anchorage, tested to confirm whether or not they will safely support this load.

(b) *Method B.* At least 1 in 50 anchorages, subject to a minimum total of 3 anchorages, chosen in areas where, by inspection, strength is felt likely to be least should be tested to destruction. The safe working load may then be determined by dividing the lowest failure value found by a factor of safety of 1.5.

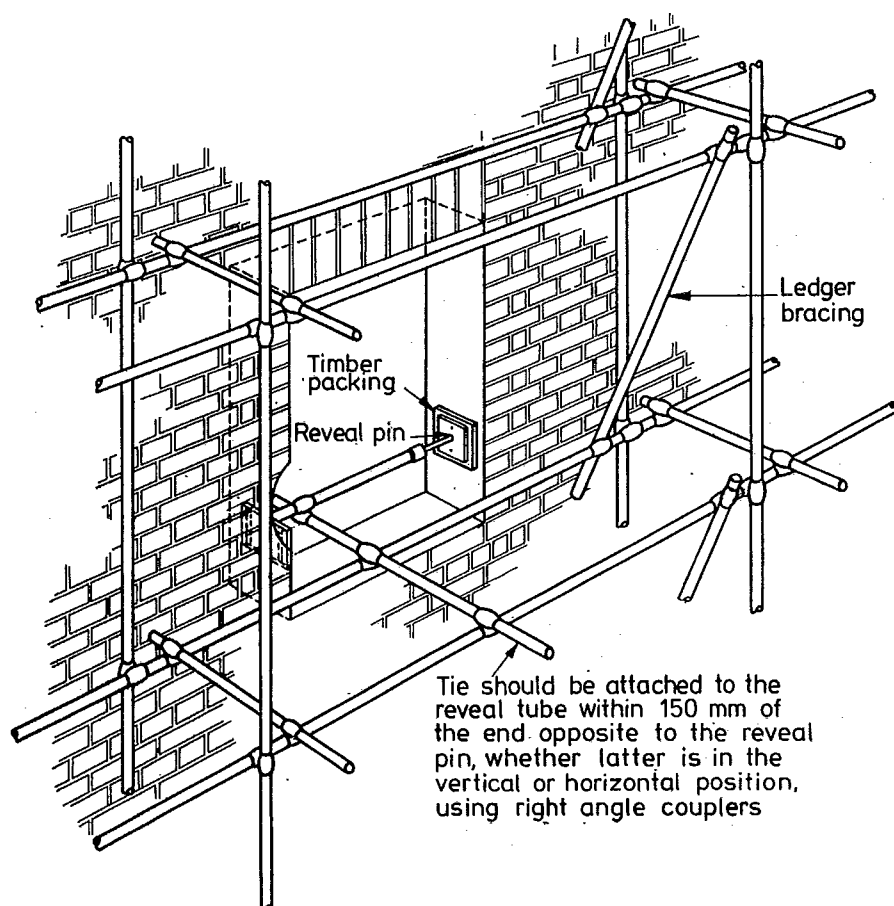
9.7.7 Ring bolts. Typical ring bolts are shown in figures 9 and 10, and may be of two sizes:

(a) with rings of between 50 mm and 55 mm internal diameter through which scaffold tube may be passed to form a tie assembly;

(b) with smaller rings for use with wire or steel banding ties.

In case (b), the tube and fittings assembly should be such that it prevents the scaffold from moving inwards or outwards.

9.7.8 Wire and steel banding ties. Where the small ring anchor ties shown in figure 11 are used, the scaffold may be attached to the building or structure with 6 mm wire rope threaded through the ring and secured with a minimum of three turns. Steel banding of equivalent strength may also be used.



NOTE 1. This drawing should be read in conjunction with the text.

NOTE 2. The tube in the reveal can be in the vertical or horizontal position.

Figure 7. Reveal tie

When wire or banding is used, the tie does not prevent the scaffold from moving inwards to the building and accordingly such ties should be accompanied by adjacent butting and sway transoms.

Many elements of a building may afford opportunities for the attachment of wire ties and may be used provided they are of adequate strength. However, it should be realized that through weakness of design or attachment the serviceability of these elements is frequently negligible. The scaffold erector should always verify the strength and pull-out capabilities of these elements, which will include rainwater pipes, parapets and other architectural features, before any use is made of them. Where there is any doubt as to the suitability of such features, alternative attachment points should be found. Rainwater guttering should never be used for the attachment of ties.

When viewed in plan, tie tubes or banding ties should be set at right angles to the building unless they are intended to plan brace the scaffold from lateral movement. In this case, they may be set at an angle to the plan perpendicular to the building but should be fixed in pairs at opposing angles so as to afford lateral stability in both directions and should be accompanied by ties at right angles to the building to prevent outward movement.

9.8 Loads for which ties should be designed

9.8.1 Design of ties. Each tie comprises an anchorage to the structure served and a tying member connecting this to the scaffold. If a single anchorage is not strong enough

to provide a safe working capacity of 6.25 kN, two or more should be used or the design reconsidered.

9.8.2 Inwards/outwards capacity. Providing that the recommendations of 9.7.1 to 9.7.8 are followed, each tie assembly may be considered as having the following safe working capacity.

(a) *Box ties, lip ties and through ties.* All the ties shown in figures 3, 4, 5 and 6 will have an inwards and outwards capacity of 6.25 kN.

(b) *Reveal ties.* Where these rely solely on friction, there is no mechanical interlock and construction is in accordance with figure 7, loads should not exceed 3.5 kN. Where the reveal tube goes behind a load-bearing feature, it may be considered as a lip tie.

(c) *Cast-in and drilled-in anchorages.* The manufacturer should state the ultimate capacity of his anchorage components in various materials (see 9.7.6).

Where a tying member is a wire or steel band, a tube butting against the structure will be required in order to provide sufficient inwards strength.

(d) *Rakers.* These should be used in accordance with the angle of rake of the unbraced length as given in table 14.

9.8.3 Horizontal and vertical capacity. Except in special cases, the design should call for no vertical or horizontal capacity. But in the event of damage to the scaffold below, some vertical or horizontal strength will prove advantageous.

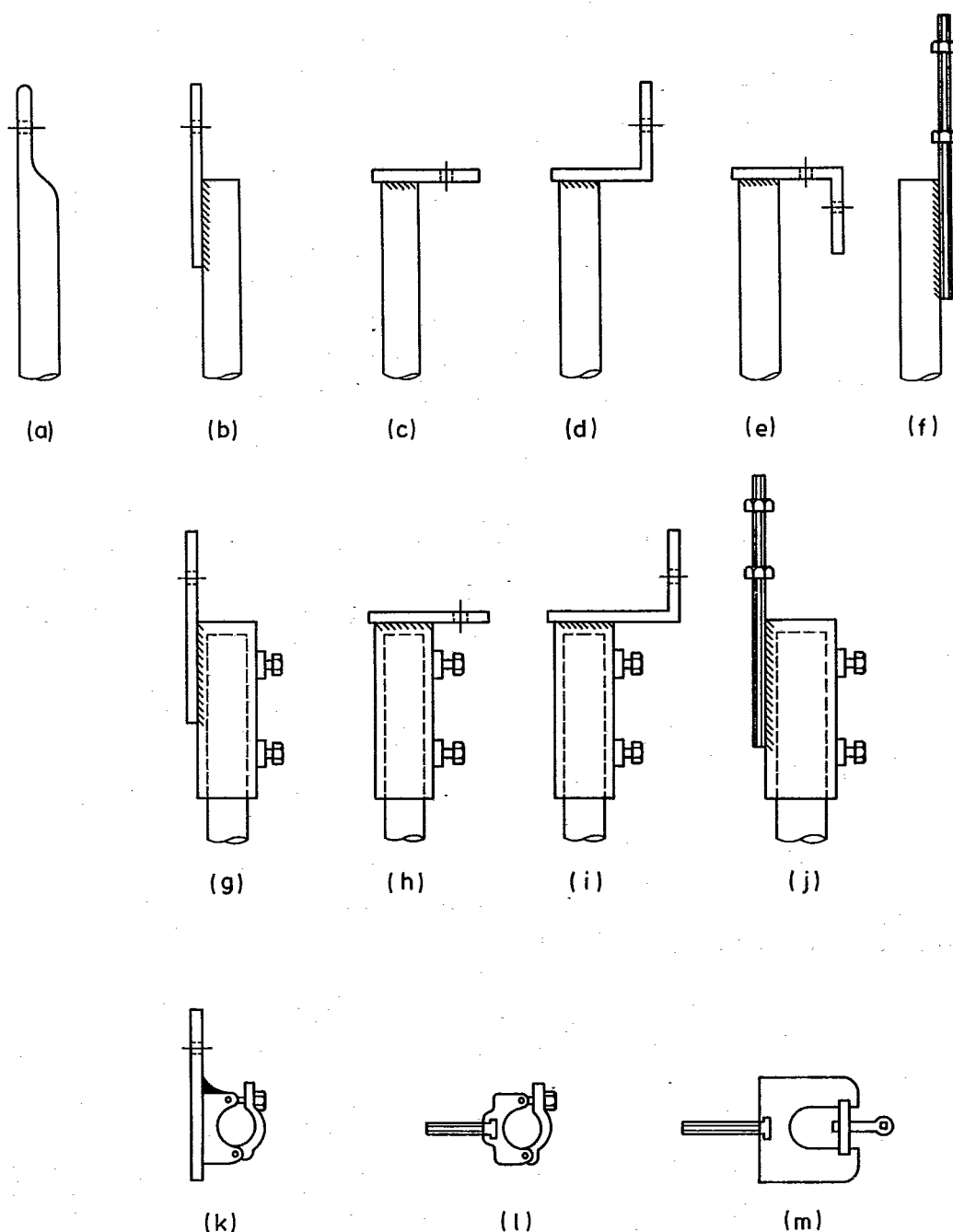


Figure 8. Typical end details for tie tubes

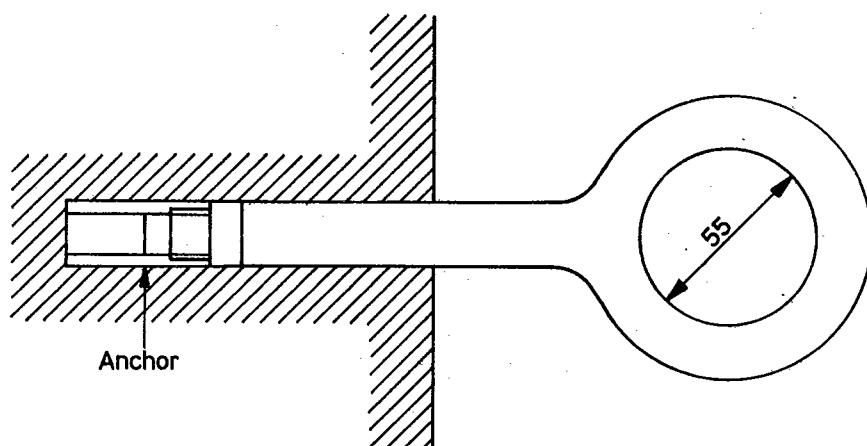
9.8.4 Sheeted scaffolds. The recommended spacing for tying in sheeted scaffolds is given in 9.3. In the case of sheeted scaffolds, capacities of double those recommended (see 9.8.2) should be adopted for each tying in position.

9.9 Abnormal facades and scaffolds. In circumstances where it is impracticable to fix ties in the surface of a building, other methods of ensuring the stability of a scaffold should be adopted both during use and erection or dismantling. Suitable methods include the use of raking tubes, buttresses, wire ties over the roof or round the sides, struts from other buildings and additional width of the scaffold.

If the ends of buildings are without windows and are unsuitable for fixing ties, reliance may be placed on the return scaffolds at the front and the back, or on wire

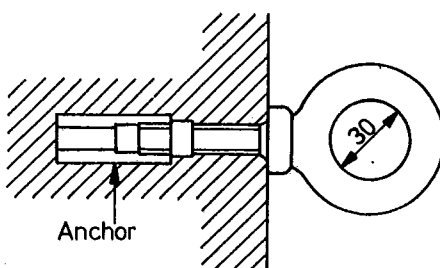
ties along the front and the back. Where the untied facade is longer than 6 m, plan bracing across the corners of the scaffold and its front and back returns should be fixed at intervals of height not more than 8.50 m. Where the untied facade is longer than 10 m, additional plan bracing should be fixed across the full length of the untied structure at intervals of height of not more than 8.50 m. For lengths greater than 15 m, other methods will need to be considered.

Where a complete hollow structure is fully scaffolded internally or a structure of small plan area is completely surrounded outside by scaffolding, it may be possible to dispense with ties and place reliance on butting transoms. In this case the lateral stability of the scaffold should be ensured by face bracing.



The dimension is in millimetres.

Figure 9. Typical ring bolt tie



The dimension is in millimetres.

Figure 10. Typical wire or band tie anchorage

10. Bracing

10.1 General. Bracing 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 300 mm of an intersection.

10.2 Ledger bracing. Independent tied access scaffolding should contain ledger bracing which should generally be on alternate pairs of standards. Any pair of standards which are ledger braced should be made into a complete series of triangles.

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

The ledger bracing should preferably 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.

The 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 toeboard. This arrangement may require an extra width on the scaffold to accommodate the brace.

Ledger bracing from the inside ledger to the guardrail level of the lift below may be used provided that every

pair of standards is so braced instead of every alternate pair.

The direction of ledger bracing is immaterial for the structural stability of the scaffold but it should be pre-planned to take account of the intended use of the scaffold.

In scaffolding over footpaths, it may not be possible to ledger brace the lowest lift. Ledger bracing may be omitted from this lift provided the lengths of the standards in the lift are not in excess of 2.7 m. In this case account should be taken of the reduced loading capacity of this lift.

When the height of the lowest lift is in excess of 2.7 m, a knee brace should be inserted across the top corner of the lower lift, commencing at approximately 1.8 m 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. To be effective, a ledger should be fixed adjacent to where the knee brace meets the standard.

10.3 Facade bracing. Longitudinal bracing should be provided to all scaffolds in which the movement along the facade of the building is not prevented by other means. It need not be fixed where the scaffold is securely butted between opposing outside or inside faces of returns or recesses, provided that no length greater than 10 m is so fixed against movement in both directions.

When longitudinal bracing is omitted, the lateral movement of both the inside and outside lines of the standard at every lift should be prevented either by both lines being adequately butted or by adequate plan bracing onto firm points inserted at every level.

The two principal forms of longitudinal bracing arrangements are where the bracing takes the form of either a zig zag from bottom to top or a continuous sloping tube from bottom to top. In either case the bracing tubes should be connected either:

- (a) to every lift on to extended transoms with right angle couplers; or
- (b) to every standard with swivel couplers.



One such brace assembly should be provided at intervals along the scaffold not exceeding 30 m.

The longitudinal bracing should be fixed as near to the standards as possible. When the brace is fixed to extended transoms, the latter should be fixed to the outside ledgers, with right angle couplers.

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 guardrail should be placed through the braced bay to prevent people passing.

The joints in continuous diagonal bracing should be made by overlapping the two lengths of the tube by a distance of at least 300 mm and joining them together with two parallel couplers. Alternatively, the two tubes may be joined by a sleeve coupler or other coupler capable of sustaining the applied load or by an expanding joint pin lapped with a butt tube with one fitting either side of the joint.

10.4 Plan bracing. Plan bracing should be provided to all portions of an access scaffold which are not otherwise stabilized against lateral distortion. It may be joined by the same type of couplers used for longitudinal bracing and the same rules with regard to strength apply.

10.5 Couplers for 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 5 kN.

10.6 Further requirements. Reference should be made to 39.9 for further requirements for bracing, struts and raking tubes.

11. Foundations

11.1 General. The foundations for a scaffold should be adequate to carry and dispose the load imposed both locally at each standard and, in general, to carry the whole weight of the scaffold.

The foundation for a scaffold should be maintained in an adequate condition during the life of the scaffold.

11.2 Hard surfaces. On surfaces such as steel and concrete where there is adequate hardness and thickness to prevent the scaffold tube penetrating into the surface, the uprights of a scaffold may be placed directly on the surface, although it is generally preferable to use a base plate.

11.3 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.

11.4 Other surfaces. On soil, ash, hoggins, 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.

11.5 Sole plate area. When a sole plate is used, the sole plate area beneath any one standard should be at least 1000 cm², with a least dimension of 219 mm, and if the sole plate is of timber, it should be not less than 35 mm thick. On sites where the ground is soft or has been disturbed, the sole plate area should be not less than 1700 cm² when individual sole plates are used,

e.g. under hoist towers, and not less than 3400 cm² when two are combined together under two standards. In this case, if the sole plate is of timber, it may be necessary to use one with a total thickness in excess of 35 mm.

11.6 Soil compaction. The soil or ground beneath the sole plate should be well compacted and free from irregularities which would make the sole plate unstable or poorly bedded.

11.7 Sloping foundations. On slopes exceeding 1 vertical to 10 horizontal, a check may have to be made on the foundations to ensure the stability of the scaffold.

12. Standards

12.1 Foundations. Standards should be founded as detailed in clause 11.

12.2 Erection tolerances. Erection tolerances should not exceed the figures detailed in 18.1.

12.3 Joints. The joints in standards should be staggered. Joints in standards of access scaffolds tied to a building may be made with either joint pins or sleeve couplers. As these types of couplers have limited load capacity in tension, in scaffolds which are free standing or projecting above the level of a building or otherwise subject to forces which would produce tension in the uprights, the standards should be joined in a manner capable of resisting the applied tension.

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 6.5 m of a scaffold where an extended base lift is necessary for pedestrian access or other reason, when a joint in all four of the standards at the corner of any one bay is permissible provided that one of the joints is lapped with a short length of tube.

12.4 Lift heights. The vertical intervals at which standards are linked to one another, i.e. the lift height, is the most important dimension in scaffolding. This dimension should be measured on site and maintained in accordance with the requirements of the design.

Where any of the standards in a scaffold are founded in a light well or 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 not greater than that of the foot lift of the remaining scaffold. Where access for the public is required under the first lift, a height of up to 2.7 m is permissible, provided that the load in the standards does not exceed those given in table 14.

13. Ledgers

13.1 Attachment. Ledgers should be fixed to standards with right angle couplers, except in the case referred to in 13.3, and should be horizontal except that a foot lift may follow the slope of the ground at the base of a scaffold. In this case, the transoms may be attached to the standards and the ledgers to the transoms.

13.2 Joints. Joints in ledgers may 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. However, when guardrails are to remain permanently in place, the absence of a joint in the guardrail 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. Where joints are

necessary they should be positioned at a distance not greater than $1/3$ of the span between adjacent standards.

13.3 Curved building surfaces. 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. If underslung transoms are used to modify the height of one platform, these transoms should be joined to the ledgers with right angle couplers. For large radius curves, separate scaffolds with platforms of the same height may be used.

14. Transoms and putlogs

14.1 Length of transoms and putlogs. The length of transoms and putlogs will vary according to the intended use of the scaffold and should be such that the widths of scaffolds given in table 2 are obtained.

Transoms should be extended inwards and outwards, as necessary, for the purpose of butting the face of the building and fixing the longitudinal bracing.

14.2 Couplers. Transoms may be fixed to the inside and outside ledgers with right angle or putlog couplers, except in the cases referred to in 10.3 and 13.1, when only right angle couplers should be used. Attachment to braces should be in accordance with clause 10.

14.3 Spacing

14.3.1 Boarded lifts. The spacing of transoms and putlogs for boarded lifts should be in accordance with table 3, except that the distance between transoms should not result in bay lengths greater than those given in table 1. Board end transoms should be fixed so that the end overhang of a board does not exceed that given in table 3. In no case should the overhang be less than 50 mm.

14.3.2 Non-boarded lifts. Transoms and 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 300 mm of the standard.

On scaffolds of a height greater than 50 m, the transoms on unboarded lifts, when fixed at the frequency of one transom per pair of standards, should be fixed to the ledgers or uprights with right angle or other suitable couplers provided they are capable of sustaining a safe working slip load of 5 kN.

When a boarded platform is moved to a new level, the transoms on the lift from which the boards have been taken may be re-arranged to comply with the requirements for a non-boarded lift.

14.4 Putlog blades. A putlog should generally be fixed with its blade horizontal (but see 8.2).

15. Working platforms and decking

15.1 General. Scaffold platforms should be of the widths given in table 2 for the purposes given.

15.2 Decking. Any group of boards across the width of the scaffold should be of the same length, with all boards of the same thickness.

15.3 Supports. The spacing of the transoms to support the boards should vary according to the thickness and length of the boards as given in table 3.

The overhang of the boards of any thickness should not exceed four times their thickness and should not be less than 50 mm (see table 3).

Table 2. Widths of access scaffold platforms

Purpose	Minimum widths	Practical widths using 225 mm nominal width boards
For access, inspection, gangways and runs	440 mm	2 boards
Working platforms for men without materials or only for the passage of materials	640 mm	3 boards
For men and materials provided there is 440 mm left clear for the passage of men or 640 mm if barrows are used	870 mm	4 boards
For carrying trestles or other similar higher platforms	1.07 m	5 boards
For use in dressing or roughly shaping stone *	1.3 m	6 boards
For use to support a higher platform where the supporting scaffold is also used for dressing and roughly shaping stone *	1.5 m	7 boards

*These scaffolds should be specially designed.

Table 3. Maximum span of scaffold boards

Nominal thickness of board	Maximum span between transoms	Minimum overhang	Maximum overhang
mm	m	mm	mm
38	1.5	50	150
50	2.6	50	200
63	3.25	50	250

Boards which are nominally 38 mm thick are the most commonly used and are customarily supplied in lengths of 3.90 m. When these are used, there should be four transoms to each board. Boards which are nominally 38 mm thick and less than 3.35 m long may be supported on three transoms. Boards which are nominally 38 mm thick and less than 2.13 m long should not be used unless they are fixed down to prevent tipping.

Boards which are less than 1.80 m long may be supported on two transoms, but should be fixed down at both ends. Such boards occur adjacent to ladder openings and provision should be made to prevent them from moving under impact and vibration. Boards which are used on small static and mobile access towers and on other small platforms, where the platform is surrounded by a guardrail and posts and there are no end joints in the boards, need not be fixed down but should be prevented from moving.

15.4 Gaps in decking. Gaps between boards should be as small as is reasonably practicable. Scaffolds should be erected as near to the building as is reasonably practicable, except when it is required for workmen to sit on the edge of the boarded deck in which case the gap should not exceed 300 mm.

15.5 Toeboards. Toeboards and end toeboards should be suitably fixed to all working platforms where a person may fall more than 1.98 m. They should be of such a height that the gap between the top of the toeboard and the guardrail does not exceed 762 mm and have a minimum height of 152.5 mm. They should be placed inside the standards.

15.6 Guardrails. Working platforms from which a person may fall more than 1.98 m should have a guardrail and end guardrails fixed inside the standards at a height of between 915 mm and 1150 mm above the level of the decking.

If the guardrails are set higher than 915 mm, a second lower guardrail or higher toeboard should be provided to limit the gap to 762 mm. Suitably added brick guards or retaining boards are an acceptable alternative for a second or intermediate guardrail.

15.7 Brick guards. Brick guards or other suitable vertical protection are desirable in cases where materials may fall from the scaffold. These screens can be hung from the guardrails and should be prevented from outward movement. Toeboards may be incorporated within the screen and the screens should be capable of preventing the materials being used passing through.

15.8 Length of decking. The ends of a working platform should, where possible, extend beyond the end of the wall or working face by a distance of 600 mm when work is to be carried out up to the end of the wall.

15.9 Slope of decking. 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. These may incorporate gaps not exceeding 100 mm in width for wheels of barrows.

16. Ladder access to and in scaffolds

16.1 General. Every sloping ladder should stand on a firm and level base and be supported only by the stiles. Where practicable, it should be set at an angle of 4 vertical to 1 horizontal. The stiles should be securely fixed to the scaffold at the top by lashings, as shown in figure 11, or by other attachments.

Ladders should preferably project at least 1.07 m above the top landing place with the landing rung level with or slightly above the level of the landing platform.

Ladders should not be extended by lashing two lengths together.

16.2 Landings. The vertical distance between two successive landing places should not exceed 9.0 m.

The landing places should be provided, where necessary, with access holes for the user which should not exceed 500 mm in width and should be as small as practicable in the other direction.

The landing places should be kept clear of all material and should be provided with guardrails and toeboards.

16.3 Ladder towers. Where practicable, the ladder access to the scaffold should be with its own ladder tower fixed to the outside of the main scaffold. Figure 26 is a typical example of such a tower. For the constructional details of ladder towers see 30.2.

On large construction sites consideration should be given to the use of staircase towers and ramps. (See clauses 30 and 33.)

17. Raising and lowering material

17.1 Gin wheels. Gin wheels may be fixed to scaffolding for the purposes of raising and lowering materials during the construction of the scaffold and for the user of the completed scaffold.

The gin wheel should be mounted on a cantilever tube projecting outwards from the scaffold to a suitable distance, which should be kept to a minimum and preferably not greater than 750 mm.

The horizontal tube holding the gin wheel should be fixed with right angle couplers to two uprights in the case of an independent tied scaffold. In the case of a putlog scaffold, a puncheon should be fixed near to the wall from a suitable putlog at a lower level to a putlog at the working level and extending upwards. The gin wheel tube should be fixed to this and to the outer standard. A diagonal brace from the gin wheel tube to the outer end of a lower putlog may alternatively be used to brace the standard carrying the gin wheel.

A ring type gin wheel is preferable (see figure 12(a)). If a hook type gin wheel is used it should be lashed to the supporting tube and the hook moused (see figure 12(b)) unless it is provided with a safety catch. In either case the gin wheel fixing to the tube should be prevented from slipping towards or from the building by one fitting mounted on either side of the fixing.

Materials should be firmly attached to the gin wheel rope and should not exceed 50 kg in mass.

Gin wheel ropes should be of the correct size to suit the gin wheel (usually 18 mm) and should comply with the requirements of the appropriate British Standard and be marked with an identification tag and the safe working load.

17.2 Scaffold jib cranes and hoists. Scaffold jib cranes should be attached to a standard in a scaffold by the means recommended by the manufacturer. Special consideration should be given to the strengthening of the scaffold in the location of the crane and its attachment to the building at this point.

17.3 Hoist towers. When a hoist is used, it is usual to construct a special hoist tower. This may be attached to the outside of a scaffold and may also utilize one or two of the standards of the scaffold as corners of the hoist tower. A hoist tower should be constructed in accordance with 30.1.

17.4 Multiple rope blocks. The attachment of multiple rope blocks to scaffolding should be made the subject of special design in respect of the scaffold itself and its attachment to the building in the location of the upper block.

17.5 Impact loading. Where mechanical handling is used, special allowance should be made in the design of the loading area for the additional loads due to the impact of placing (see clauses 23 and 24).