Australian STANDARD®

Scaffolding

Part 6: Metal tube-and-coupler scaffolding — Deemed to conform to AS/NZS 1576.1

STANDARDS Australia

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Australian Steel Institute
Engineered Wood Products Association of Australasia
Engineers Australia
Hire and Rental Industry Association of Australia
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Part 6: Metal tube-and-coupler scaffolding — Deemed to conform to AS/NZS 1576.1

First published as AS 1576—1974.
Revised and redesignated in part as AS 1576.3 Supplement 1—1991.
Jointly revised and redesignated as AS/NZS 1576.6:2000.
AS/NZS 1576.6:2000 revised and redesignated AS 1576.6:2020.

Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD-036, Scaffolding, to supersede AS/NZS 1576.6—2000, *Scaffolding, Part 6: Metal tube-and-coupler scaffolding—Deemed to comply with AS/NZS 1576.3*.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to provide tabulated geometrical limits and guidance which, when applied to tube and coupler installations, would ensure conformance to requirements of AS/NZS 1576.1.

This edition includes the following technical changes from the previous edition:

(a) The height of scaffolding that is covered, as specified by the Scope, has been reduced from 33 m to 30 m top working platform height.

(b) The requirements for both facade and birdcage scaffolds have been revised.

This Standard includes a commentary on some of the clauses. The commentary directly follows the relevant clause, table or figure, is designated by "C" preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

Contents

Australian Standard®

Scaffolding

Part 6: Metal tube-and-coupler scaffolding — Deemed to conform to AS/NZS 1576.1

Section 1 Scope and general

1.1 Scope and exclusions

1.1.1 Scope

This Standard specifies requirements for unsheeted metal tube-and-coupler scaffolding that does not exceed 30 m in height to top working platforms deemed to conform to the performance requirements of AS/NZS 1576.1 for light, medium and heavy duty loads.

1.1.2 Exclusions

This Standard does not apply to —

(a) prefabricated (modular) scaffolds (see AS 1576.3);

(b) scaffolding installations that require specific engineering design to establish the strength of any part of the scaffold or the adequacy of the supporting structure; and

NOTE Examples of scaffolding installations that require a specific engineering design are access openings, cantilever scaffolds, catch platforms (fans), drilled-in anchors, trusses and tube-and-coupler scaffolds that support any form of screening (e.g. chain-wire mesh, fabricated-mesh panels, plastic sheeting, plywood, shade cloth).

(c) scaffold components used as temporary edge protection (see AS/NZS 4994.1) where they do not form part of the scaffold.

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS 1892.1, *Portable ladders, Part 1: Performance and geometric requirements*

AS/NZS 1163, *Cold-formed structural steel hollow sections*

AS/NZS 1576.1, *Scaffolding, Part 1: General requirements*

AS/NZS 1576.2, *Scaffolding, Part 2: Couplers and accessories*

AS 1576.3, *Scaffolding, Part 3: Prefabricated and tube and coupler scaffolding*

AS/NZS 1577, *Scaffold decking components*

AS/NZS 2269, *Plywood—Structural*

1.3 Definitions

For the purpose of this Standard, the definitions given in AS/NZS 1576.1 and those below apply.

1.3.1
may
indicates the existence of an option

1.3.2.
reveal tie
scaffolding assembly used in compression within a reveal to secure a scaffold to a structure

1.3.3
shall
indicates that a statement is mandatory

1.3.4
should
indicates a recommendation

1.35
uplift
lifting of one end of a plank, caused by a downward force being applied to the other end of the plank

1.4 Duty classification

The duty classification of working platforms shall conform to AS/NZS 1576.1. Duty live loads shall include impact forces and the weight of persons, materials, debris, tools and equipment.

The following duty classifications and minimum widths of working platforms shall apply:

(a) *Light duty* — A load of 225 kg (including a single concentrated load of up to 120 kg) per bay, per working platform level and a working platform width of not less than 450 mm.

(b) *Medium duty* — A load of 450 kg (including a single concentrated load of up to 150 kg) per bay, per working platform level and a working platform width of not less than 675 mm.

(c) *Heavy duty* — A load of 675 kg (including a single concentrated load of up to 200 kg) per bay, per working platform level and a working platform width of not less than 900 mm.

NOTE The number of working platform levels allowed will depend on the type of scaffold, bay size and the height of the scaffold. Table 3.3 and Table 3.4 indicate the duty and number of working platform levels for steel tube installations and aluminium tube installations respectively.

Section 2 Components

2.1 Tubes

2.1.1 Steel tubes

Steel tubes shall —

(a) be manufactured by the electric resistance weld process (ERW);

(b) have a minimum yield strength of 250 MPa and shall conform to AS/NZS 1163;

(c) have a nominal outside diameter of 48.3 mm; and

(d) have a nominal wall thickness of 4.0 mm (a galvanized tube with a nominal wall thickness of 3.2 mm may be used).

2.1.2 Aluminium tubes

Aluminium tubes shall have —

(a) a minimum yield strength of 240 MPa;

(b) a nominal outside diameter of 48.4 mm; and

(c) a nominal wall thickness of 4.47 mm.

2.1.3 Mixing of tubes

Steel tubes and aluminium tubes shall not be mixed in the one scaffold, except for guardrails, midrails or other members that have an independent structural function.

NOTE For example, standards support load in conjunction with other standards and with spur braces, so groups of these elements should be of the same material. A jointed vertical standard assembly will accumulate load down a load path; so the material should be consistent throughout to ensure predictable structural action, unless specific engineering design has been applied.

2.2 Couplers and accessories

Couplers and accessories shall be in accordance with AS/NZS 1576.2.

2.3 Scaffold planks

Scaffold planks shall be in accordance with AS/NZS 1577.

2.4 Soleplates

On surfaces such as compacted soil or gravel, soleplates shall be —

(a) positioned under the baseplates; and

(b) large enough and configured so that sufficient bearing area is created to spread the load from the baseplate to the supporting surface to prevent subsidence or damage to that surface.

NOTE Timber scaffold planks used as soleplates should not include excessive longitudinal splits.

Section 3 Independent scaffold

3.1 Standards

Standards shall —

(a) be founded on baseplates;

(b) be vertical;

(c) extend to the full height of the scaffold;

(d) be spaced as specified in Table 3.1;

(e) be joined with end-to-end couplers; and

(f) not have joints that occur —

(i) in longitudinally or transversely adjacent standards in the same lift;

(ii) in the same standard in adjacent lifts;

(iii) more than once between adjacent ledgers; or

(iv) more than 300 mm from a ledger.

Table 3.1 — Maximum spacing of standards for independent or birdcage tube-and-coupler scaffolds

Duty classification (see AS/NZS 1576.1)	Tube material	Maximum longitudinal spacing of standards mm Bay length	Maximum transverse spacing of standards mm Bay width	Minimum clear dimension mm (see AS/NZS 1576.1)
Heavy duty	Steel	1800	1200	900
	Aluminium	1800	1200	
Medium duty	Steel	2400	1800	675
	Aluminium	2100	1800	
Light duty	Steel	3000	2700	450
	Aluminium	2400	2100	

NOTE 1 The material specifications for steel and aluminium tube are stated in Clauses 2.1.1 and 2.1.2 respectively. Further information on calculations is given in commentaries to Tables 3.3 and 3.4.

NOTE 2 The maximum width is set to limit the bending moment of the putlogs of which there are typically two per bay (the imposed action for bending being 2/3 of the duty action for each putlog, applied as four point bending, with loads at 1/4 span from supports; and the deflection of the putlogs to less than 30 mm when the concentrated load for the duty action is applied at midspan).

NOTE 3 The maximum length is set to limit deflection of the ledgers to less than 30 mm when 85 % of the concentrated load for the duty is applied at midspan. The use of 85 % reflects the putlog's support reaction where the imposed load is 15 % of putlog span from the ledger providing such support reaction.

3.2 Ledgers

3.2.1 General

Ledgers shall —

(a) be fixed to each standard in a longitudinal row with right-angle couplers;

(b) be horizontal; and

(c) extend to the full length of the scaffold.

Base lift ledger shall be fitted as close to the supporting surface as practicable, but not more than 500 mm from that surface. The distance between vertically adjacent ledgers shall be nominally 2000 mm.

If base lift ledgers and transoms are omitted, the appropriate reduction in either maximum scaffold height or the number of allowed working levels shall be as specified in Clause 3.9.

3.2.2 Joints

Joints shall be made with joint pins or sleeve type end-to-end couplers.

Joints shall not be located —

(a) in horizontally or vertically adjacent ledgers in the same bay;

(b) in the same ledger in adjacent bays;

(c) more than once between adjacent standards;

(d) in the end bays of a scaffold; or

(e) more than 300 mm from a standard.

NOTE Internal joint pins used in tubes of different wall thicknesses or in tubes produced by the ERW process are incapable of resisting tensile forces in the joint.

3.3 Transoms

Where transoms are used to fix transversely adjacent standards, they shall be —

(a) full length tubes without joints;

(b) horizontal;

(c) fixed to each standard with right angle couplers; and

(d) fixed as close as practicable to the node point of each ledger and standard.

Base lift transom shall be fitted as close to the supporting surface as practicable, but not more than 500 mm from that surface. The distance between vertically adjacent transoms shall be nominally 2000 mm.

If base lift transoms and ledgers are omitted, the appropriate reduction in either maximum scaffold height or the number of allowed working levels shall be as specified in Clause 3.9.

3.4 Longitudinal bracing

The outside row of standards in the scaffold shall be provided with longitudinal bracing that —

(a) extends from the base of the scaffold to its full height;

(b) is provided in both end bays of every scaffold run;

(c) is arranged —

(i) across the longitudinal plane of the bays, forming diagonal bracing (see Figure 3.1); or

(ii) up a bay, forming parallel bracing (see Figure 3.2); or

(iii) up a bay, forming heel-and-toe bracing (see Figure 3.3);

(d) has any brace in sections joined by lapping or splicing; and

(e) is fixed, as close as practicable to the node points at every crossing, to —

(i) the standard crossed with a swivel coupler; or

(ii) the transom crossed with a right-angle coupler.

The horizontal distance between intermediately braced panels in any lift shall not exceed three bays.

NOTE A typical brace against a slope is illustrated in Figure 3.4.

3.5 Transverse bracing

Each end of the scaffold shall be provided with transverse bracing in each lift (see Figure 3.5) that —

(a) extends from the base of the scaffold to its full height;

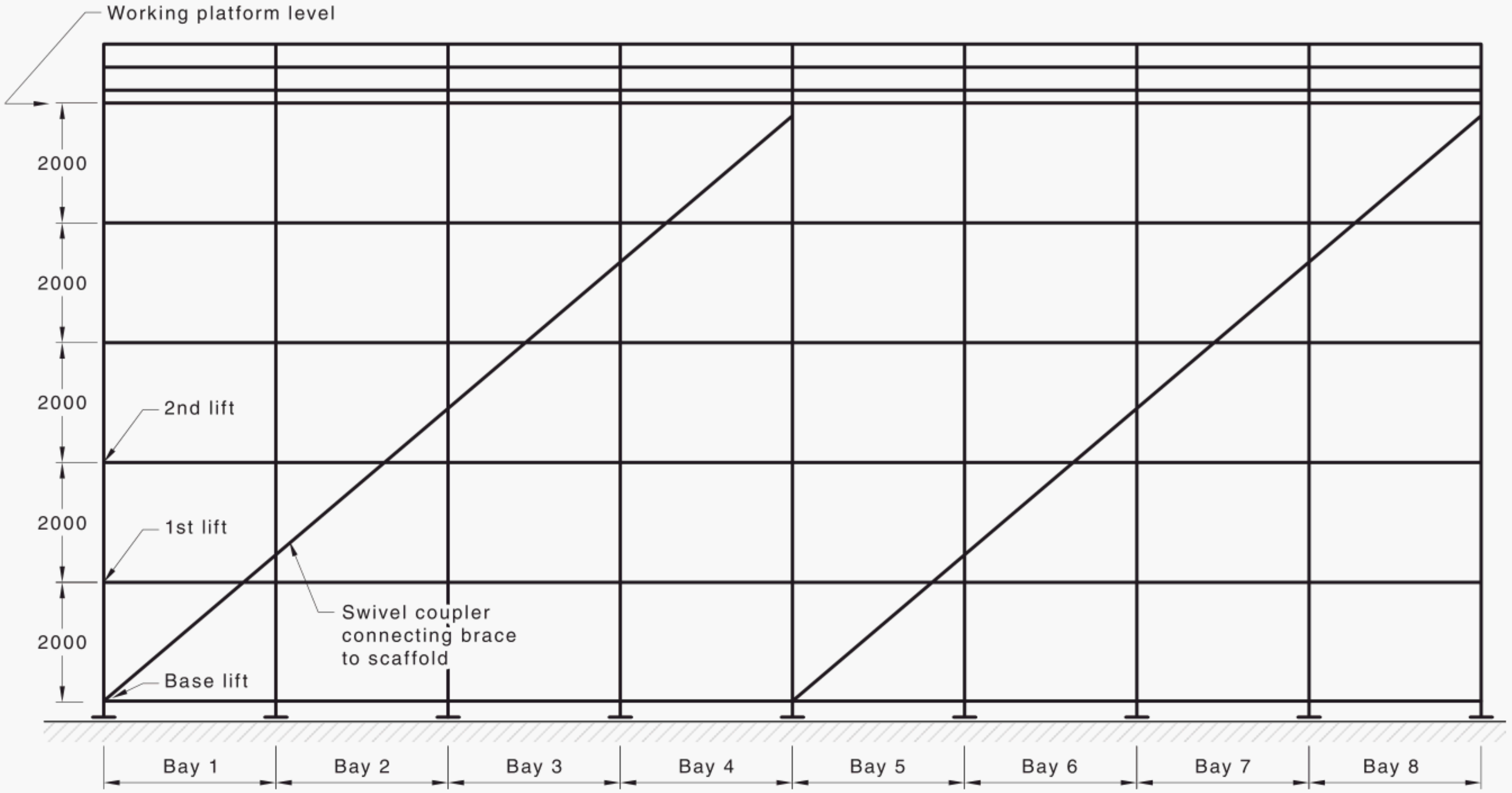
(b) is arranged across the transverse plane of the bay, forming diagonals; and

(c) is fixed, as close as practicable to the node points at every crossing, to —

(i) the standard crossed with a swivel coupler (see Figure 3.6); or

(ii) the ledger crossed with a right-angle coupler (see Figure 3.6).

Dimensions in millimetres

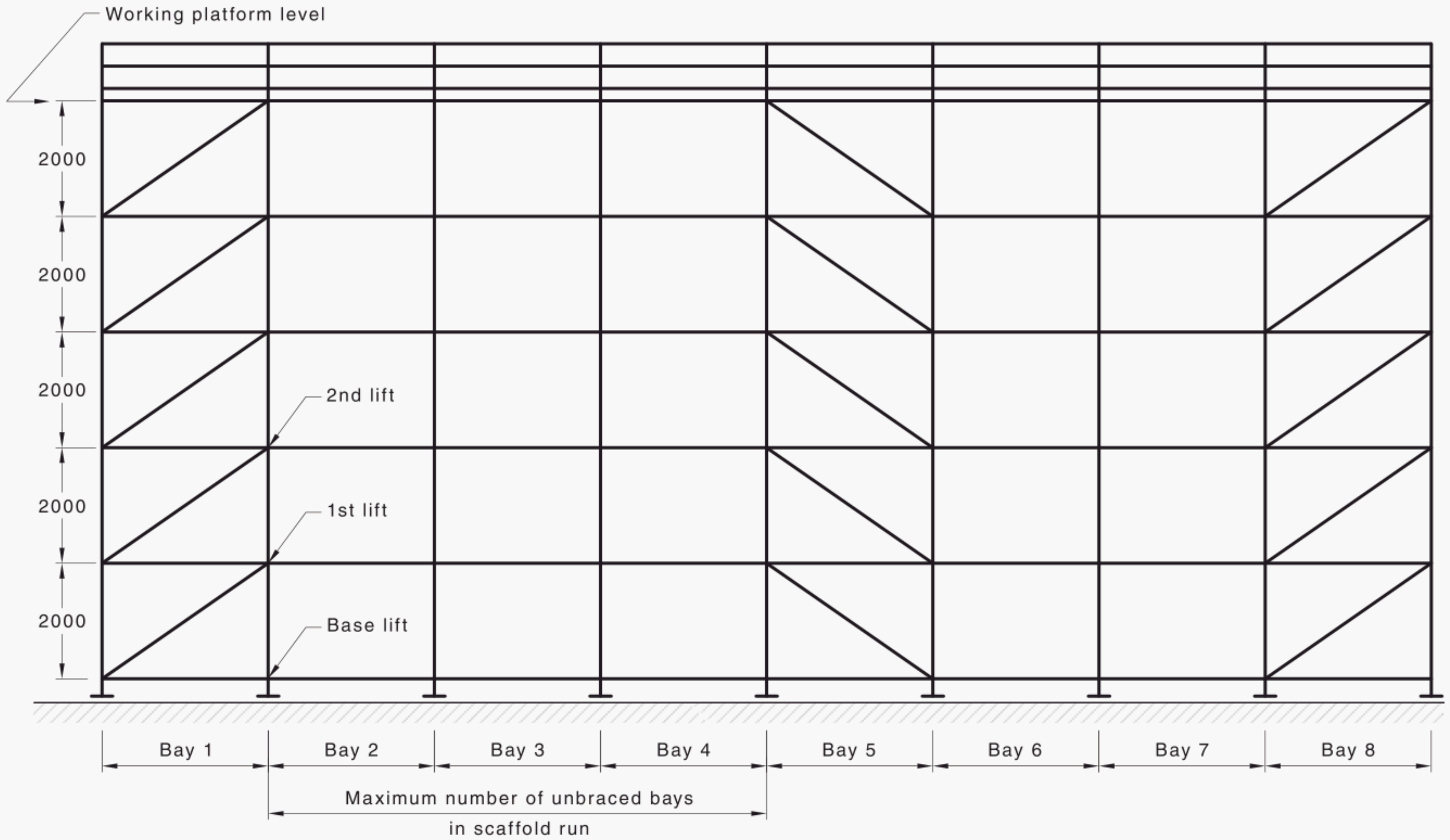


NOTE 1 Longitudinal braces are most effective at 45°.

NOTE 2 Edge protection at lower working platforms omitted for clarity.

Figure 3.1 — Typical diagonal bracing of tube-and-coupler scaffolding

Dimensions in millimetres

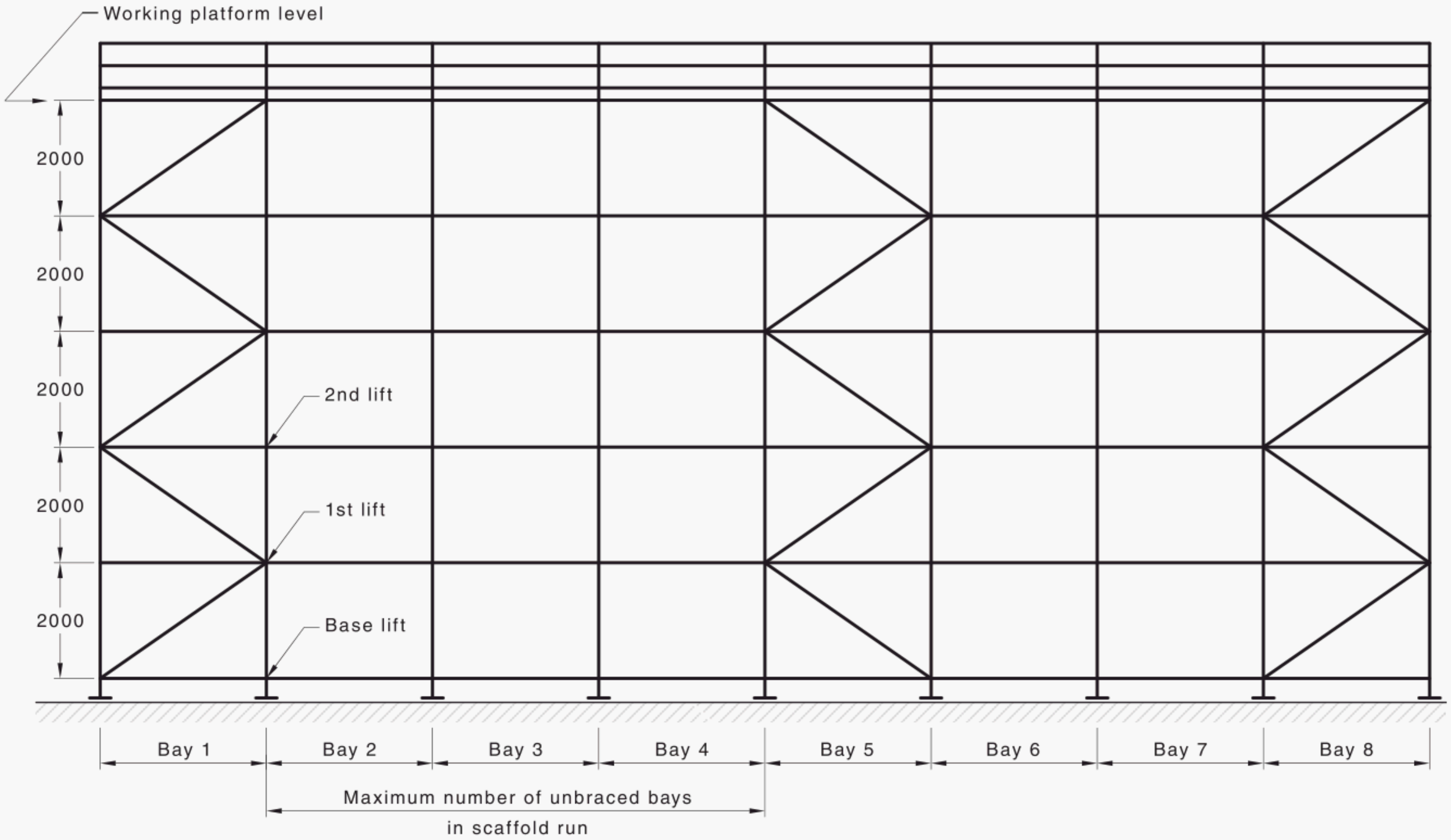


NOTE 1 Longitudinal braces are most effective at 45°.

NOTE 2 Edge protection at lower working platforms omitted for clarity.

Figure 3.2 — Typical parallel bracing of bays

Dimensions in millimetres



NOTE 1 Longitudinal braces are most effective at 45°.

NOTE 2 Edge protection at lower working platforms omitted for clarity.

Figure 3.3 — Typical heel-and-toe bracing of bays

Dimensions in millimetres

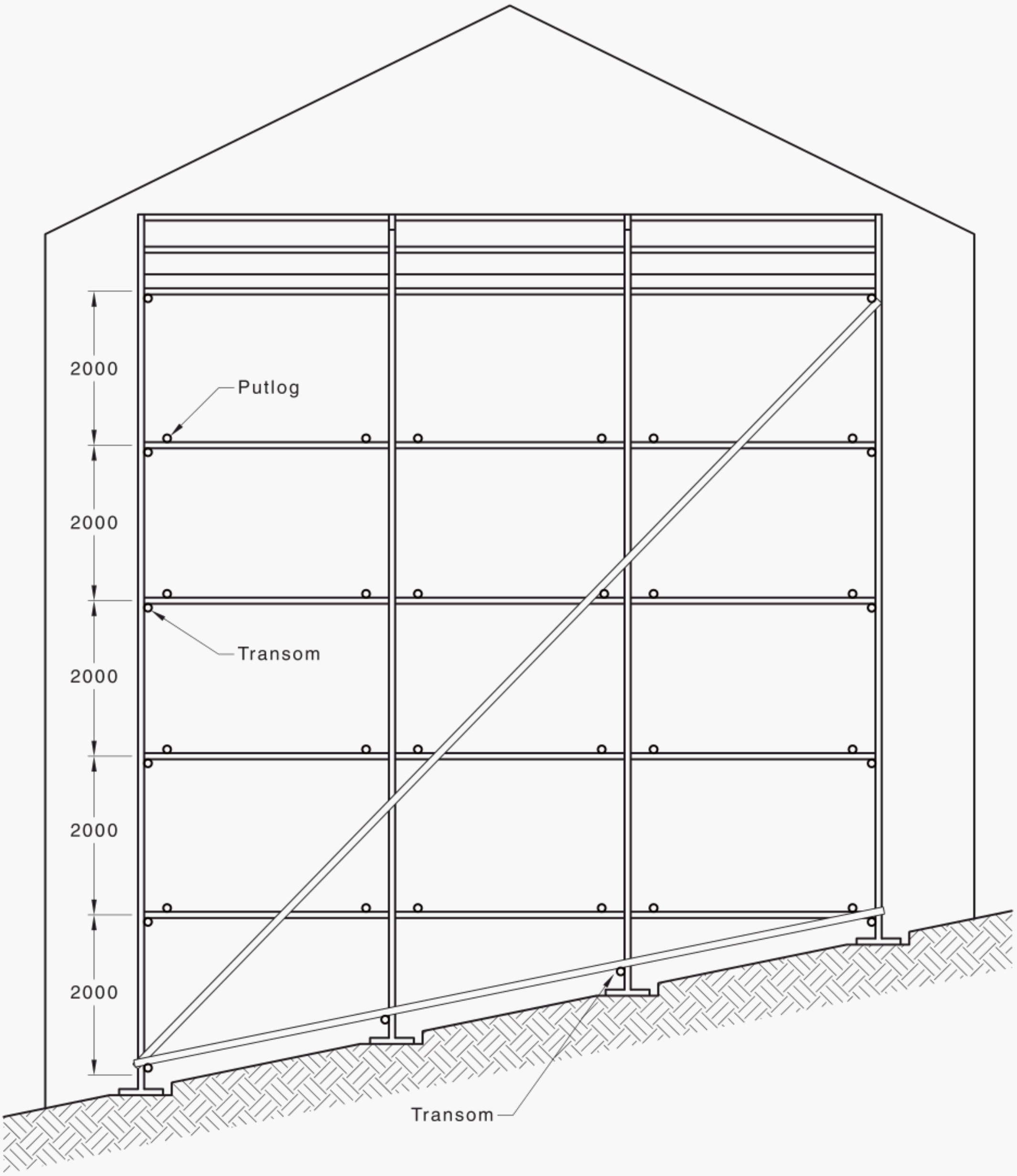
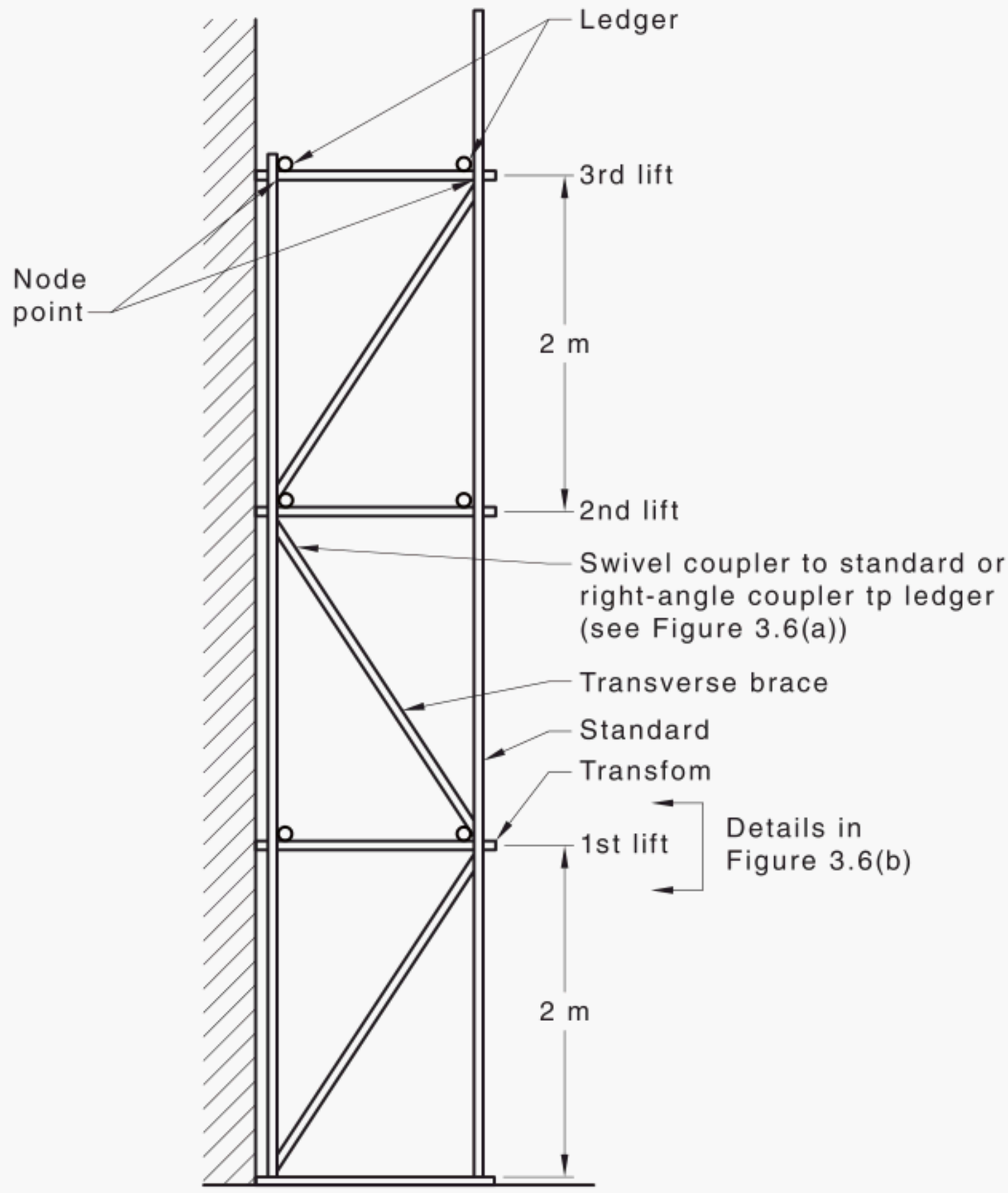
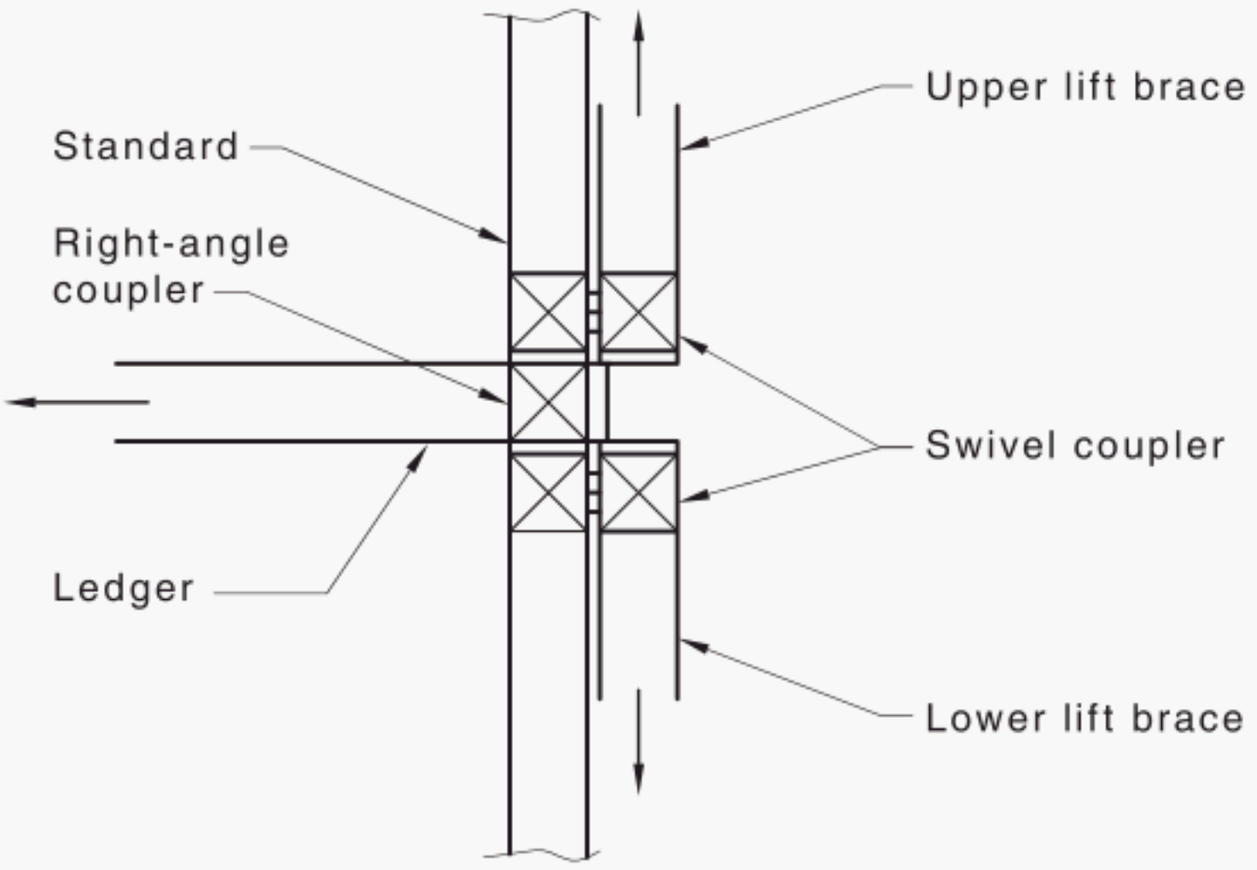


Figure 3.4 — Typical brace against slope

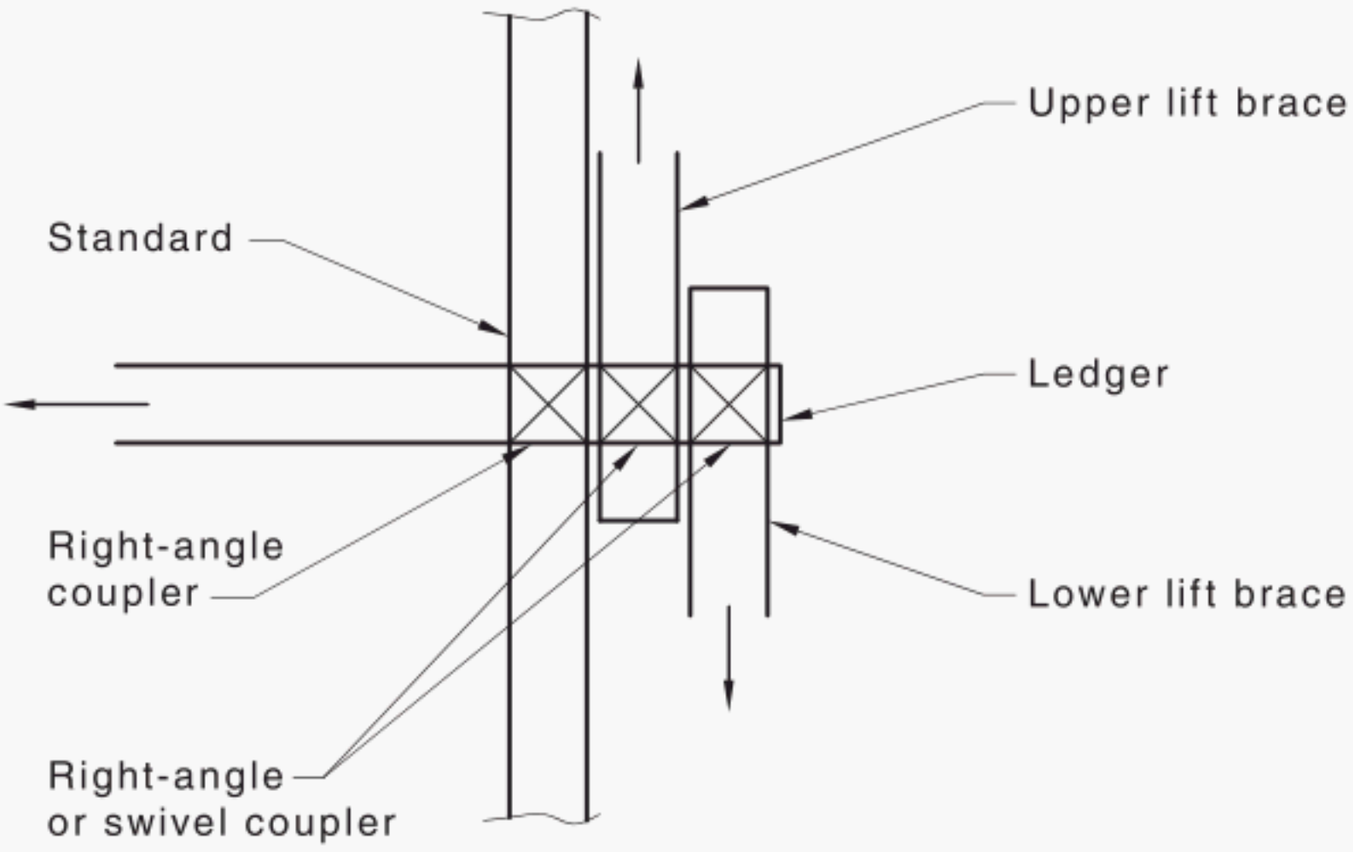


NOTE Ties, edge protection and access not shown.

Figure 3.5 — Typical transverse bracing



(a) Transverse brace to standard connection



(b) Transverse brace to ledger connection

NOTE 1 End bay shown.

NOTE 2 A brace each side of the standard can interfere with the working platform.

Figure 3.6 — Detail in Figure 3.5 showing transverse brace connections

3.6 Ties

3.6.1 General

Scaffold installations shall be tied to a laterally supportive structure where freestanding stability cannot be demonstrated.

3.6.2 Freestanding stability

For freestanding stability, the height limits of working platforms above a supporting surface base level, or above a wider supporting birdcage/buttress arrangement shall be as follows:

(a) If a base level width, inclusive of any extension from outriggers or rakers, is not greater than 1200 mm, the height of any working platform, above the base level, shall not exceed two times the scaffold width at that base.

(b) If a base level width, inclusive of any extension from outriggers or rakers, is greater than 1200 mm, the height of any working platform, above the base level, shall not exceed three times the scaffold width at that base.

The base width dimension shall be measured from outside edge to outside edge of standards, outriggers or rakers where these members meet the horizontal base plane.

3.6.3 Lateral support for stability

If freestanding stability as specified in Clause 3.6.2 is not satisfied, the scaffold shall be tied to a laterally supportive structure and the following shall apply:

(a) Each tie shall be rigidly connected to the supporting structure and fixed to prevent inwards and outwards movements of the scaffold. Anchors and other methods relying on friction between components and the supporting structure, such as reveal ties, shall not be used.

(b) Each tie shall be connected to not less than two standards or two ledgers within 600 mm of a standard with right angle couplers.

(c) A tie tube shall be a full length tube without joints.

(d) The distance between the end of the scaffold and the first tie at any level shall not exceed —

  (i) one bay in the case of a scaffold with no return; or

  (ii) three bays in the case of a scaffold with a tied return.

(e) The distance between longitudinally adjacent ties at any level shall not exceed three bays.

(f) The vertical distance between the supporting surface and the first level of ties shall not be greater than three times the least base width, subject to a maximum of 4 m.

(g) The vertical distance between adjacent levels of ties shall not exceed 4 m.

(h) The location of ties shall not obstruct clear access along the full length of any working platform or access platform.

NOTE 1 A transom of extended length may act as a tie tube.

NOTE 2 It is good practice to vertically stagger the ties.

NOTE 3 For typical tie assemblies, see Figure 3.7(A), 3.7(B) and 3.7(C).

NOTE 4 For typical horizontal and vertical tie spacing, see Figure 3.8.

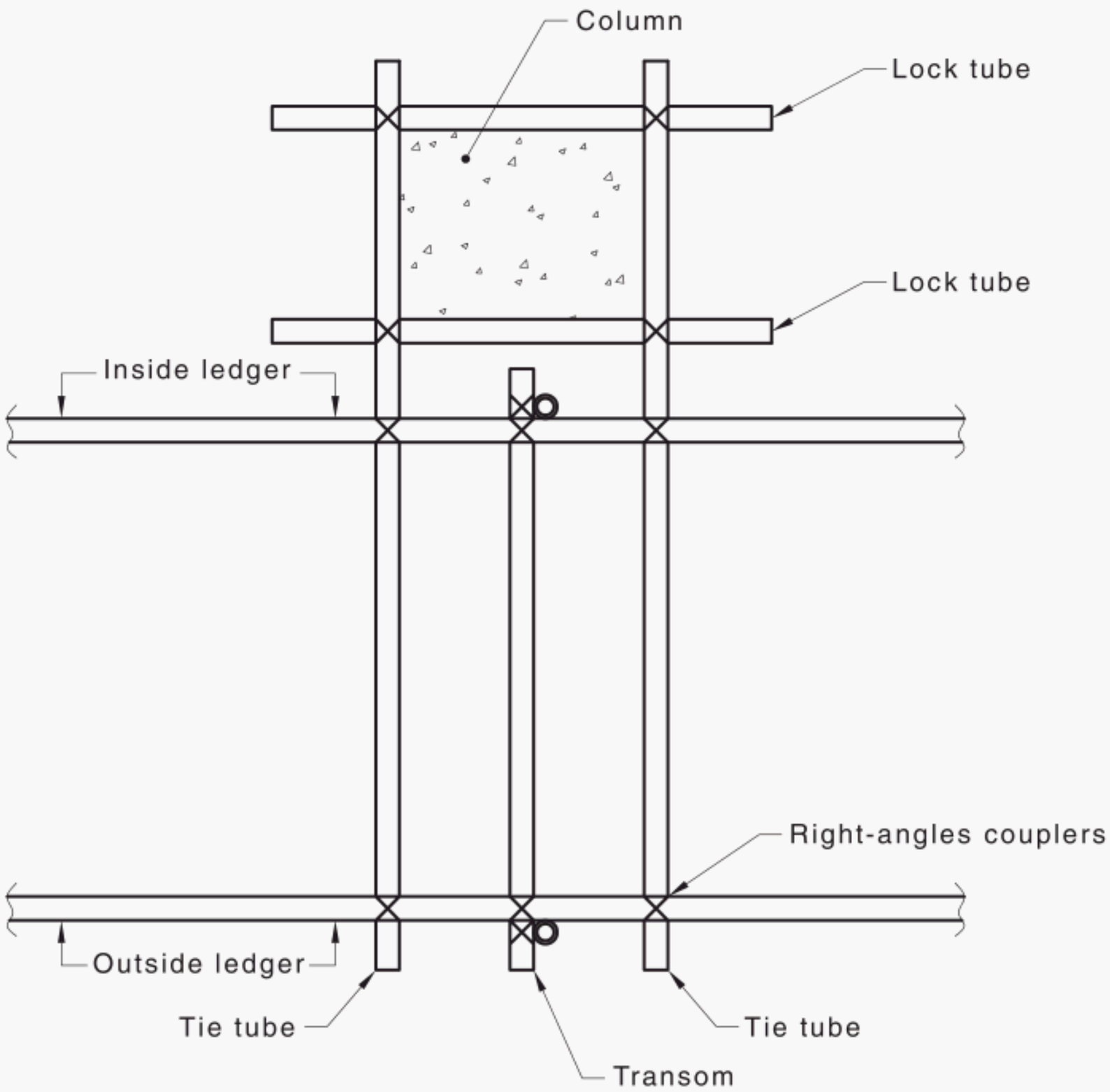


Figure 3.7(A) — Typical tie assemblies — Box-tie around structural column

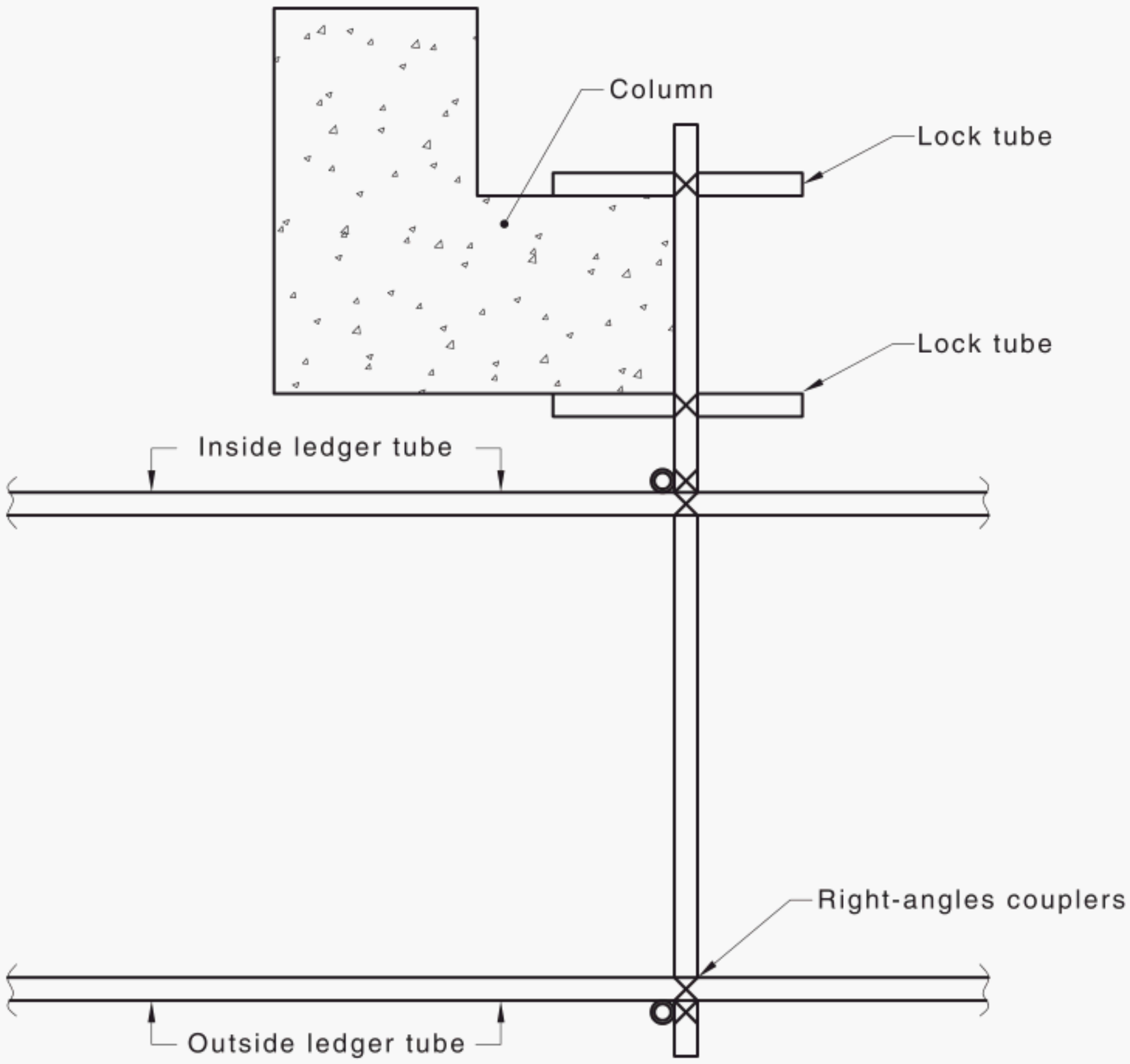
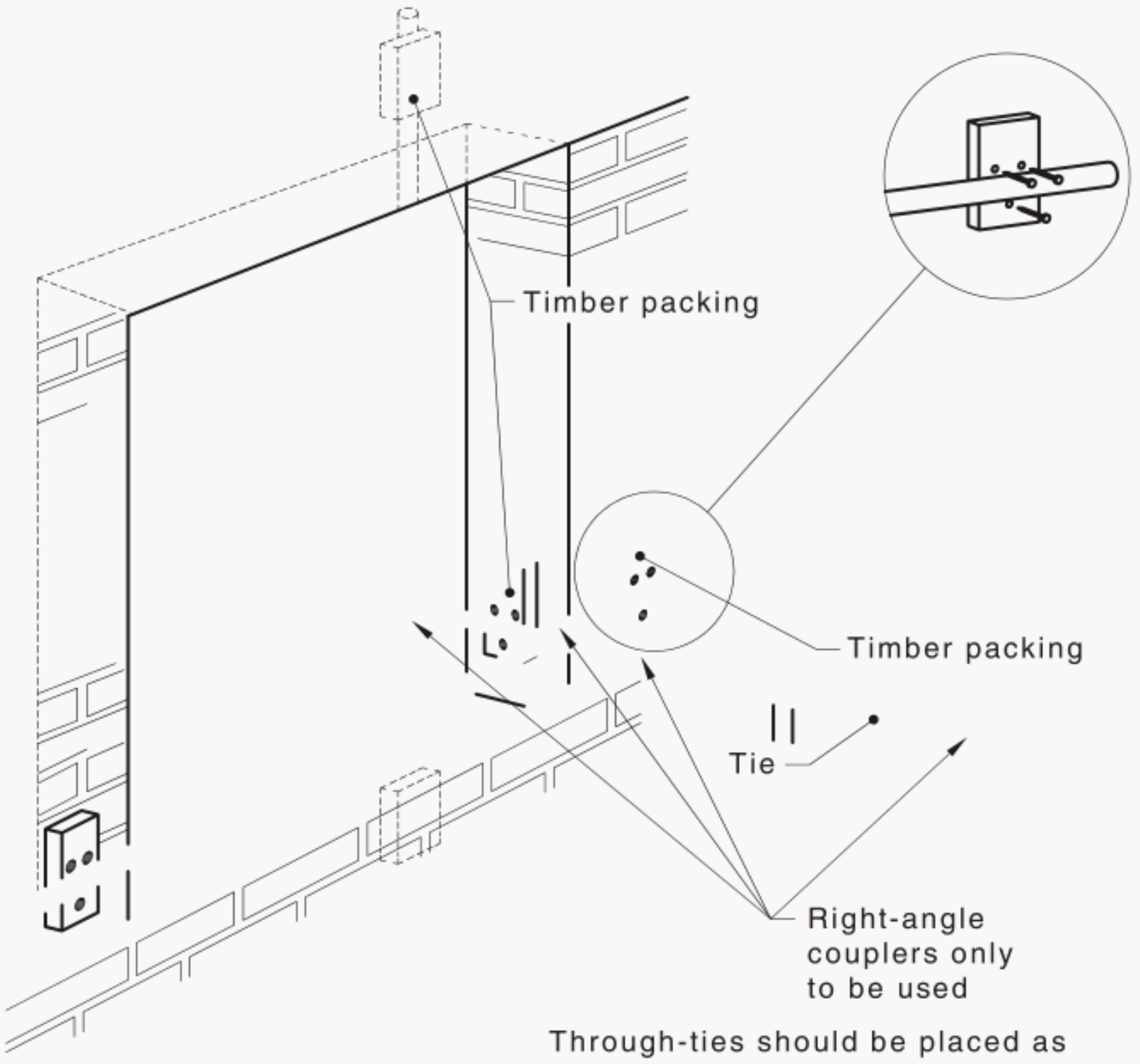
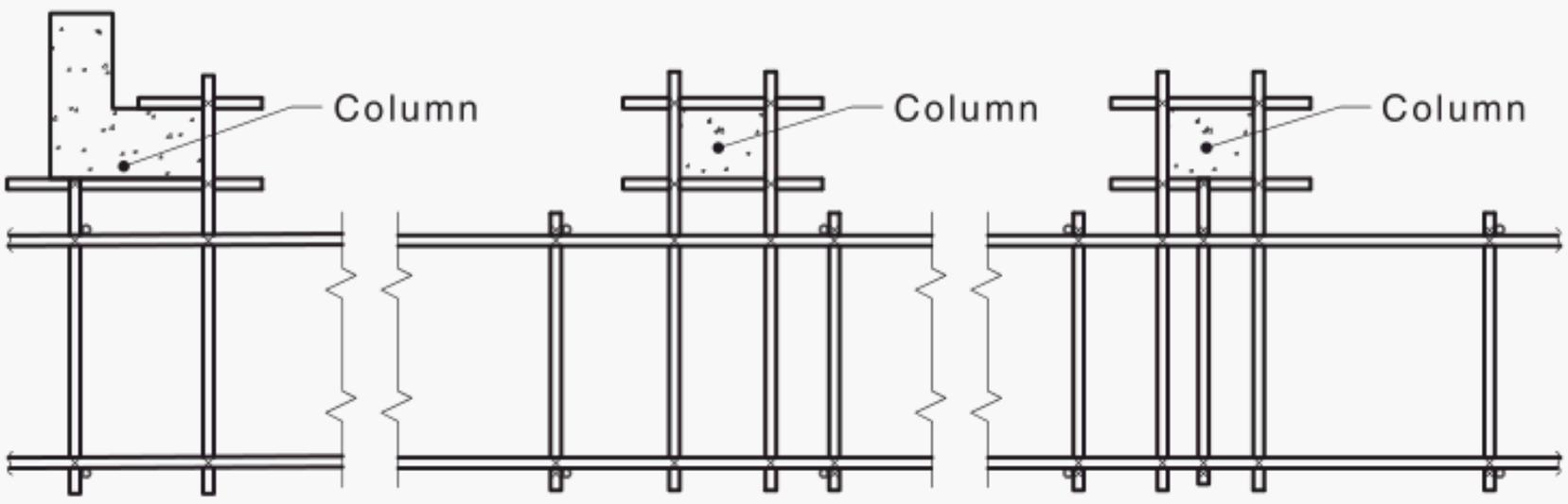


Figure 3.7(B) — Typical tie assemblies — U-tie around structural column



(a) A through-tie

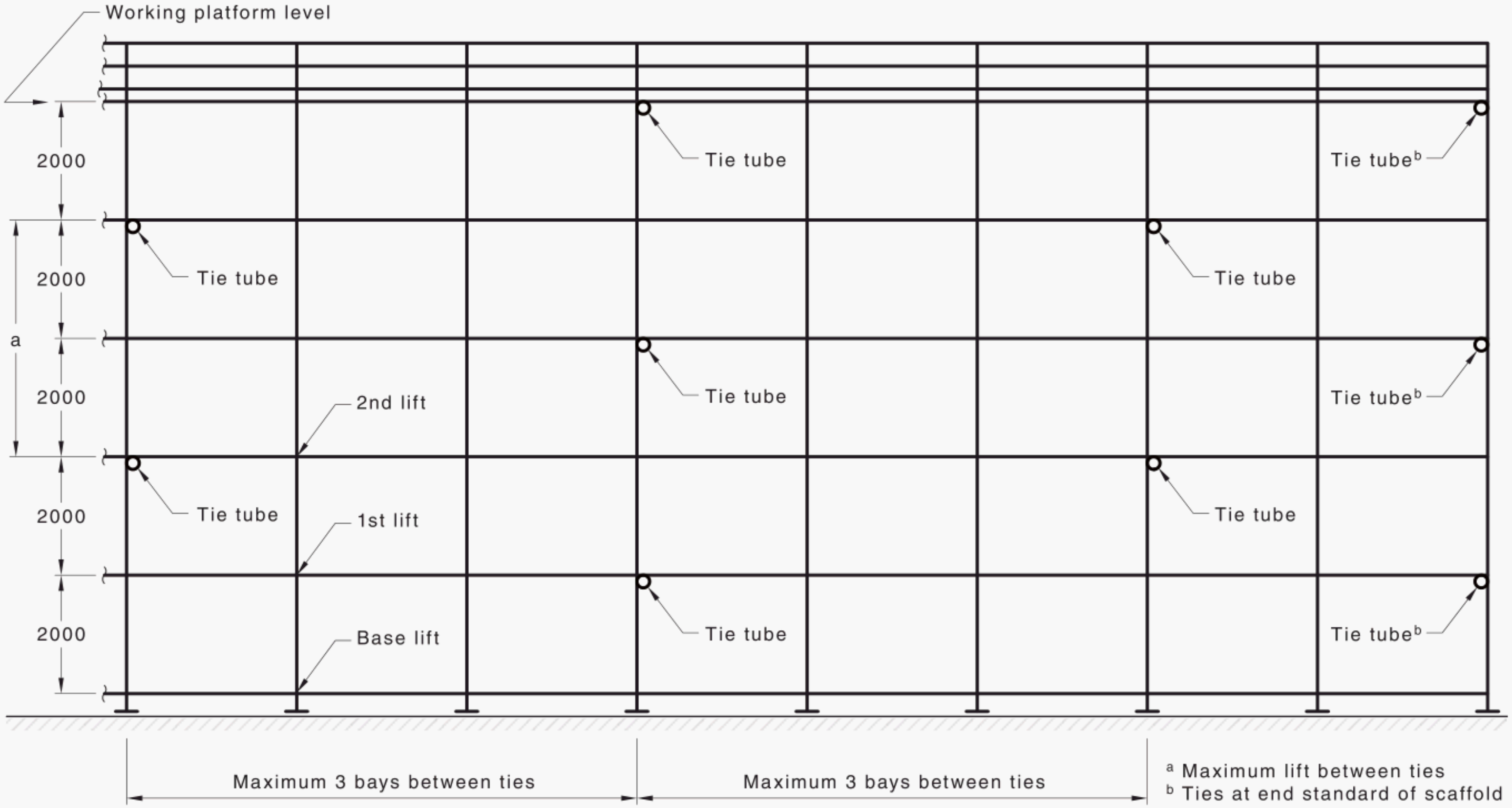


Double-lip or U-tie Box tie Column tie with butt

(b) A typical arrangement

Figure 3.7(C) — Typical tie assemblies — Through-tie and arrangement

Dimensions in millimetres



NOTE 1 Bracing is not shown.

NOTE 2 Edge protection at lower working platforms omitted for clarity.

Figure 3.8 — Typical horizontal and vertical tie spacing

3.7 Putlog

The following apply to putlogs:

(a) Putlogs shall be horizontal.

(b) Each putlog shall be fixed to the upper surface of each ledger it crosses with putlog couplers or right angle couplers. Where transoms are not used, putlogs shall be fixed with right-angled couplers.

(c) The types of couplers used in any one lift shall be compatible, so that putlogs provide true and even support for the scaffold planks.

(d) Putlogs shall be fixed at not more than 250 mm from each side of each standard.

(e) Putlogs may cantilever towards the working face to support additional scaffold planks, provided that —

(i) the width of the additional platform does not exceed 450 mm;

(ii) the transverse standard spacing is not less than 950 mm; and

(iii) the putlogs are fixed to ledgers with right-angle couplers.

(f) Putlogs shall be full-length tubes, without any joints over their length.

NOTE For maximum space between putlogs for LVL planks, and vertically laminated planks, see supplier documentation.

(g) Additional intermediate putlogs shall be provided as specified in Tables 3.2(A) and 3.2(B).

Table 3.2(A) — Maximum spacing of putlogs for solid hardwood timber planks conforming to AS/NZS 1577

Duty classification see AS/NZS 1576.1 and AS/NZS 1577	Stress grade seasoned and sized or sawn final dry thickness mm	F22	F17	F14	F22	F17	F14
		45	45	45	35	35	35
Heavy duty	Max putlog space, mm	1800	1600	1400	1200	1000	800
Medium duty	Max putlog space, mm	2400	1800	1600	1400	1100	900
Light duty	Max putlog space, mm	2700	2400	2100	1900	1400	1200

NOTE 1 The span spacing in this Table assumes a plank section width of 225 mm or wider made from either green sawn 50 mm or 38 mm hardwood and air-dried as sawn finish with 6 % to 7 % shrinkage, or from overcut size followed by kiln drying and machining to thickness.

NOTE 2 For descriptions of the stress grades identified in this Table, see AS 2082.

Table 3.2(B) — Maximum spacing of putlogs for solid softwood timber planks conforming to AS/NZS 1577

Duty classification see AS/NZS 1576.1 and AS/NZS 1577	Stress grade seasoned and sized thickness mm	MGP 15	MGP 12	MGP 10	MGP 15	MGP 12	MGP 10
		45	45	45	35	35	35
Heavy duty	Max putlog space, mm	1200	900	600	700	500	300
Medium duty	Max putlog space, mm	1400	1000	700	800	600	400
Light duty	Max putlog space, mm	2000	1400	900	1100	800	500

NOTE 1 The span spacing in this Table assumes a plank section width of 225 mm or wider for planks that have been kiln dried and machined to thickness.

NOTE 2 For descriptions of the stress grades identified in this Table, see AS/NZS 1748.1 and AS/NZS 1748.2.

3.8 Working platforms

Working platforms shall be in accordance with Clause 1.4 and the following apply:

(a) Platforms shall be constructed from scaffold planks conforming to AS/NZS 1577.

(b) Platforms shall extend across the full transverse width of the bay.

(c) Planks forming any one working platform shall be of uniform thickness.

(d) Planks shall be closely laid with gaps between adjacent planks of not more than 10 mm.

(e) Except at returns or irregular profiles, planks shall be butted rather than lapped.

(f) Each plank shall overhang its end putlogs by not less than 150 mm nor more than 250 mm.

(g) Where it is necessary to lap planks, the overlapping plank shall extend past the putlog by not less than 150 mm.

(h) Planks less than 3000 mm in length shall be positively secured against an end being lifted by a downward force on the other end.

(i) The loading shall not exceed the designated duty loading of the bay/level and total bay/level duties shall not exceed the combinations for the scaffold as specified in Table 3.3 and Table 3.4.

(j) Additional planks may be supported by that portion of putlogs cantilevered towards the working face, provided that the outermost plank is secured against displacement and the bay extension platform so formed does not exceed light duty, irrespective of the duty of the adjacent working platform.

(k) Table 3.3 and Table 3.4 allow for all lift levels to be planked if required but the number and duty of active bay/levels shall be limited to the quantities specified in Table 3.3 and Table 3.4. Where the 500 mm or lower base lift ledgers and/or transoms are omitted, the height or quantity of duty levels shall be reduced in accordance with Clause 3.9.

(l) Access shall be provided to the scaffold either from the building or from the base lift. Access from a building shall be in accordance with Item (m) of Clause 3.8 or by a ramp with edge protection.

(m) Access between adjacent working platforms that are greater than 300 mm vertically apart shall be provided by intermediate steps, stairs or ladders.

NOTE 1 Platforms may be continuous on one level or staggered at different levels.

NOTE 2 Where strong winds are likely to occur, planks should be positively secured against displacement.

Table 3.3 — Number of working platforms for scaffold constructed with steel tube

Size of bays	2 m	Top working platform height	Facade scaffold Combination duty/work-levels within a bay			Birdcage scaffold Combination duty/work-levels within a bay		
Length (mm) × Width (mm)	lifts	m	Number heavy	Number medium	Number light	Number heavy	Number medium	Number light
1800 × 900	15	30	1	1	—	1	—	—
	12	24	2	—	1	1	—	—
	10	20	2	1	—	1	—	1
	8	16	3	—	1	1	1	—
	4	8	4	—	—	2	—	—
1800 × 1200	15	30	1	—	1	—	1	—
	12	24	2	—	—	1	—	—
	10	20	2	1	—	1	—	1
	8	16	3	—	—	1	—	1
	4	8	4	—	—	2	—	—
2400 × 900	15	30	—	1	—	—	—	1
	12	24	—	2	1	—	1	—
	10	20	—	3	1	—	1	1
	8	16	—	4	—	—	2	—
	4	8	—	4	—	—	3	—
2400 × 1200	15	30	—	—	1	—	—	—
	12	24	—	2	—	—	1	—
	10	20	—	3	—	—	1	1
	8	16	—	4	—	—	2	—
	4	8	—	4	—	—	3	—
2400 × 1800	15	30	—	—	—	—	—	—
	12	24	—	—	1	—	—	—
	10	20	—	2	—	—	—	1
	8	16	—	3	—	—	1	—
	4	8	—	4	—	—	2	1
2700 × 1800	15	30	—	—	—	—	—	—
	12	24	—	—	—	—	—	—
	10	20	—	—	3	—	—	—
	8	16	—	—	5	—	—	1
	4	8	—	—	4	—	—	4

NOTE 1 The Table notes the allowable number of working levels vertically arranged within one bay, as limited by structural capacity. Occupational safety considerations may limit use of multiple working levels within a bay to avoid overhead work.

NOTE 2 "Medium duty" level imposes 2/3 the live-load of a "Heavy duty". "Light duty" level imposes 1/3 the live-load of a "Heavy duty". "Heavy duty" levels may be replaced with Medium duty and Light duty levels with equivalent total imposed live-load (e.g. 3 × Medium may replace 2 × Heavy, or 3 × Light may replace 1 × Heavy, or 2 × Light may replace 1 × Medium).

C3.3 Parameters used in analysis to compile Table 3.3 are as follows:

Mass of components applied

Tube mass of 4 mm wall steel tube for dead load — 4.37 kg/m

(continued)

Tube as standards, transoms, putlogs, ledgers, midrails and guardrails

LVL 230 mm wide, or other planks with length equal to bay length — 6 kg/m

Whole number of plank widths to fit bay width

LVL 230 mm wide, or other toeboard with length equal to bay length — 6 kg/m

Toeboard on facade scaffold bays

Right angle couplers — 1.35 kg

Putlog couplers — 0.85 kg

Geometry tolerances applied

Lift height tolerance —50 mm

Bay length and width tolerance — 50 mm

Transom and putlog length overhang — 150 mm

For weight influence on a standard, the average spacing of lateral components was set at 900 mm. Thus the total number of putlogs and transoms influencing a line of standards was 2 per 1800 mm bay, 2.66 per 2400 mm bay, etc.

Combination of leads and load factors applied

($1.5Q_{total} + 1.5G_{total}$)

Facade scaffold — influence on outer standard with putlogs, planks, rails and toeboards at all lift levels.

Birdcage scaffold — influence on inner standard surrounded by four bays with putlogs and planks at all levels.

Analysis according to AS 4100 (Steel structures)

OD mm	Wall thickness mm	f_y MPa
48.3	3.2 (gal)	250

Nominal column length 2000 mm

Effective column length with k = 1, nominal length plus length tolerance of –50 mm

ϕN_c further reduced for bending due to eccentricity of — 15.99 mm radius of gyration

Leading to reduced characteristic capacity, further reduced by both a load factor of 1.5 and a reuse factor, giving a working load limit of — 16.8 kN

where

Q_{total} = total imposed live load action

G_{total} = total imposed dead load action

OD = outside diameter

f_y = yield stress used in design for steel columns

(continued)

ϕN_c = capacity factor modified, axial load capacity

Table 3.4 — Number of working platforms for scaffold constructed with aluminium tube

Size of bays	2 m	Top working platform height	Facade scaffold Combination duty/work-levels within a bay			Birdcage scaffold Combination duty/work-levels within a bay		
Length (mm) × Width (mm)	lifts	m	Number heavy	Number medium	Number light	Number heavy	Number medium	Number light
1800 × 900	15	30	—	—	1	—	—	—
	12	24	—	1	—	—	—	1
	10	20	1	—	—	—	—	1
	8	16	1	—	1	—	1	—
	4	8	2	—	—	1	—	—
1800 × 1200	15	30	—	—	—	—	—	—
	12	24	—	—	1	—	—	—
	10	20	—	1	—	—	—	1
	8	16	1	—	1	—	—	1
	4	8	2	—	—	—	1	—
2100 × 900	15	30	—	—	—	—	—	—
	12	24	—	—	1	—	—	—
	10	20	—	1	—	—	—	1
	8	16	—	1	1	—	—	1
	4	8	—	3	—	—	1	1
2100 × 1200	15	30	—	—	—	—	—	—
	12	24	—	—	1	—	—	—
	10	20	—	1	—	—	—	—
	8	16	—	1	1	—	—	1
	4	8	—	2	1	—	1	—
2100 × 1800	15	30	—	—	—	—	—	—
	12	24	—	—	—	—	—	—
	10	20	—	—	—	—	—	—
	8	16	—	1	—	—	—	—
	4	8	—	2	1	—	1	—
2400 × 2100	15	30	—	—	—	—	—	—
	12	24	—	—	—	—	—	—
	10	20	—	—	—	—	—	—
	8	16	—	—	1	—	—	—
	4	8	—	—	4	—	—	1

NOTE 1 The Table notes the allowable number of working levels vertically arranged within one bay, as limited by structural capacity. Occupational safety considerations may limit use of multiple working levels within a bay to avoid overhead work.

NOTE 2 "Medium duty" level imposes 2/3 the live-load of a "Heavy duty". "Light duty" level imposes 1/3 the live-load of a "Heavy duty". "Heavy duty" levels may be replaced with Medium duty and Light duty levels with equivalent total imposed live-load (e.g. 3 × Medium may replace 2 × Heavy, or 3 × Light may replace 1 × Heavy, or 2 × Light may replace 1 × Medium).

C3.4 Parameters used in analysis to compile Table 3.4 are as follows:

Mass of components applied

Tube mass of 4.47 mm wall aluminium tube for dead load — 1.67 kg/m

Tube as standards, transoms, putlogs, ledgers, midrails and guardrails

LVL 230 mm wide, or other planks with length equal to bay length — 6 kg/m

Whole number of plank widths to fit bay width

LVL 230 mm wide, or other toeboard with length equal to bay length — 6 kg/m

Toeboard on facade scaffold bays

Right angle couplers — 1.35 kg

Putlog couplers — 0.85 kg

Geometry tolerances applied

Lift height tolerance —50 mm

Bay length and width tolerance — 50 mm

Transom and putlog length overhang — 150 mm

For weight influence on a standard, the average spacing of lateral components was set at 900 mm. Thus the total number of putlogs and transoms influencing a line of standards was 2 per 1800 mm bay, 2.66 per 2400 mm bay, etc.

Combination of loads and load factors applied

($1.5Q_{total}$ + $1.5G_{total}$)

Facade scaffold — influence on outer standard with putlogs, planks, rails and toeboards at all lift levels.

Birdcage scaffold — influence on inner standard surrounded by four bays with putlogs and planks at all levels.

Analysis according to AS/NZS 1664.1 (Aluminium structures)

OD mm	Wall thickness mm	F_{cy} MPa	ϕF_L tube beam	ϕF_L 2.05 m column
48.4	4.47	240	204 MPa	37.0MPa

Nominal column length 2000 mm

Effective column length with k = 1, nominal length plus length tolerance of — 50 mm

ϕN_c further reduced for bending due to eccentricity of — 15.61 mm radius of gyration

Leading to reduced characteristic capacity, further reduced by both a load factor of 1.5 and a reuse factor, giving a working load limit of — 8.7 kN

where

Q_{total} = total imposed live load action

G_{total} = total imposed dead load action

(continued)

OD = outside diameter

F_{cy} = compressive yield strength used in design for aluminium columns

ϕF_L = capacity factor modified, limit state stress used in design for the aluminium component noted

ϕN_c = capacity factor modified, axial load capacity

3.9 Omission of base lift

The number of 2 m lifts and height in Table 3.3 and Table 3.4 include those lifts and the height above the 500 mm or less base lift as specified in Clause 3.2.1 and Clause 3.3.

For installations where the base lift is omitted, a reduction shall be applied to the maximum height for the given duties and working levels allowed or, if the height is not so reduced, the allowed duty/levels shall be reduced.

NOTE The reduction to be applied depends on the height of the first lift, which lift and height are to be included in the count of lifts and height in Tables 3.3 and 3.4.

In the case where the first lift is still nominally 2 m, the height reduction or duty load reduction shall be as follows:

(a) For steel installations, a reduction of 6 lifts being 12 m or one Heavy duty level.

(b) For aluminium installations, a reduction of 4 lifts being 8 m or one Medium duty level.

In the case where the first lift is increased up to nominally 2.25 m, to afford greater clearance under the scaffold at the support level, the height reduction or duty load reduction shall be as follows:

(i) For steel installations, a reduction of 8 lifts being 16 m or one Heavy duty and one Light duty level or similar reduction combination such as two Medium duty levels.

(ii) For aluminium installations, a reduction of 6 lifts being 12 m or one Heavy duty level.

C3.9 *The calculations of the reductions specified in Clause 3.9 are based on an increase in the column effective length factor from K = 1 to K = 1.5.*

3.10 Edge protection

Edge protection shall be in accordance with Clause 5.7.

Section 4 Single-pole scaffold

4.1 Standards

Standards shall be in accordance with Clause 3.1 and the following:

(a) The longitudinal spacing of standards, measured centre to centre, shall be not more than 1800 mm, irrespective of the classification.

(b) The transverse distance from the supporting wall to the centre-line of a standard shall be not less than 1150 mm nor more than 1250 mm.

4.2 Ledgers

Ledgers shall be in accordance with Clause 3.2.

4.3 Longitudinal braces

Longitudinal braces shall be in accordance with Clause 3.4.

4.4 Transverse braces

Transverse braces shall be in accordance with Clause 3.5 and, where there is no return or where an additional standard has not been provided at the ends of a scaffold, be fixed to the tie tubes, as close as practicable to the supporting wall, with swivel couplers.

NOTE Longitudinal braces in the first bay of the return may perform the additional function of transverse braces at the end of the run.

4.5 Ties

Ties shall be in accordance with Clause 3.6, except for Item (b), and the following:

(a) Every tie tube shall be connected to at least one standard or one ledger within 300 mm of a standard.

(b) Every scaffold that exceeds one lift in height shall have its first level of ties located at or immediately below the first lift.

4.6 Putlogs

Putlogs shall be provided at every lift of the scaffold, and shall be in accordance with Clause 3.7 and the following:

(a) Except at openings in the supporting wall, the inner end of each putlog shall be fitted with a putlog blade.

(b) Each putlog blade shall be inserted into the supporting wall by not less than 75 mm.

(c) Putlog blades shall be reversed on returns, to enable horizontal platforms to be constructed on both the run and the return.

(d) Where putlogs are required at window openings, door openings or other recesses in the supporting wall, their inner end shall be supported by standards built up from internal floors or bridles.

4.7 Working platforms

Working platforms shall be heavy duty platforms (see Clause 1.4) conforming to the relevant requirements of Clause 3.8.

4.8 Edge protection

Edge protection shall be in accordance with Clause 5.7.

Section 5 Specific applications

5.1 General

Except where the requirements herein specify otherwise, the requirements of AS 1576.3 shall apply to specific applications.

5.2 Birdcage scaffolds

Birdcage scaffolds shall be in accordance with the following:

NOTE For a plan view of a freestanding birdcage scaffold, see Figure 5.1.

(a) Each external face shall be braced as if it is a longitudinal face conforming to Clause 3.4.

(b) In each direction, there shall be not more than two rows of standards between longitudinally braced rows of standards.

(c) Joints in ledgers and transoms shall not be made in the following locations:

  (i) In horizontally or vertically adjacent members.

  (ii) In the same member in adjacent bays.

  (iii) More than once between adjacent standards.

  (iv) In the end bays of a scaffold.

(d) Joints in ledgers and transoms shall be made with external sleeve couplers.

(e) Putlogs shall be lapped at a ledger and not joined within a bay.

(f) Where heavy duty platforms are set up in adjacent bays at the same lift, the ledger to standard or transom to standard connections that support such adjacent platforms shall be strengthened with check couplers.

(g) Where bay widths are not a multiple of the width of the scaffold plank, appropriate means, such as plywood overlay, shall be used to cover excessive gaps between planks.

Structural plywood with a grade of not less than Grade F11, as specified in AS/NZS 2269, and thickness of not less than 13 mm may be used to span gaps of not more than 150 mm between planks, provided the plywood fully covers and is securely fastened to the planks on either side of the gap.

5.3 Mobile scaffolds

Scaffolds having standards fitted with castors for mobility shall be in accordance with the following:

(a) A base lift of ledgers and transoms shall be fixed to the standards as close as practicable to the castors.

(b) The castors shall be retained to the standards to prevent dropping out.

(c) Plan braces shall be fixed to the standards with right angle couplers at the base of the scaffold and at every second lift, to prevent distortion of the scaffold while it is being moved. The length of a plan brace shall be not more than 3000 mm between connecting points, unless it is fixed at approximately the midspan to prevent buckling.

(d) Longitudinal face braces shall be fixed to each outer longitudinal row of standards. In the case of a multi-bay scaffold, braces shall in accordance with Clause 5.2 (b).

(e) Scaffold planks shall be secured against displacement.

(f) The supporting structure of a mobile scaffold shall be a hard flat surface. Unless the castors incorporate adjustable legs, the surface shall be level. Where the castors incorporate adjustable legs, the gradient of the surface shall not exceed 5°, unless provision is made to take the load off the castors during use of the scaffold.

(g) The height of the scaffold shall conform to the requirements of Clause 3.6.2.

(h) An internal ladder access, conforming to Clause 5.6, shall be provided.

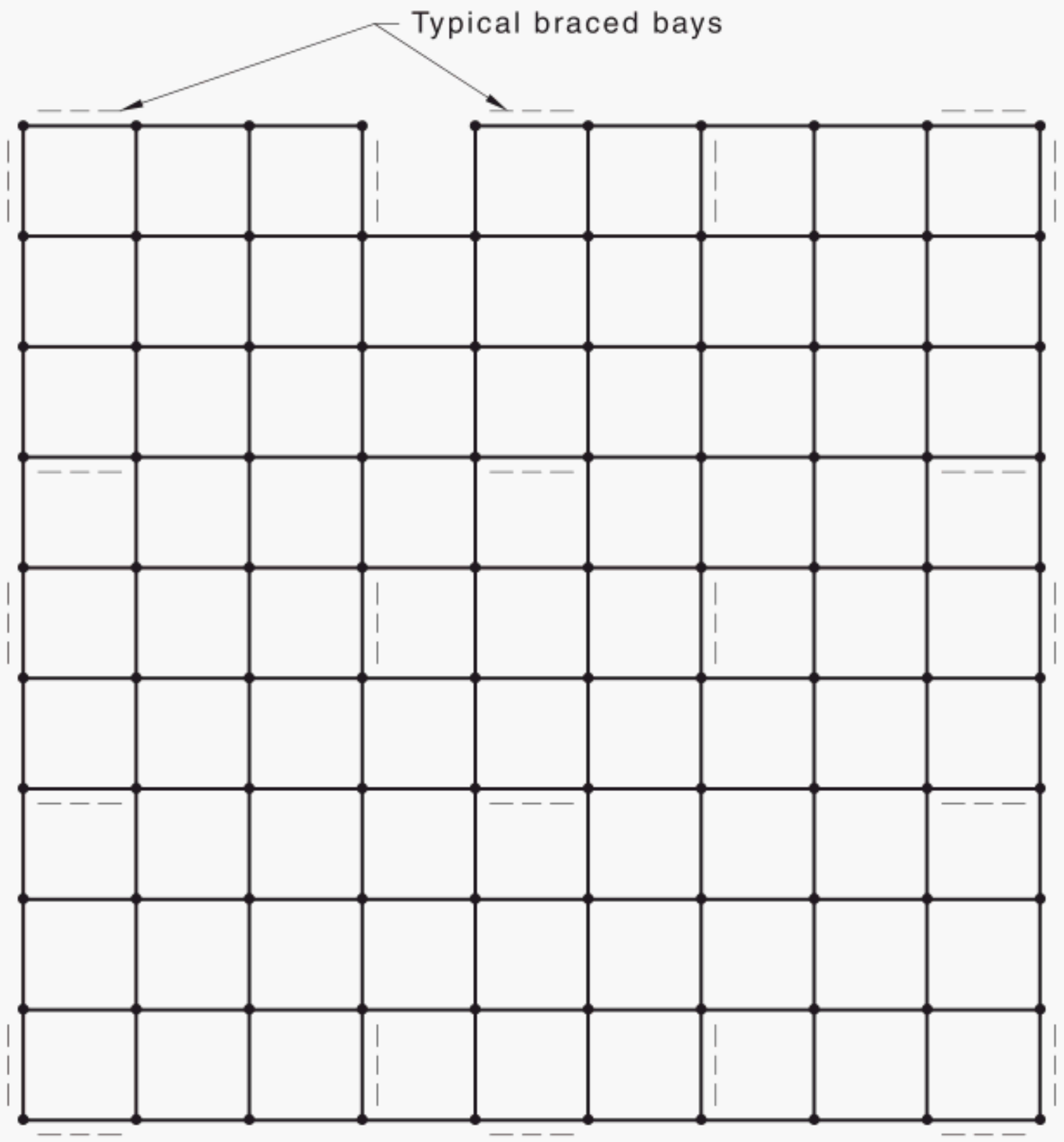


Figure 5.1 — Plan view of a freestanding birdcage scaffold

5.4 Sloping working platforms

The slope of working platforms shall be not more than a rise of 3° (1:19) horizontal.

Where it is necessary to provide sloping working platforms, the scaffold shall be in accordance with the following:

(a) The ledgers supporting the sloping platform shall be fixed to the upper surface of transoms with right angle couplers.

(b) To prevent creep, the planks shall be fixed by —

  (i) lashing to the putlogs;

  (ii) fixing cleats to their underside, hard against a putlog; or

  (iii) bolts, pins, dee brackets or similarly devices that prevent sliding of planks under the action of gravity.

(c) The guardrails and midrails shall be fixed to the standards with swivel couplers.

(d) Where further lifts are above the sloping platform, the lift immediately above the sloping platform shall provide adequate head clearance along the full length of the sloping platform.

5.5 Accessways and barrow runs

5.5.1 General

Accessways and barrow runs shall be in accordance with the requirements for heavy duty working platforms as specified in AS/NZS 1576.1, except that the platform width may be reduced to —

(a) 450 mm, where passage is required for persons only; or

(b) 675 mm, where passage is required for wheelbarrows [see Illustration (a), Figure 5.2].

5.5.2 Slope

The transverse slope shall not exceed 3°.

The longitudinal slope shall not exceed 20°. Where the longitudinal slope is greater than 7° from the horizontal, it shall incorporate slip restraint. Slip restraint shall be of a similar performance level that can be achieved by the use of cleats that are —

(a) nominally 25 mm thick;

(b) nominally 50 mm wide;

(c) spaced at intervals of nominally 450 mm;

(d) securely fixed to the upper surface of the platform; and

(e) the full width of the platform other than a 100 mm wide gap for a wheel of a material transporter, if required.

5.6 Access for working platforms

5.6.1 General

Access shall be provided to and from working platforms as specified in AS/NZS 1576.1.

NOTE For typical means of access, see also Figure 5.2.

Ladders shall not adversely affect the stability of the scaffold. External ladders shall be used only on birdcage scaffolds and tied scaffolds. Mobile scaffolds shall be fitted with internal ladders that are clear of the surface supporting the scaffold.

External access to a scaffold from a ladder shall be unobstructed and shall not require persons to climb over or through guardrails. Such ladders shall be parallel to the scaffold [see Illustration (b), Figure 5.2].

5.6.2 Portable ladders

Portable ladders shall be single or extension ladders in accordance with the industrial grade requirements of AS 1892.1 and AS/NZS 1576.1. Where extension ladders are used, they shall be designed to be supported by scaffold framework, taking into consideration the operation of the latching device.

If portable straight ladders or extension ladders of the general type are used, additional provisions shall be used to secure those ladders within the scaffold.

NOTE Examples of such provisions are shown in Figure 5.3.

5.6.3 Use of ladders

Ladders shall —

(a) be pitched at a slope of not less than one horizontally to four vertically and not greater than one horizontally to six vertically;

(b) be secured against displacement at the base and head using proprietary fixings or lashing;

(c) be provided with landings at the head and at the base;

NOTE Where the ladder rests on a fully covered supporting structure, the base landing may be omitted.

(d) have a base offset from the head of the ladder below, so that ladders do not take the form of a single continuous ladder;

(e) extend a minimum of 900 mm above the landing or top departure point, or other suitable hand-holds shall be available continuing up to that height; and

(f) have a clear and unobstructed access and egress at each landing.

The maximum height between successive landings serviced by a portable ladder shall not exceed 4000 mm or two lifts, whichever is the greater.

5.7 Edge protection

5.7.1 General

Except where Clause 5.7.6 applies, edge protection shall be provided on the open sides and ends of any access platform, barrow run or working platform located at a height from which a person or object could fall. The fall height shall be not greater than that stipulated in the relevant legislation of the relevant State, Territory or country.

Such edge protection shall be either —

(a) a guardrail, a toeboard and a midrail; or

(b) a guardrail, a toeboard and infill.

5.7.2 Guardrails

Guardrails shall be —

(a) of scaffold tube;

(b) parallel to the platform;

(c) set at a height above the platform of not less than 900 mm and not greater than 1100 mm;

(d) joined with end-to-end couplers; and

(e) fixed to —

(i) the inside of each standard crossed with right-angle, swivel or putlog couplers; or

(ii) the upper end of each standard passed with finial couplers.

5.7.3 Toeboards

Toeboards shall be —

(a) scaffold planks conforming to AS/NZS 1577;

(b) securely fixed to the inside of the standards; and

(c) positioned so that —

(i) they extend above the platform surface by not less than 150 mm; and

(ii) gaps between the toeboard and the platform are not greater than 10 mm.

5.7.4 Midrails

Midrails shall be —

(a) of scaffold tube;

(b) parallel to the platform;

(c) set at approximately midway between the guardrail and the upper edge of the toeboard;

(d) joined with end-to-end couplers; and

(e) fixed to the inside of each standard crossed using right-angle, swivel or putlog couplers.

5.7.5 Infill

Infill shall be —

(a) brickguards of proprietary manufacture, secured between the guardrail and the platform and incorporating a kickplate with a height of not less than 150 mm; or

(b) chainwire mesh, secured between the guardrail and toeboard, where the mesh is of steel wire with a diameter of not less than 2.5 mm and openings with a size not greater than 50 mm × 50 mm.

5.7.6 Omission of edge protection

Edge protection or components of edge protection may be omitted at points of access from a ladder or at edges of platforms adjacent to the face of a building or structure, provided the following apply:

(a) Points of access to ladders are —

(i) adequately protected by gates or other means; or

(ii) sufficiently distant from working platforms to prevent persons working from such platforms inadvertently falling through any opening.

NOTE Gates may be by swing tubes as in Illustration (c), Figure 5.2, or prefabricated gates hung off a standard with a spring return to ensure self-closing as in Illustration (e), Figure 5.2.

(b) Where a toeboard is omitted adjacent to the face of a building or structure (other than a working face), such face —

(i) is of a strength and rigidity not less than that of a toeboard;

(ii) extends at least 150 mm above the top of the platform; and

(iii) is not more than 10 mm from the platform edge.

(c) Where a toeboard is not provided adjacent to the working face of a building or structure —

(i) the gap between the platform edge and the face is less than 225 mm; and

(ii) adequate safeguards are taken to prevent any person being endangered in the event of debris falling.

(d) Where a guardrail or midrail is omitted adjacent to the face of a building or structure, other than a working face, such a face —

(i) is not more than 100 mm from the platform edge;

(ii) has a strength and rigidity of not less than that of a guardrail;

(iii) extends at least 900 mm above the top surface of the platform; and

(iv) adequately performs the function of a guardrail.

(e) Where a guardrail or midrail is omitted adjacent to a working face of a building or structure, such a face —

(i) is less than 225 mm from the platform edge;

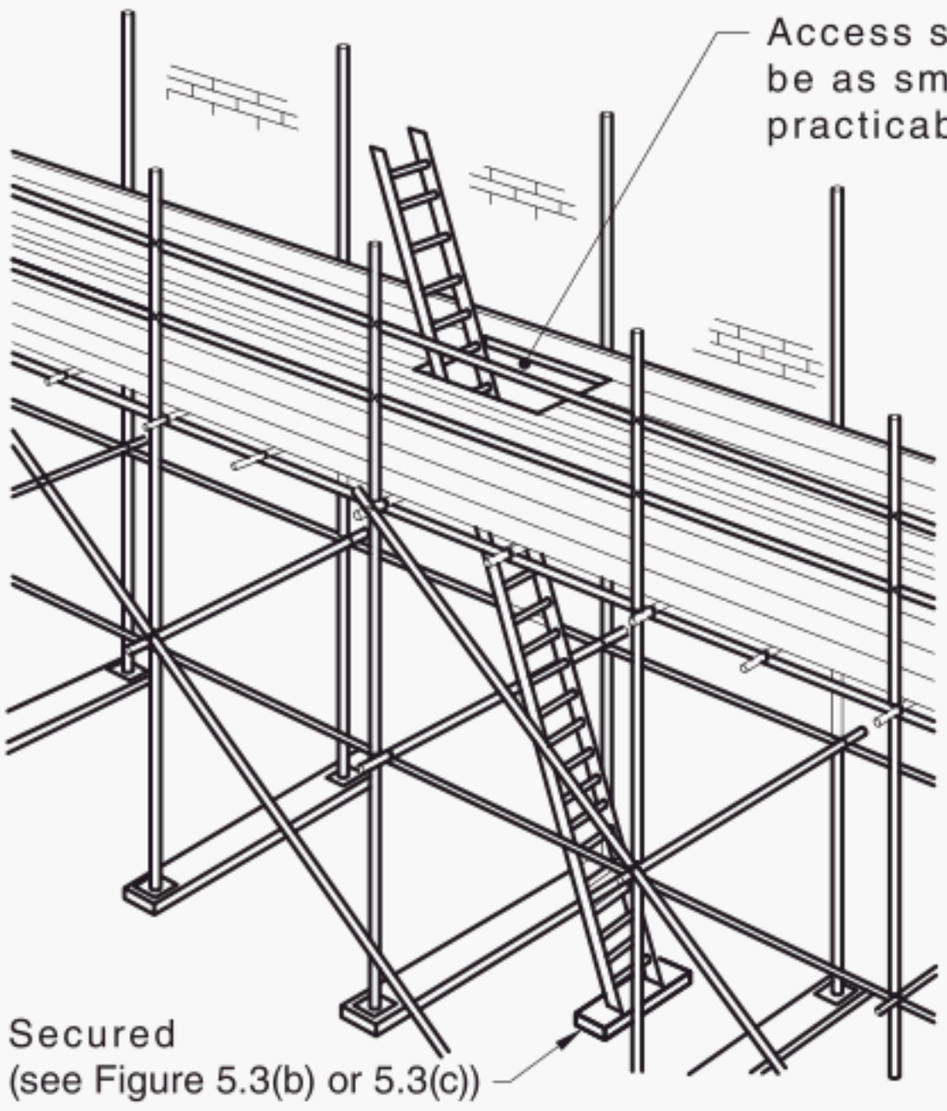
(ii) has a strength and rigidity not less than that of a guardrail;

(iii) extends at least 900 mm above the top surface of the platform; and

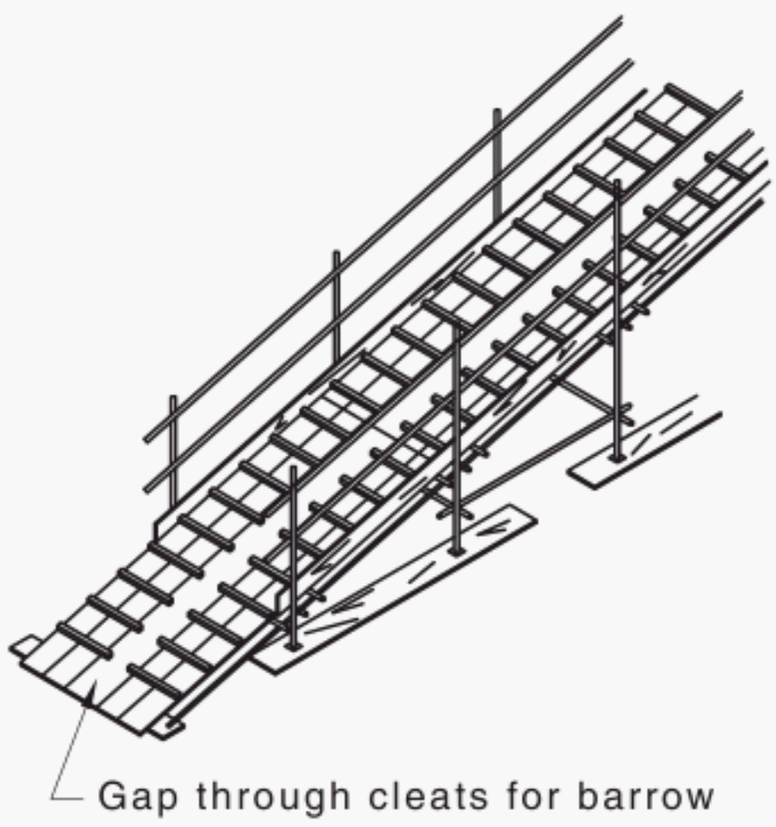
(iv) in all other respects, adequately performs the function of a guardrail.

5.7.7 Additional protection

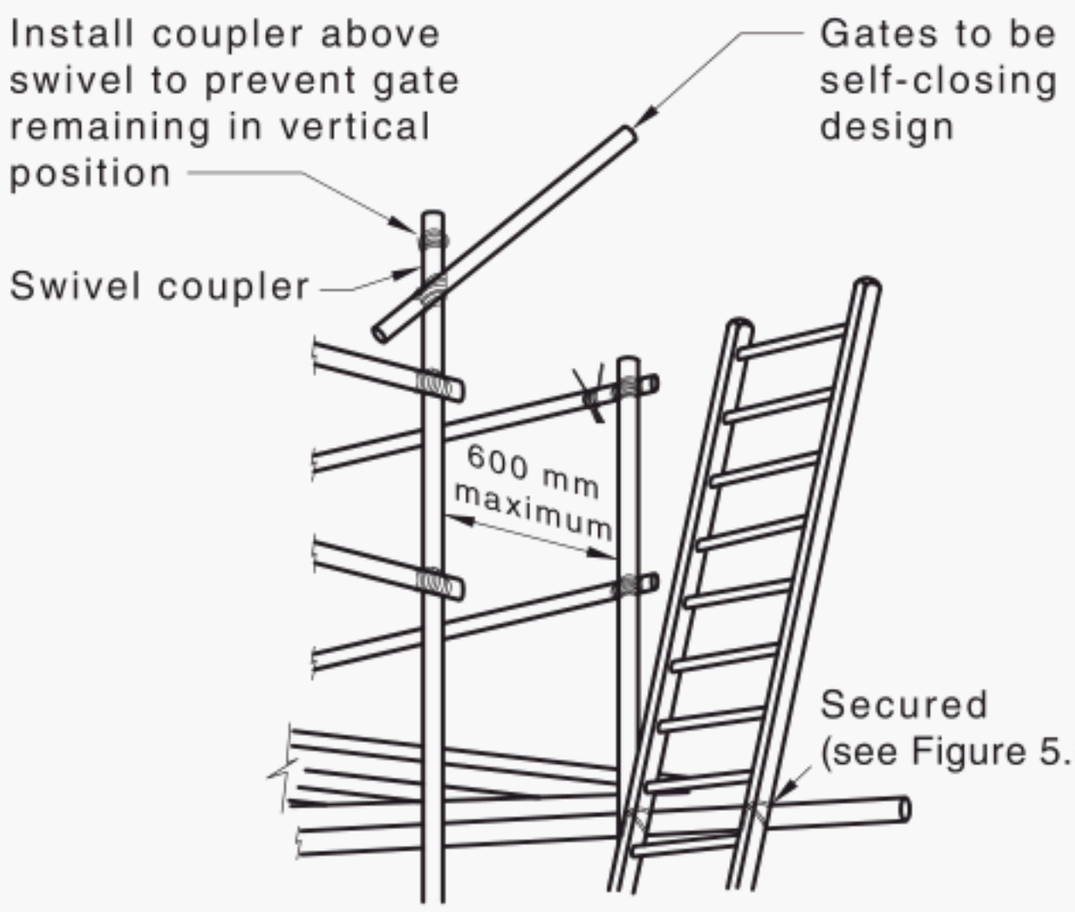
Where equipment or materials are intended to be deposited on a working platform to a height exceeding the height of the toeboard or in a position where there is any likelihood of such materials or equipment falling or being knocked from the platform, infill shall be provided for edge protection.



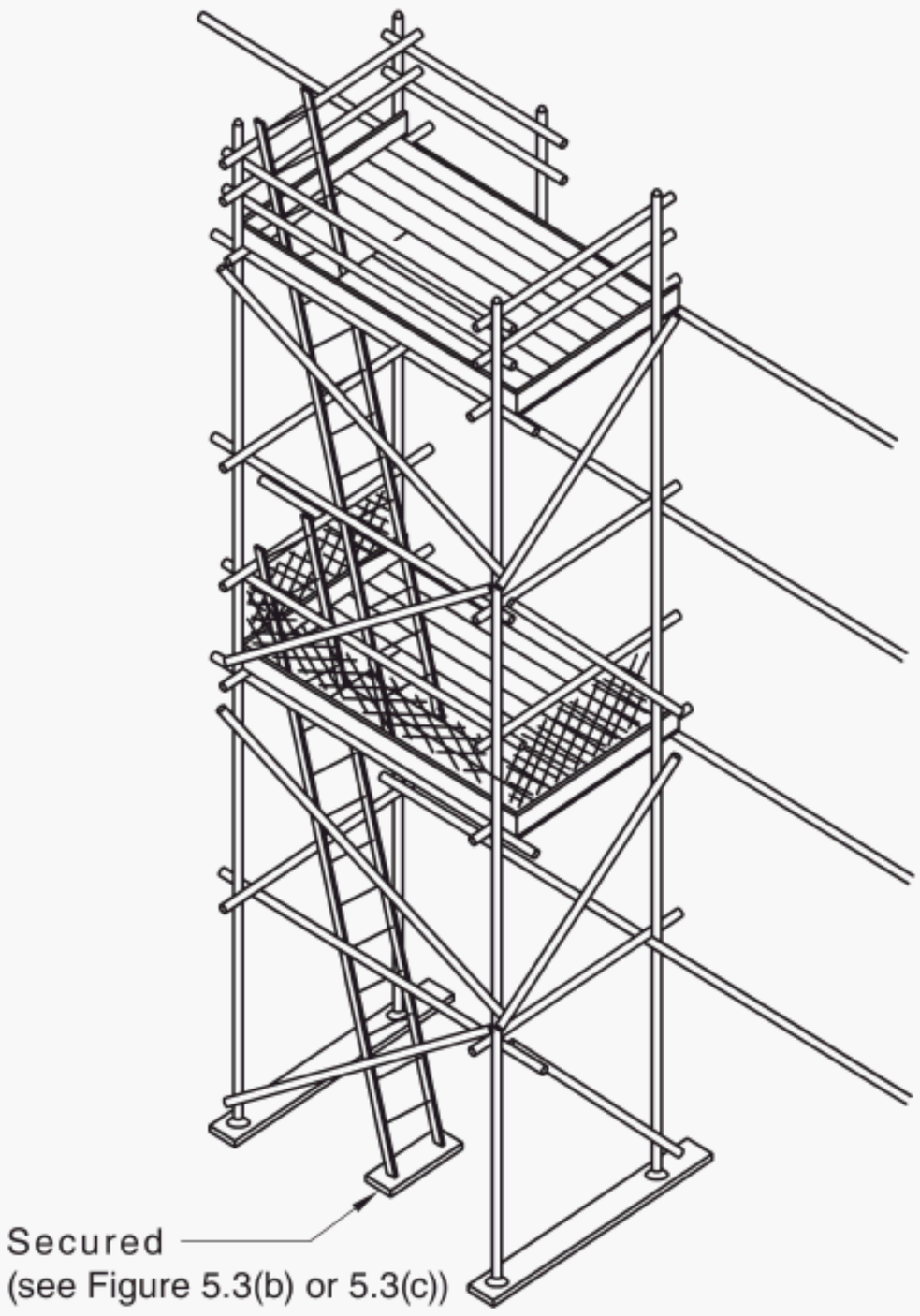
(b) Typical internal ladder access



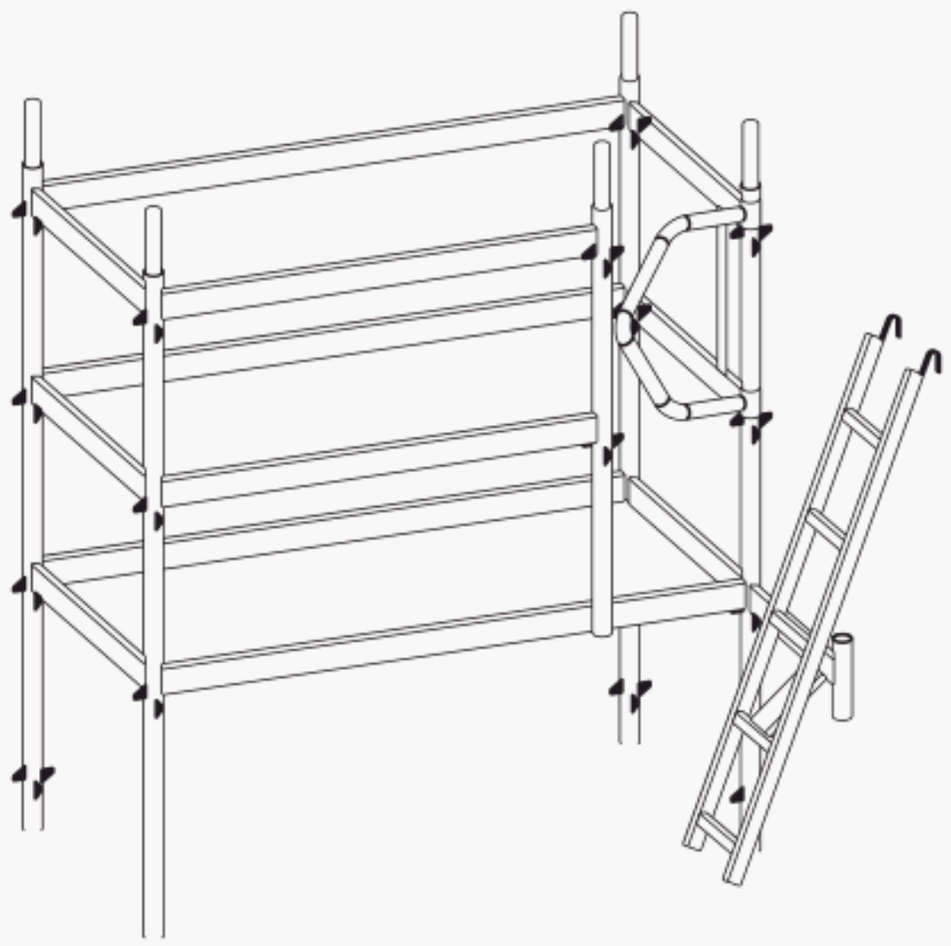
(a) Typical barrow ramp



(c) Typical external ladder access

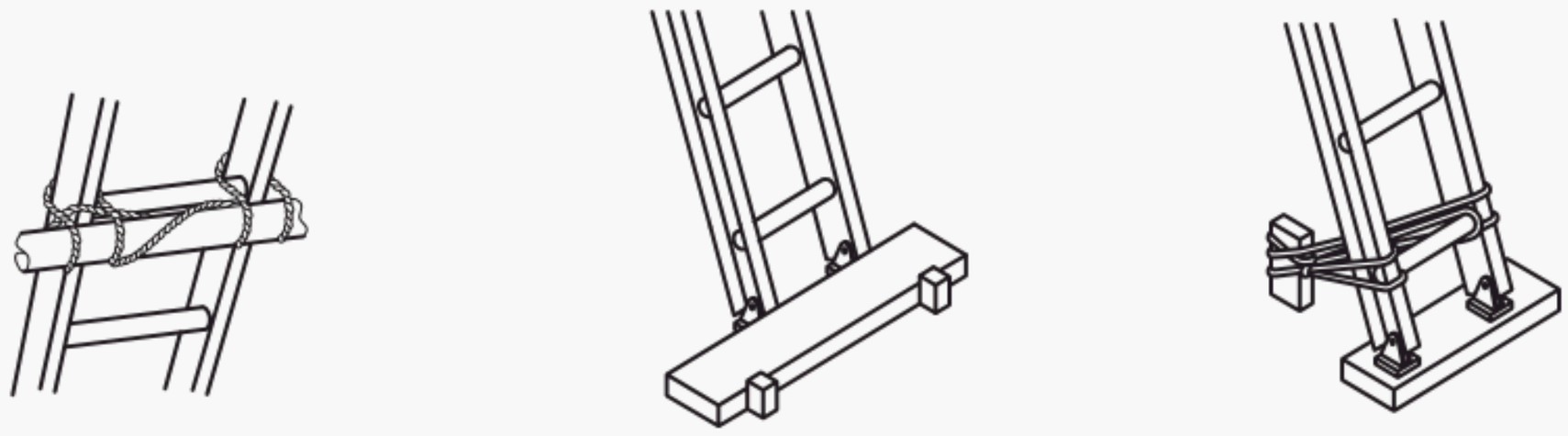


(d) Typical ladder access tower



(e) Typical external ladder access with spring return gate

Figure 5.2 — Typical means of access



(a) Lashing (b) Pegs and board (c) With board, tied to peg

Figure 5.3 — Typical means of securing ladders

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