

Australian/New Zealand Standard

Guidelines for scaffolding

AS/NZS 4576:1995

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A.C.T. WorkCover

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Guidelines for scaffolding

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STANDARDS AUSTRALIA
1 The Crescent,
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STANDARDS NEW ZEALAND
Level 10, Standards House,
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Wellington 6001 New Zealand

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD/36 on Scaffolding.

Every attempt has been made to ensure that the information in this Standard is compatible with Worksafe Australia's publications *National Standard for Plant* and *National Occupational Health and Safety Certification Standard for Users and Operators of Industrial Equipment*, and with *Health and Safety in Employment Act 1992* in New Zealand.

Persons using this Standard are advised to familiarize themselves with the specific statutory requirements relating to scaffolding and the certification of scaffolders in New Zealand and in the States and Territories of Australia.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	8
1.2 INCLUSIONS	8
1.3 EXCLUSIONS	8
1.4 REFERENCED DOCUMENTS	8
1.5 DEFINITIONS	8
SECTION 2 TRAINING AND COMPETENCY	
2.1 GENERAL	9
2.2 FURTHER INFORMATION FROM REGULATORY AUTHORITIES	9
2.3 SUPERVISION OF TRAINEES	9
2.4 TRAINING PROGRAMS	10
2.5 GAINING EXPERIENCE	10
2.6 RECORD OF TRAINING	10
2.7 AUSTRALIAN CERTIFICATES OF COMPETENCY	11
2.8 NEW ZEALAND CERTIFICATES OF COMPETENCY	11
SECTION 3 TOOLS AND EQUIPMENT	
3.1 INTRODUCTION	12
3.2 SCAFFOLD SPANNERS	12
3.3 PODGER HAMMERS	12
3.4 ADJUSTABLE WRENCHES	13
3.5 SPIRIT LEVELS	13
3.6 RULES AND TAPE MEASURES	13
3.7 SCAFFOLD BELTS	13
3.8 INDUSTRIAL SAFETY HELMETS	13
3.9 GLOVES	13
3.10 FOOTWEAR	14
3.11 FIBRE ROPE	14
3.12 WEBBING SLINGS	15
SECTION 4 SITE FOR ERECTION	
4.1 INTRODUCTION	16
4.2 PUBLIC PLACES	16
4.3 WORK AREAS FOR SCAFFOLDERS	16
SECTION 5 HAZARDS	
5.1 OCCUPATIONAL HEALTH AND SAFETY	17
5.2 EXPERT ADVICE	17
5.3 IDENTIFICATION OF HAZARDS	17
5.4 PROXIMITY TO POWERLINES	18
5.5 PROXIMITY TO HAZARDOUS PLANT	19
5.6 RISK ASSESSMENT	20
5.7 RISK CONTROL	20

SECTION 6 SELECTION

6.1 OCCUPATIONAL HEALTH AND SAFETY	21
6.2 CRITERIA	21
6.3 SUPPORTING STRUCTURE	21
6.4 FITNESS FOR PURPOSE	22

SECTION 7 MATERIALS

7.1 COMPLIANCE WITH STANDARDS	23
7.2 INSPECTION OF USED EQUIPMENT	24

SECTION 8 GENERAL DESIGN

8.1 INTRODUCTION	27
8.2 GENERAL	27
8.3 FOUNDATIONS	27
8.4 STABILITY	28
8.5 TYING	28
8.6 RIGIDITY	31
8.7 WORKING PLATFORMS	31
8.8 EDGE PROTECTION	33
8.9 ACCESS AND EGRESS	34
8.10 CONTAINMENT SHEETING	38
8.11 STEEL WIRE ROPE (SWR)	41
8.12 CHAIN	44

SECTION 9 GENERAL CONSTRUCTION

9.1 SELECTION OF APPROPRIATE METHOD	45
9.2 ORGANIZING THE WORK SEQUENCE	45
9.3 ADVERSE WEATHER	45
9.4 PLATFORM	45
9.5 GUARDRAILS	45
9.6 ACCESS	45
9.7 WORKING ALOFT	46
9.8 SAFETY HARNESS	46
9.9 EQUIPMENT HANDLING	46
9.10 HANDBALLING	46
9.11 HANDLINES	46
9.12 TOPPING UP STANDARDS	47
9.13 USE OF GIN WHEELS	47
9.14 CANTILEVER BUILDERS' HOISTS	48

SECTION 10 ADDITIONAL REQUIREMENTS FOR SPECIFIC TYPES
OF SCAFFOLD

10.1 TRESTLE SCAFFOLDS	50
10.2 BRACKET SCAFFOLDS	51
10.3 PREFABRICATED SCAFFOLDS	55
10.4 MOBILE SCAFFOLDS	61
10.5 TUBE-AND-COUPLER SCAFFOLDS	63
10.6 SPUR SCAFFOLDS	64
10.7 CANTILEVERED SCAFFOLDS	64
10.8 MAST-CLIMBING WORK PLATFORMS	66
10.9 HUNG SCAFFOLDS	67

	<i>Page</i>
SECTION 11 ADDITIONAL REQUIREMENTS FOR SUSPENDED SCAFFOLDS	
11.1 EQUIPMENT	71
11.2 ERECTION, ALTERING AND DISMANTLING	71
11.3 ACCESS	72
11.4 SUPPORTING STRUCTURES	72
11.5 SUSPENSION RIGS	73
11.6 OVERHEAD FIXINGS	78
11.7 TRAVERSING EQUIPMENT	78
11.8 ROPE TENSION	79
11.9 ELECTRICAL EQUIPMENT AND CONTROLS	79
11.10 PNEUMATIC EQUIPMENT	80
11.11 PROTECTIVE DEVICES	80
11.12 LOAD-LIMITING DEVICES	80
11.13 CRADLES	80
11.14 MULTI-TIERED CRADLES	81
11.15 TRAINING	81
11.16 NOTIFICATION OF USE	81
11.17 SAFETY EQUIPMENT	82
11.18 OPERATION	82
11.19 WORK PRACTICES	82
11.20 WHILE UNATTENDED	83
SECTION 12 GENERAL USE	
12.1 SPECIFIC TYPES OF SCAFFOLD	84
12.2 BEFORE USE	84
12.3 HANDOVER CERTIFICATE	84
12.4 DURING USE	85
12.5 AFTER USE	85
SECTION 13 INSPECTION, TESTING AND MAINTENANCE	
13.1 RECORD KEEPING	86
13.2 FREQUENCY OF INSPECTIONS	86
13.3 AUSTRALIAN REQUIREMENTS	86
13.4 NEW ZEALAND REQUIREMENTS	87
13.5 INSPECTIONS	87
13.6 REPAIRS TO ERECTED SCAFFOLD	88
13.7 COUPLERS AND ACCESSORIES	88
13.8 SCAFFOLD TUBES	88
13.9 SCAFFOLD PLANKS	88
13.10 MODULAR SCAFFOLDING	89
13.11 ACCESS LADDERS	89
13.12 SCAFFOLDING HOISTS	91
13.13 PROTECTIVE DEVICES	92
13.14 LOAD-LIMITING DEVICES	93
13.15 WIRE ROPES FOR SCAFFOLDING HOISTS	93

APPENDICES

A	REFERENCED DOCUMENTS	95
B	GLOSSARY OF TERMS	98
C	SAMPLE QUESTIONS FOR AUSTRALIAN EXAMINATIONS	113
D	COMMON BENDS AND HITCHES FOR FIBRE ROPE	116
E	GENERAL LOADING INFORMATION	117
F	INDUSTRIAL SAFETY NETS	122
G	INSPECTION OF BELTS AND HARNESES—CHECK LIST	130
H	INSPECTION OF SELF-LOCKING ANCHORAGES—CHECK LIST	131
I	CANTILEVER BUILDERS' HOISTS	132
J	INSPECTION CHECKLIST	134
K	RECORD AND INSPECTION SHEETS	140
L	AUSTRALIAN TEST FOR TIMBER SCAFFOLD PLANKS	143

FIGURES

3.1	EXAMPLES OF COMMONLY USED SCAFFOLDING TOOLS	12
3.7	A TYPICAL SCAFFOLDER'S BELT	13
3.11	COMMON WHIPPING	14
4.3	TYPICAL EXAMPLE OF WELL-STACKED SCAFFOLDING EQUIPMENT	16
5.4.2	CLEARANCE TO ELECTRICAL CONDUCTOR WIRES	18
8.3(A)	UNSAFE FOUNDATION	29
8.3(B)	ADEQUATE FOUNDATION	29
8.3(C)	FOUNDATIONS ON SLOPING GROUND	30
8.3(D)	UNDERMINING OF SUPPORTING FOUNDATION	31
8.5	SOME TIE ASSEMBLIES	32
8.6	TYPICAL TRANSVERSE BRACING FOR A SCAFFOLD	33
8.7	UNSAFE WORKING PLATFORMS	35
8.8(A)	TYPICAL BRICKGUARDS	37
8.8(B)	TYPICAL CANTILEVERED CATCH PLATFORM	37
8.9(A)	TYPICAL MEANS OF ACCESS	39
8.9(B)	UNSUITABLE FORMS OF LADDER ACCESS	40
8.10(A)	TYPICAL LAP DETAILS OF CONTAINMENT SHEETING	42
8.10(B)	TYPICAL FIXING ARRANGEMENT OF CONTAINMENT SHEETING	42
8.10(C)	TYPICAL POSITIONING OF EYELETS TO SUPPORT CONTAINMENT SHEETING	43
8.11(A)	A TYPICAL CONSTRUCTION OF STEEL-WIRE ROPE	44
8.11(B)	MEASURING THE DIAMETER OF STEEL-WIRE ROPE	44
9.10	HANDBALLING	47
9.11	USE OF A HANDLINE	48
9.13	GIN WHEELS	49
10.1(A)	TYPICAL SPLITHEAD AND TRESTLE SCAFFOLDS	52
10.1(B)	WRONG USE OF TRESTLE SCAFFOLDS	53
10.2.5	TYPICAL LADDER-BRACKET SCAFFOLD	54
10.3.5	A TYPICAL ACCESS OPENING IN A MODULAR SCAFFOLD	56
10.3.6(A)	TYPICAL MODULAR SCAFFOLDING	58
10.3.6(B)	SOME COMMON LEDGER FIXING DEVICES FOR MODULAR SCAFFOLDS	58

	<i>Page</i>
10.3.6(C) POSITIONING LEDGERS IN A MODULAR SCAFFOLD	59
10.3.7 TYPICAL FRAME SCAFFOLDING	60
10.3.8 TYPICAL TOWER-FRAME SCAFFOLDING	62
10.4 TYPICAL MOBILE SCAFFOLDS	63
10.5 TYPICAL TYPES OF TUBE-AND-COUPLER SCAFFOLD	65
10.7 TYPICAL CANTILEVERED SCAFFOLD	66
10.8 TYPICAL SINGLE-MAST-CLIMBING WORK PLATFORM	67
10.9(A) EXAMPLES OF HUNG SCAFFOLDS	69
10.9(B) TYPICAL DETAILS OF HUNG SCAFFOLDS USING CHAIN AND ROPE	70
11.1(A) A TYPICAL DOUBLE-ROPE SUSPENDED SCAFFOLD	72
11.1(B) A TYPICAL TRAVERSING SWING-STAGE SUSPENDED SCAFFOLD	73
11.5.1 TYPICAL SUSPENSION RIGS	74
11.5.6 TYPICAL COUNTERWEIGHTS FOR COUNTERWEIGHTED NEEDLES	77
13.8 COMMON DEFECTS IN SCAFFOLD TUBES	89
13.9(A) FAULTS IN TIMBER SCAFFOLD PLANKS	90
13.9(B) FAULTS IN METAL SCAFFOLD PLANKS	91
13.15 COMMON DEFECTS IN SCAFFOLDING HOIST WIRE ROPES	94
B1 TYPICAL COUPLERS AND ACCESSORIES	109
B2 TYPICAL ARTICULATED CRADLE	111
B3 TYPICAL INDIVIDUAL CRADLE	111
B4 MAIN DIMENSIONS OF A SCAFFOLD	112
B5 EXAMPLE OF AN INDEPENDENT SCAFFOLD	112
D1 COMMON BENDS AND HITCHES FOR FIBRE ROPE	116
F3(A) TYPICAL ARRANGEMENT OF OUTRIGGED OR PERIMETER NETS	125
F3(B) SITING OF OUTRIGGED NETS	128
F3(C) ATTACHMENT OF SAFETY NET USING A TIE CORD	129
I1 CANTILEVER BUILDERS' HOIST	133
L1 SIMPLY SUPPORTED PLANK FOR JUMP TEST	143
L2 CANTILEVERED PLANK FOR JUMP TEST	144

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Guidelines for scaffolding**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard gives practical guidance for the training and certification of scaffolders, the preparation of sites for scaffolding, and the safe selection, supply, erection, alteration, dismantling, maintenance, inspection and use of scaffolding and scaffolding equipment.

1.2 INCLUSIONS

This Standard gives guidance for the general use of scaffolding, including:

- Portable ladders used as access to platforms.
- Portable trestle ladders supporting scaffold planks.
- Ladder bracket scaffolds.
- Temporary stairways, landings, ramps and other access ways.
- Temporary catch platforms including covered ways, safety nets and footpath hoardings (gantries) comprised of scaffolding equipment.
- Temporarily installed working platforms, including swing stages and boatswain's chairs.
- Temporary loading platforms and cantilevered crane loading bays.
- Temporary seating stands, stages, lighting towers and camera towers for concerts, sporting events, and so on, substantially comprised of scaffolding equipment.
- Mast climbing work platforms.

1.3 EXCLUSIONS

This Standard does not give guidance for:

- Temporarily installed guardrails.
- Portable ladders not used in connection with scaffolding.
- Permanently installed walkways, stairways, ladders, catwalks and the like.
- Building maintenance units.
- Crane boxes, scissor hoists, boom-type elevating work platforms (i.e. cherry pickers), lifts, and (men and materials) hoists.
- Falsework, shoring, back-propping and any other frame-work for the support of floors, walls, roofs and structural members of buildings, structures, ships, boats or mines.

1.4 REFERENCED DOCUMENTS

The documents in Appendix A are referred to in this Standard.

1.5 DEFINITIONS

For the purpose of this Standard and the scaffolding industry, the definitions given in Appendix B apply.

SECTION 2 TRAINING AND COMPETENCY

2.1 GENERAL

Australian and New Zealand occupational health and safety laws require employers to provide scaffolders with the information, instruction, training and supervision necessary to allow them to work safely.

In order for scaffolding to be erected, altered and dismantled correctly, safely and efficiently, scaffolders must:

- Know the basic relevant rules of physics and mechanics.
- Be able to read and understand the supplier's information, general site plans, design drawings and specifications for scaffolds. (An ability to make simple calculations of dead load and live load is often needed.)
- Have a thorough knowledge of the scaffolding equipment being used.
- Have thorough knowledge of the construction methods and design requirements associated with that equipment.
- Be able to recognize common hazards at the worksite and be capable of taking effective precautions, to control risks to health and safety arising from these hazards.
- Visually inspect scaffolding equipment for faults.
- Have the physical skills needed for scaffolding construction.
- Be competent in manual lifting techniques.
- Work safely and confidently at heights.
- Correctly use the various tools, ropes and gin wheels.
- Erect and dismantle scaffolding in the correct sequence.

2.2 FURTHER INFORMATION FROM REGULATORY AUTHORITIES

Contact your local regulatory authority for further information about:

- Training of scaffolders.
- Assessment and application procedures for certificates of competency.
- Recognition of prior learning and overseas qualifications.
- Suspension and cancellation of certificates of competency.

2.3 SUPERVISION OF TRAINEES

Trainees engaged in the erection, alteration or dismantling of scaffolding should be directly supervised by a competent scaffolder.

The supervising scaffolder should monitor the work, to ensure compliance with regulatory requirements and recommended practice and be in a position to take immediate charge in the event of an emergency.

Trainees should not be required to carry out scaffolding work in an isolated location out of sight and earshot of the supervising scaffolder.

The appropriate ratio between certificated scaffolders and trainee scaffolders in a gang depends on the level of experience and competence gained by each trainee, the complexity of the scaffolding work being undertaken and the risks associated with any mistakes that may be made by trainees. The ratio should be determined by the employer through consultation with the supervising scaffolder, taking into account any requirements of the regulatory authority. The supervising scaffolder will be carrying out the employer's legal obligation to supervise trainee scaffolders to perform the work safely and without risk to health.

2.4 TRAINING PROGRAMS

Employers should provide trainee scaffolders with a structured and comprehensive training program.

Training programs should include both formal instruction and supervised practical work experience. Ideally, the formal instruction will be delivered as a series of separate modules or topics with periods of continuing work experience between each module.

Instructors should be competent industrial trainers who have gained extensive experience as practising scaffolders. A thorough knowledge and understanding of the regulatory requirements for scaffolding and the recommended work practices for scaffolders are essential.

The information in this Standard should be supplemented with examples of suppliers' documented information and other relevant information from the regulatory authority, industry groups and training establishments.

The work experience of trainees should occur in a logical sequence, starting from the least demanding tasks and skills, with minimum risks to health and safety, and progressing through to the most demanding tasks and skills, with the greatest risks to health and safety.

The person in charge of a gang that includes one or more trainees should be a scaffolder with extensive experience, a consistent record of using recommended work practices and a willingness and ability to pass on knowledge and skills.

2.5 GAINING EXPERIENCE

Trainees with no scaffolding experience should each gain work experience on the ground as a 'groundie' with a gang of experienced scaffolders. In this way, each trainee learns to recognize scaffolding components and gains an understanding of erection techniques while remaining safely on the ground.

Ground work exposes trainees to plans and specifications and the fundamentals of estimating and preparing materials. It also provides experience in the preparation of ropes and gin wheels, the fixing of bends and hitches to haul materials, and the basic manual handling techniques needed to minimize strain when shifting and passing up large quantities of gear.

A trainee who has become a competent groundie should be introduced to working aloft by gradually increasing the degree of complexity of the tasks.

A trainee who has gained the confidence and ability to work without supervision is ready to be assessed (or to complete a staged assessment) for a certificate of competency. Some sample examination questions set in Australia are given in Appendix C.

2.6 RECORD OF TRAINING

There should be a formal record of training for each trainee scaffolder. This can take the form of a logbook held by the trainee.

The record of training should include details of the formal instruction modules and the scaffolding-related work practices that have been experienced. Entries should be progressively recorded and verified by a signature of the person overseeing that item of training or experience.

Training records should be taken into account when assessing the trainee for a certificate of competency and should influence the nature and extent of the assessment. They will also provide a useful reference for a prospective employer.

2.7 AUSTRALIAN CERTIFICATES OF COMPETENCY

There are nationally uniform certification requirements in force in all Commonwealth, State and Territory jurisdictions in Australia.

Under these requirements, certification applies where a person or object could fall more than 4 m from a scaffold or from an adjacent open floor.

The types of national certificate classes are:

- *Basic scaffolding* Basic scaffolding certificates include prefabricated scaffolds, bracket scaffolds, work associated with ropes and gin wheels and the installation of safety nets, static lines and cantilever materials hoists with a working load limit of up to 500 kg.
- *Intermediate scaffolding* Intermediate scaffolding certificates cover basic scaffolding and also include tube-and-coupler scaffolds, cantilevered crane loading platforms, cantilevered and spurred scaffolds, barrow ramps and sloping platforms, scaffolding associated with perimeter screens and shutters and mast-climbing work platforms.
- *Advanced scaffolding* Advanced scaffolding certificates cover basic and intermediate scaffolding and also include hung scaffolds, suspended scaffolds and the installation of all types of cantilevered hoists, including personnel and materials hoists.

National rigging certificates also cover some of this work, such as the erection, alteration and dismantling of mast-climbers, cantilevered crane loading bays, fully-fabricated hung scaffolds, suspended scaffolds and cantilevered builders' hoists.

Scaffolders who hold old State and Territory certificates can continue to operate under those certificates in accordance with State and Territory laws.

2.8 NEW ZEALAND CERTIFICATES OF COMPETENCY

Under New Zealand regulations, certification applies where a person or object could fall more than 5 m from a scaffold.

The types of New Zealand certificate classes are:

- *Basic scaffolding* The equipment range includes free standing modular system scaffolds, ropes, gin wheels, static lines and fall arrest systems.
- *Suspended scaffolding* The equipment range includes hand haul and mechanical boatswain's chairs, building maintenance units and swinging stages (hand haul and mechanical types).
- *Advanced scaffolding* The equipment range includes free standing modular system scaffolds, tube-and-coupler scaffolds including tube-and-coupler covered ways and gantries, scaffolding associated with perimeter safety screens and shutters, cantilevered hoists with a working load limit not exceeding 250 kg (for materials only), ropes, gin wheels, safety nets for public protection, catch nets, static lines, fall arrest systems, bracket scaffolds (tank and formwork types), cantilevered load platforms supported by a scaffold, cantilevered scaffolds, spurred scaffolds, barrow ramps, sloping platforms, mast climbers, hung scaffolds including scaffolds hanging from tubes, wire ropes and chains.

The equipment range excludes hand-haul and mechanical types of boatswain's chairs, building maintenance units and swinging stages.

SECTION 3 TOOLS AND EQUIPMENT

3.1 INTRODUCTION

There are a range of tools and work practices that scaffolders need to be familiar with.

The tools and equipment that are commonly used to erect, maintain and dismantle scaffolding are described in this Section (see also Figure 3.1).

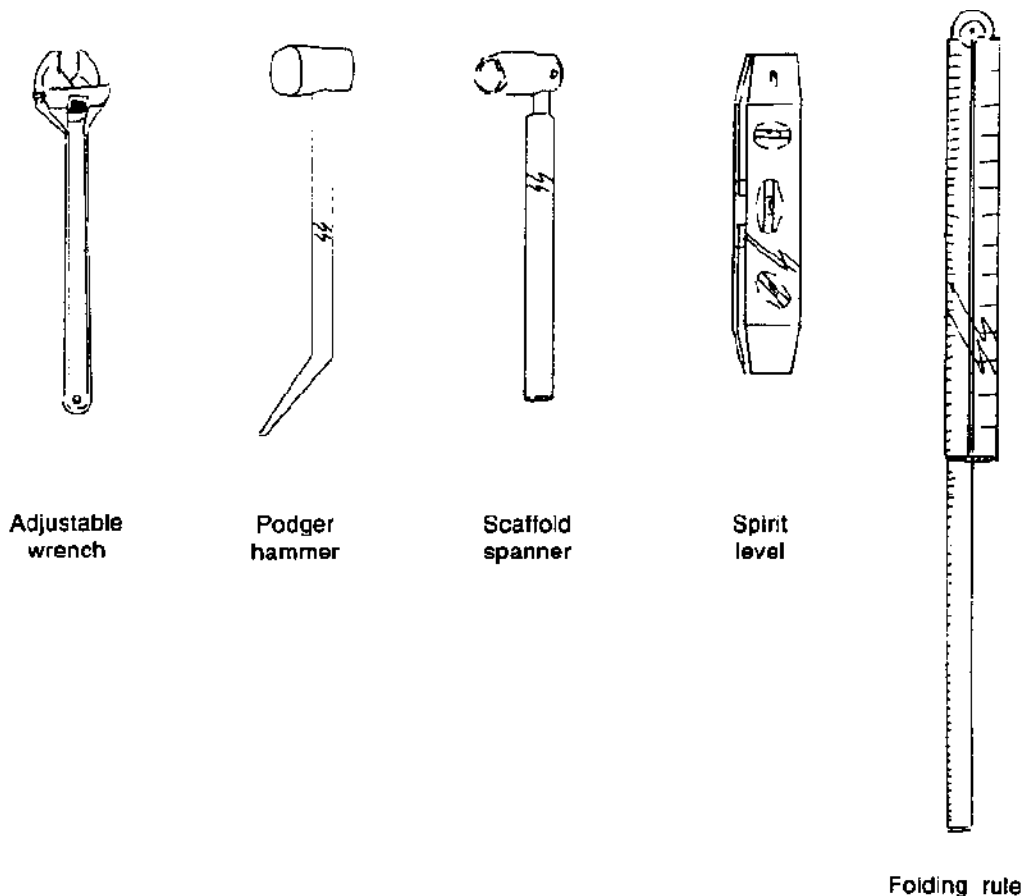


FIGURE 3.1 EXAMPLES OF COMMONLY USED SCAFFOLDING TOOLS

3.2 SCAFFOLD SPANNERS

‘Scaffold spanner’ and ‘scaffold key’ are defined in Appendix B.

The handle of scaffold spanners should be not less than 200 mm nor more than 250 mm long.

Scaffold spanners with a worn rivet or a sloppy head should be repaired or replaced.

3.3 PODGER HAMMERS

‘Podger hammer’ is defined in Appendix B.

Podger hammers with a loose head or a hairline crack at the juncture between the head and the shaft should be replaced.

3.4 ADJUSTABLE WRENCHES

An adjustable wrench (shifter or shifting spanner) is normally used where an obstruction makes the use of a scaffold spanner impossible.

Care should be taken to avoid burring nuts and bolt heads when using an adjustable wrench.

The arm of an adjustable wrench used for couplers should be not less than 200 mm nor more than 250 mm long.

3.5 SPIRIT LEVELS

Spirit levels are used to check that scaffolding members are horizontal or plumb.

When working aloft, use spirit levels that are compact enough for use with one hand and for safe stowing on a scaffolder's belt when not in use.

3.6 RULES AND TAPE MEASURES

Rules and tape measures should be carried in a purpose-designed pouch on the scaffolder's belt or clipped to the inside of the belt, to minimize the risk of dislodgment while the scaffolder is working aloft.

3.7 SCAFFOLD BELTS

A scaffolder's belt (see Figure 3.7) should be used to safely carry scaffold tools while they are not used.

The belt should be made of sturdy leather, canvas webbing or material of equivalent strength and characteristics.

Leather or canvas frogs (bayonet holders) should be used to secure scaffold spanners, podger hammers and adjustable wrenches. Folding rules and small spirit levels should be secured in carpenter's chisel pouches or similar.

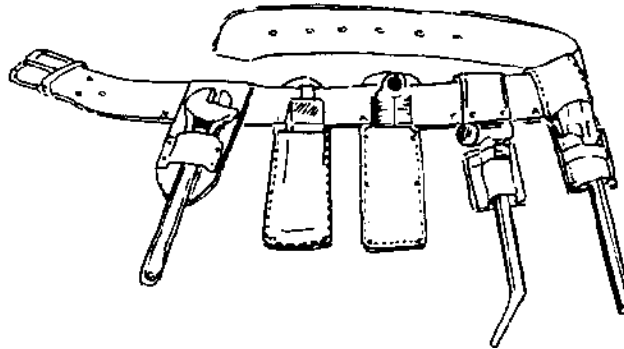


FIGURE 3.7 A TYPICAL SCAFFOLDER'S BELT

3.8 INDUSTRIAL SAFETY HELMETS

Industrial safety helmets complying with AS 1801 or NZS 5806 should be worn, wherever there is a risk of objects falling from above and on any work site where a hard hat sign is displayed.

3.9 GLOVES

Gloves should be close fitting and non-slip.

3.10 FOOTWEAR

Footwear should be comfortable, provide maximum grip and give protection from pinching, jamming and crushing. A range of lightweight flexible footwear with steel or plastic protective caps is available (see AS/NZS 2210.1 and AS/NZS 2210.2).

3.11 FIBRE ROPE

Fibre rope used as a handline for the raising or lowering of scaffolding gear should be at least 12 mm in diameter. Rope used for haulage with a gin wheel should be at least 16 mm in diameter.

To avoid high-stranding and excessive kinking, a new coil of rope should be laid on a flat surface and unwound through the coil in an anti-clockwise direction, carefully removing any kinks and loops as they form.

Where natural fibre rope is not used immediately, it should be laid out in the sun until it has dried and softened.

Prior to being cut, rope should be whipped with twine on either side of the proposed cut (see Figure 3.11), to prevent the rope from unlaying or fraying.

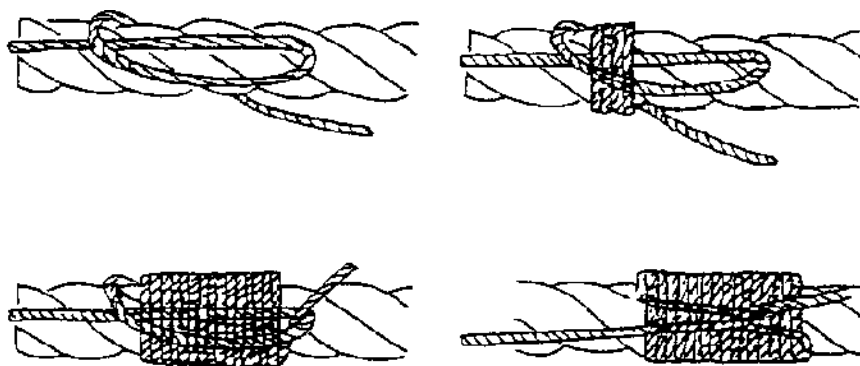


FIGURE 3.11 COMMON WHIPPING

The length of each whipping should be at least equal to the rope diameter.

Fibre rope should be stored:

- Away from exhaust gases and boilers, radiators, steampipes and other sources of heat.
- In a dry cool room with good air circulation.
- In loose coils hanging on large wooden pegs well above the floor.

Fibre rope should not be stored on the ground or floor or in boxes or cupboards with restricted air circulation.

Wet rope should be naturally dried and cleaned before being stored. Do not disturb a frozen rope until it has completely thawed, because frozen fibres may be damaged when handled.

Rope in use should be thoroughly inspected along its entire length on a daily basis. Look for:

- External wear.
- Cuts and abrasions.
- Burns.
- Powdered or hairy fibres.
- High-stranding or kinking.
- Grit and dirt lodged in strands.
- Internal wear between strands.

If there is any reasonable doubt about the soundness of a rope, it should be replaced.

When a competent person has condemned a rope, it should be destroyed at once or cut up into short lengths so that it cannot be used for lifting purposes.

Common bends and hitches for fibre rope are illustrated in Appendix D.

Further advice on the care and use of fibre rope is given in AS 4142.1.

3.12 WEBBING SLINGS

Flat webbing slings should comply with AS 1353.1 and be used in accordance with AS 1353.2.

SECTION 4 SITE FOR ERECTION

4.1 INTRODUCTION

There are a range of hazards, such as powerlines, traffic, plant and explosive substances that must be identified and assessed prior to erecting a scaffold. Specific requirements for hazards are given in Section 5.

4.2 PUBLIC PLACES

Protective measures must be taken to separate the public from the dangers of scaffolding while erecting, altering or dismantling scaffolding, particularly on, over or adjacent to any public thoroughfare or adjoining property.

Check with the local authority to see if a permit is required.

4.3 WORK AREAS FOR SCAFFOLDERS

The preparation of a work area for scaffolders must allow for the safe erection, alteration or dismantling of scaffolding, including the safety of all site personnel.

There must be a firm supporting surface for storing equipment and erecting the scaffold.

Debris and unnecessary materials and equipment should be removed and space provided for the delivery, unloading and stacking of scaffolding equipment.

Isolate the work area from other site personnel.

An example of well-stacked scaffolding equipment is given in Figure 4.3.

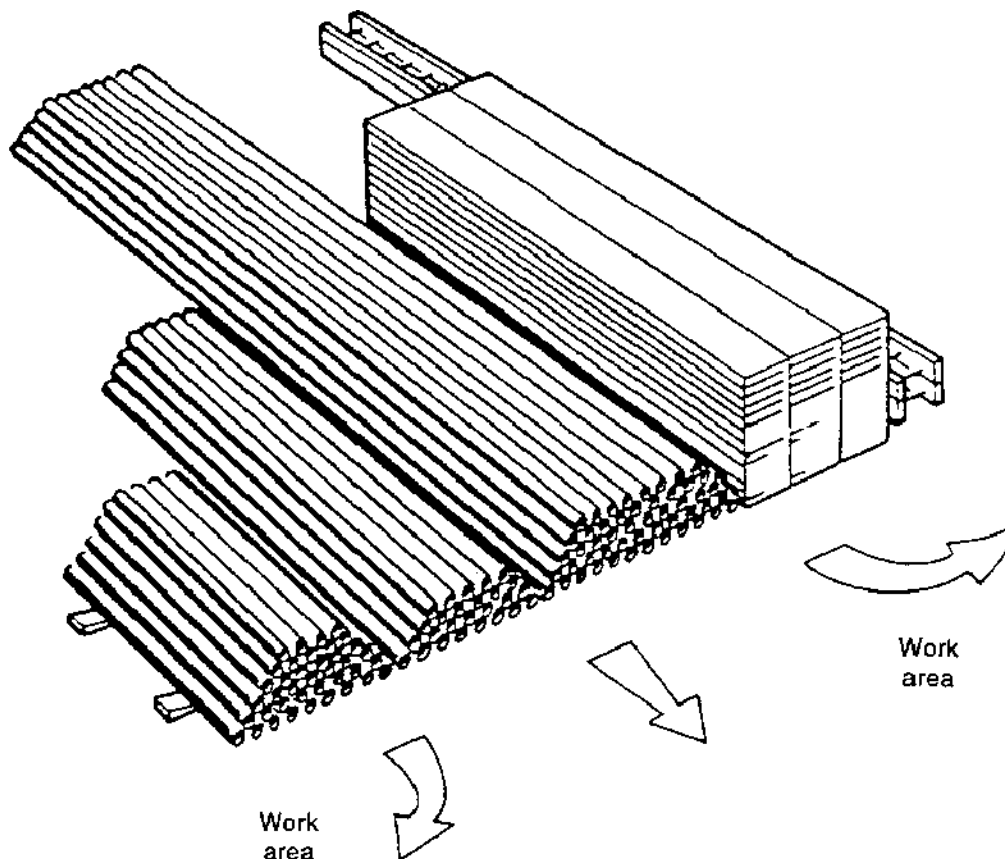


FIGURE 4.3 TYPICAL EXAMPLE OF WELL-STACKED SCAFFOLDING EQUIPMENT

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S E C T I O N 5 H A Z A R D S

5.1 OCCUPATIONAL HEALTH AND SAFETY

Under occupational health and safety laws in Australia and New Zealand:

- Plant and associated systems of work must not cause unnecessary risks to the health of workers and others, including members of the public.
- Plant and associated systems of work must be maintained in a safe condition.
- Employees must cooperate with their employer.
- Employees must take care of the health and safety of themselves, fellow workers and others.

The essential elements of minimizing risk are:

- Use expert advice.
- Identify hazards.
- Assess risk.
- Control risk.

5.2 EXPERT ADVICE

Wherever possible, expert advice should be sought by the main employer during the planning stage of the project and when unforeseen circumstances or changes to the project schedule occur, to identify potential hazards and to assess and control risks.

Expert advice is available from a number of sources, including equipment suppliers, health and safety professionals, industry organizations, occupational health and safety authorities, scaffolding and access design consultants, subcontractors and workplace health and safety committees.

5.3 IDENTIFICATION OF HAZARDS

Hazards that have the potential to cause injury or illness are commonly associated with elevated work, scaffolding and other temporary access equipment, and include:

- Engaging in the erection and dismantling of a scaffold or access equipment.
- Using a scaffold or equipment.
- Being in the vicinity of elevated work, a scaffold or equipment (including the general public).
- Working at heights.
- Falls from heights.
- Falling objects.
- Manual handling.
- Electricity.
- Corrosive substances.
- Volatile atmospheres.
- Movement of cranes, vehicles and machinery.
- Weak or unstable supporting structures.
- High winds and storms.

5.4 PROXIMITY TO POWERLINES

5.4.1 General Powerlines are a potential hazard to persons erecting, working from or in the vicinity of a scaffold.

Isolate or shield any electrical wires. Electrical wires or apparatus that pass through a scaffold should be de-energized or protected by the supply authority and should be fully enclosed by a non-conductive material such as moisture-resistant flooring-grade particle board complying with AS 1859, dry timber, plywood or similar non-conductive material.

The possibility of movement of powerlines caused by strong wind should be considered.

5.4.2 Australian requirements The clearance between scaffolds and any transmission line, main apparatus or transmission apparatus should be not less than (see Figure 5.4.2):

- 4.0 m where any metal member is used.
- 1.5 m where only non-conductive materials such as dry timber or plywood are used.

Advice should be sought from the local electricity supply authority for any reduction to the above clearances.

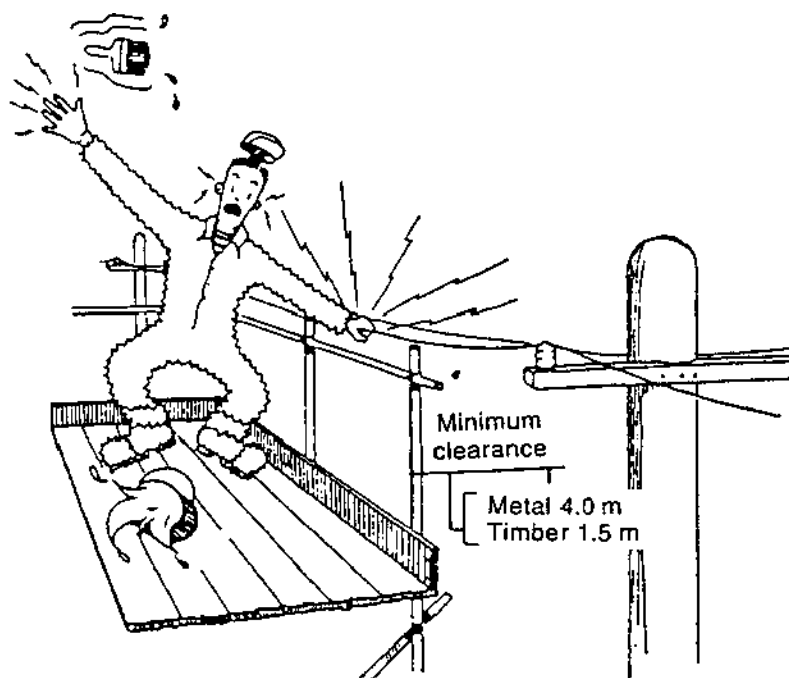


FIGURE 5.4.2 CLEARANCE TO ELECTRICAL CONDUCTOR WIRES

Do not erect scaffolding until the necessary measures have been taken to minimize risk and a written authorization has been received from the electricity supply authority.

High voltage mains (i.e. more than 600 V) near scaffolding should be de-energized, short-circuited and earthed, or re-routed prior to erection of the scaffolding.

Low voltage mains (i.e. not more than 250 V) and medium voltage mains (i.e. in the range of 250 V to 600 V) should be de-energized, short-circuited and earthed, or re-routed where practicable. Make sure that inadvertent re-energizing of mains cannot occur while work is in progress.

Low and medium voltage mains that cannot be de-energized should be insulated by the supply authority for the full length of the scaffolding plus a minimum distance beyond each end of the scaffolding of 5.0 m. Although this insulation (e.g. tiger tails) is a safeguard against contact with live wires under dry conditions, a combination of small gaps in the insulation and wet weather conditions can cause an unsafe situation, which can result in severe shocks.

The scaffolding may only be erected where no part is allowed to touch or fall across the insulated wires.

5.4.3 New Zealand requirements The minimum distances from electrical conductors in any direction under normal conditions for the erection of scaffolding are given in Table 5.4.3. Scaffolding components must not be located within 4.0 m of any conductors of an overhead electrical power line without written permission of the owner of the line.

TABLE 5.4.3
MINIMUM DISTANCES FROM ELECTRICAL CONDUCTORS
FOR THE ERECTION OF SCAFFOLDING

Line voltage (and span)	Minimum distance m
Not exceeding 66 kV (maximum span 125 m)	4.0
Exceeding 66 kV (maximum span 125 m)	5.0
Any voltage (span greater than 125 m but less than 250 m)	6.0
Any voltage (span greater than 250 m but less than 500 m)	8.0
Any voltage (span exceeding 500 m)	As agreed with the owner of the line, but not less than 8.0

5.5 PROXIMITY TO HAZARDOUS PLANT

5.5.1 Identification Operational plant, vehicular traffic and corrosive or explosive substances pose hazards affecting the safe use of a scaffold or the structural integrity of the scaffold. The risks from these hazards should be identified, evaluated and controlled.

5.5.2 Vehicular traffic Take precautions to prevent scaffold being endangered by the movement of vehicles and other plant. Traffic damage to scaffolds is a common problem, which can be solved by ensuring that motor vehicles and mobile plant are re-routed away from the location of the scaffold. Where this is not practicable, guards or fenders should be installed to shield the scaffold from traffic damage. Where both of the above measures are not possible, a person should be assigned to direct traffic in the vicinity of the scaffold.

5.5.3 Cranes Take precautions to prevent scaffold being endangered by the movement of cranes.

A scaffold in the operational radius of a crane is in danger of damage from suspended loads. It may be necessary to evacuate the scaffold and its vicinity during lifting operations. Make sure that the scaffold does not contain any unnecessary obstructions, such as over-length transoms, putlogs, tie tubes or over-height standards.

Where it is not practicable to suspend crane operations for the life of the scaffold, the operational radius of the crane should be limited, so that loads cannot come into contact with the scaffold or its supporting structure, and clear instructions should be given to crane personnel to take particular care while moving loads near to scaffolding.

5.5.4 Plant with moving parts Fail-safe lock-out procedures must be used to prevent plant from being activated where scaffolds are constructed on, over or inside items of plant, such as overhead gantry cranes, conveyors, turbines and crushers.

5.5.5 Boilers Clearances between power generation boilers and scaffolding should allow for the expansion of the boiler during firing and its contraction following shutdown.

5.5.6 Corrosive substances Heavy concentrations of acids, alkalis and salts can corrode scaffolding components, leading to structural failure of the scaffold. Where any corrosive substance is to be stored on or near a scaffold, compatible corrosion-resistant scaffolding materials should be used. Where this is not practicable, the frequency of scaffold inspections should be increased to detect early indications of structural deterioration.

5.5.7 Explosive atmospheres Petrochemical plants, powdered milk factories and flour mills are common examples of workplaces with high explosion risks. The use of scaffolding can increase the risk of an explosion if the scaffolding equipment can spark upon impact. It may be necessary to:

- Remove the hazard before constructing the scaffold.
- Construct the scaffold from non-conductive material such as timber.
- Provide non-electrically powered scaffolding hoists for suspended scaffolds, such as manual- or pneumatic-powered scaffolding hoists.

5.6 RISK ASSESSMENT

Risks associated with hazards can be assessed by considering the following three key factors:

- *Frequency* The frequency of a particular type of injury occurring can be gauged from incident recall, accident records, industry statistics and a consideration of possibilities. One injury per 1000 person hours is generally regarded as low, and one injury per 100 person hours is generally regarded as high.
- *Duration* The duration of a person's exposure to a hazard is often expressed as a percentage of each work day. Less than 20 percent is generally regarded as low and more than 60 percent is generally regarded as high.
- *Severity* The potential severity of injuries is generally classified as being low for scratches and bruises and high for death and permanent incapacity.

5.7 RISK CONTROL

Where a risk assessment reveals a significant risk to health or safety, controls are necessary to minimize the probability of the risk occurring.

Wherever possible, the identified hazard should be eliminated. For example, prefabricating work on the ground can eliminate the hazard of persons falling.

Where it is not possible to eliminate hazards, risks can be controlled by:

- Selecting a less hazardous form of scaffolding or access system.
- Modifying the design of the system.
- Isolating the scaffold.

Where these measures do not adequately control risk, the use of appropriate personal protective equipment may also be necessary. Personal protective equipment should only be used where other solutions are not practicable. For example, individual fall arrest systems should not be the primary means of protecting people working at heights.

S E C T I O N 6 S E L E C T I O N

6.1 OCCUPATIONAL HEALTH AND SAFETY

Equipment suppliers, scaffolding designers and scaffolding contractors must consider occupational health and safety laws, taking into account the appropriate risks for the projects that should have been established by the principal employer.

Scaffolds should:

- Be constructed in accordance with a verified design or the supplier's documented information.
- Incorporate adequate and appropriate means of access and egress.
- Have safeguards to protect persons within their vicinity from hazards arising from their presence and use.
- Be used safely to carry out the necessary work.

6.2 CRITERIA

While selecting a scaffold for a particular job, consider:

- The proximity of public space or adjoining property.
- The proximity and operating radius of vehicles, cranes and other moving machinery.
- The proximity of powerlines or hazardous substances.
- The strength and condition of the ground or other supporting structure.
- The profile of the work face and any adjacent structure.
- The levels at which the job will be carried out.
- The possibility of significant impact forces being applied to the scaffold, such as demolition work and crane loading of materials.
- The exposure of the scaffold to significant environmental loads such as wind-loading, snow loads, ice build-up and heavy rain on shade cloth.
- The entry and exit for workers, materials and plant.
- The systems required to promptly rescue persons from the scaffold in the event of an accident or other emergency.
- The type of work to be undertaken.
- The materials and equipment to be used for the job and their dimensions and weight.
- The number of people required to carry out the job.
- The expected duration of the job.
- The work that will precede and follow the job.

6.3 SUPPORTING STRUCTURE

Where doubt exists about the adequacy of the supporting structure, it should be assessed by a qualified person. The assessment should take into account:

- The most adverse combination of dead loads, environmental loads and live loads.
- Any other loads on the supporting structures.
- Any equipment or other plant likely to be used on or from supporting structures.
- Any alterations to be made to supporting structures.
- Likely deterioration of supporting structures.

Where an assessment indicates the need for a supporting structure to be strengthened, the measures adopted should be as specified by a qualified person.

6.4 FITNESS FOR PURPOSE

The scaffold designer should be provided with the following information, so that the scaffold is suitable and safe for its intended use:

- The desired location of working platforms.
- Specific requirements for public protection or protection of adjoining property.
- The location of powerlines, services, public thoroughfares and operational plant.
- The nature and location of any hazardous substances.
- Clearances required at the work face and in relation to other structures or plant.
- Specific requirements for access to and egress from working platforms.
- The range of acceptable dimensions for working platforms.
- Specific edge-protection requirements.
- The maximum number of platforms to be worked on, or loaded at any one time.
- The required duty loadings for working platforms.
- Details of expected significant environmental loads.
- The maximum allowable dead load of the scaffold, which may be relevant where the scaffold is to be lifted by crane, built inside a vessel or used in a situation where its weight needs to be known.
- Any limitations and critical features of the supporting structure, such as point load limitations or counterweights on roofs.
- Any other relevant information.

SECTION 7 MATERIALS

7.1 COMPLIANCE WITH STANDARDS

The first step in the process of safely erecting and using scaffolding is to carefully select the correct scaffolding equipment for the particular job.

When ordering equipment for scaffolding, the buyer should specify that the equipment is intended to be used for the construction of a scaffold. New or unused scaffolding equipment should comply with any relevant Standards that are listed in Table 7.1.

Upon request, the supplier of any equipment should provide a statement that the equipment has been designed, manufactured and, where relevant, tested and marked in compliance with the requirements of any relevant Standards that are listed in Table 7.1. If the equipment is not new, the supplier should also provide a statement that the equipment, when new, complied with the relevant Standards that are listed in Table 7.1 at the time of its manufacture and also that, as supplied, it is in a fit and serviceable condition.

Suppliers of scaffolding equipment should provide adequate information that will enable the equipment to be used according to design specifications. The information should include guidance for the servicing and inspection of the equipment and the rejection of faulty equipment.

TABLE 7.1
STANDARDS FOR SCAFFOLDING EQUIPMENT

Type of equipment	Standard
Boatswain's chair seats	AS/NZS 1576.1
Chain	AS 2321, NZS/ISO 1835,
Cradles	AS 1576.4, AS/NZS 1576.1
Eyebolts	AS 2317, NZS/BS 4278
Fibre ropes	AS 4142.2, NZS/BS 2052
Plywood	AS/NZS 2269
Portable ladders—metal	AS 1892.1, NZS 5233
Portable ladders—timber	AS 1892.2, NZS 3609
Prefabricated platform units	AS/NZS 1576.3
Prefabricated scaffold components	AS/NZS 1576.3
Rigging screws and turnbuckles	AS 2319, NZS/BS 4429
Scaffold accessories	AS 1576.2
Scaffold couplers	AS 1576.2
Scaffold planks	AS 1577, NZS 3620
Scaffold tubes	AS/NZS 1576.3
Scaffolding hoists	AS 1418.2
Scaffolding hoist protective devices	AS 1576.4
Shackles	AS 2741, NZS/BS 3551
Sheave blocks	AS 2089
Slings—chain	AS 3775
Slings—fibre rope	AS 1380
Slings—flat synthetic-webbing	AS 1353.1
Slings—wire coil flat	AS 1438
Slings—wire rope	AS 1666, NZS/ISO 7531
Splitheads	AS/NZS 1576.5
Stairways—temporary	AS/NZS 1576.1
Steel wire ropes	AS 3569, NZS/BS 302.2
Thimbles for fibre rope	NZS 1583
Thimbles for wire rope	AS 1138
Trestles (other than trestle ladders)	AS/NZS 1576.5
Wire rope grips (bulldog grips)	AS 2076

7.2 INSPECTION OF USED EQUIPMENT

Used scaffolding equipment should be inspected to identify items that are unsuitable or that fail to comply with relevant Standards. Use the supplier's guidelines to determine the suitability of scaffolding equipment for further use. Table 7.2 and Section 13 give criteria for general inspection.

Rejected scaffolding equipment should be isolated by clear marking or tagging, or placing in containers or areas that are clearly designated for the storage of rejected equipment. Each item of rejected scaffolding equipment will need to be treated in one of the following ways:

- Repaired (e.g. replacing bolts on couplers, replacing missing wedges on modular scaffolding, re-binding ends of timber planks, appropriate re-welding).
- Reduced in length (e.g. shortening of tube, planks or wire rope to remove defective ends).
- Downgraded (e.g. downgrading a scaffold plank for use as a soleplate, provided the fault does not adversely affect the performance of the soleplate).
- Scrapped.

Records of tests, maintenance, inspections and alterations should be kept and made available upon request.

TABLE 7.2
UNSUITABLE OR DEFECTIVE SCAFFOLDING EQUIPMENT

Item	Defects
1 Scaffold tubes (see Clause 13.8)	Outside diameter less than 47.5 mm Steel wall thickness less than 3.6 mm In New Zealand, hot-dipped galvanized steel wall thickness less than 2.9 mm Aluminium wall thickness less than 4.2 mm End cut not square to axis End flame cut Unduly pitted Heavily corroded Distorted, twisted, bent or split
2 Couplers	No manufacturer's or supplier's mark Distorted, stretched or cracked Bent or stretched rivets or pins Threaded blind holes Stripped threads on bolts or nuts Seized bolts or nuts
3 Baseplates	Bent or distorted so as to prevent an even bearing Thickness less than 6 mm Surface area less than 225 cm ² (e.g. 150 mm × 150 mm) Spigot length less than 50 mm Spigot diameter less than 16 mm (or equivalent cross-sectional area)

(continued)

TABLE 7.2 (continued)

Item	Defects
4 Adjustable leg/base plate/castor	Extension exceeds 600 mm Missing fixed stop enabling less than 150 mm length of spigot to remain in tube A clearance between the inside diameter of the tube and the top of the spigot of more than 5 mm Spigot distortion causing it to jam in the tube Seized nuts
5 Castors	Manufacturer's or supplier's mark absent Working load limit not marked Fitted with pneumatic tyres Wheel diameter less than 125 mm Pintle length (either internal spigot or external socket) less than 150 mm Diametrical clearance between the pintle and tube more than 3 mm Eccentricity of the axle relative to the pintle more than 65 mm Wheel brake ineffective or missing No means to positively fix castor to the standard (see Appendix B)
6 Prefabricated structural components (see Clause 13.10)	Ends flame cut Butt-welded in the length Unduly pitted Heavily corroded Distorted, twisted, bent or split Welds cracked, broken or missing Locking devices damaged, inoperative, unrestrained or missing
7 Timber scaffold planks (see Figure 13.9(A))	Marking not in compliance with AS 1577 or NZS 3620 Width of less than 220 mm Nominal thickness reduced by more than 10% Laminations in a laminated plank are separating Warped, twisted, broken, split or worn End hoop iron broken or damaged End fixing missing Painted or treated in any way that may conceal defects Deep burns Deep oil stains that render the surface slippery Nails projecting Rot of any kind
8 Metal scaffold planks (see Figure 13.9(B))	Marking not in compliance with AS 1577 or NZS 3620 Width of less than 220 mm Distorted, twisted, bent, split or crushed Heavily corroded Welds cracked, broken or missing Rivets broken or missing End piece crushed or missing

(continued)

TABLE 7.2 (continued)

Item	Defects
9 Steel wire ropes (see Figure 13.15)	For suspended scaffolding hoists, any visible broken wire For hung scaffolds, more than 10 percent of the visible wires broken in a length equal to eight rope diameters One or more broken wires immediately below a metallised socket Outer wires worn more than 33 percent of their nominal diameter Birdcaging or birdnesting Strands high standing Core popped Severe kinking Strands crushed Wire-rope grips used on suspension ropes or secondary ropes (see Clause 11.5.8) Thimbles distorted Corrosion evident
10 Chains	Links deformed, chipped, nicked, cracked or stretched Nominal diameter or dimension reduced by more than 10 percent through wear Not a genuine lifting chain Corrosion evident
11 Shackles	Working load limit not marked Crown or pin diameter reduced by more than 10 percent through wear Bolt used in place of a shackle pin Distortion or over-straining evident Corrosion evident

SECTION 8 GENERAL DESIGN

8.1 INTRODUCTION

Section 8 provides general advice for the safe construction of the basic types of scaffolds.

8.2 GENERAL

The construction of a scaffold must comply with the relevant Australian or New Zealand occupational health and safety requirements.

Those responsible for the erection, alteration and dismantling of scaffolds should ensure that an erected scaffold complies with the relevant requirements of AS/NZS 1576.1, AS 1576.2, AS/NZS 1576.3, AS 1576.4 and AS/NZS 1576.5. The ways to achieve this are:

- Build the scaffold to the supplier's information about the system.
- Build the scaffold in accordance with AS 1576.3 Supplement 1.
- Build the scaffold to a design that has been verified by a competent person as complying with the relevant requirements of AS/NZS 1576.1, AS 1576.2, AS/NZS 1576.3, AS 1576.4 and AS/NZS 1576.5.

The design specifications of a scaffold can be either a complex set of drawings or held in the mind of the responsible scaffolder. It is the verification that the design complies with the relevant requirements of AS/NZS 1576.1, AS 1576.2, AS/NZS 1576.3, AS 1576.4 and AS/NZS 1576.5 that is important, not the form the design takes.

General loading information is given in Appendix E.

8.3 FOUNDATIONS

The foundations for a scaffold must be adequate to carry and distribute the loads imposed at each standard and of the whole loaded scaffold.

The loads likely to be carried by the scaffold's standards may need to be calculated, to enable a determination as to whether the supporting surface can hold them safely. Calculations must include the dead load and the live load. The dead load includes the self-weight of the standard plus the connected components, including ledgers, transoms, putlogs, braces, ties, planks, guardrails and attachments such as sheeting. The live load is the duty live load for persons plus materials for each platform in each bay, which should be based on the values given in Table 8.7.

To calculate the live load on a standard, assume that each standard in that bay supports one third of the duty live load on each platform in each adjoining bay. This is to allow for off-centre loading of platforms and concentrated loads placed closer to one standard.

NOTE: As an example, consider a heavy duty scaffold.

The live load on any one standard (i.e. between two bays, each of 675 kg) based on the worst possible case of loading in adjacent bays = $675 \text{ kg} \times 2 \div 3 = 450 \text{ kg}$.

Assume that the dead load of the scaffold supported by this standard is 250 kg. Then, the design load for this standard = $450 \text{ kg} + 250 \text{ kg} = 700 \text{ kg}$.

Now that the design load on the standard is known, the minimum length of the soleplate can be determined for a known ground or floor load capacity.

Assume the ground load capacity is 2000 kg/m^2 and a typical solid timber scaffold plank that is 220 mm wide will be used.

Therefore, the minimum acceptable length for the soleplate = $700 \text{ kg} \div 2000 \text{ kg/m}^2 \div 0.220 \text{ m} = 1.6 \text{ m}$.

The duty of the scaffold, the height of the scaffold and the ground conditions need to be considered when the foundation is designed. Where an excavation is planned near a scaffold, the supporting structure should be able to support the scaffold without any subsidence. The foundation must be maintained in good condition for the life of the scaffold.

On hard level surfaces such as steel or concrete, standards should be supported on base plates; however, sole plates may not be necessary if the surface does not require protection.

On timber flooring, pedestrian pavements and any other supporting structure that is likely to be adversely affected by point loads from standards, the load from the standards should be distributed by baseplates and soleplates. Soleplates should be at least equivalent in size and strength to scaffold planks and be long enough to prevent visual subsidence or damage to any supporting structure. As a general rule, each soleplate should be long enough so that it supports at least two standards. On surfaces such as soft asphalt and compacted gravel, soleplates with a size of at least 500 mm × 220 mm must be used under the baseplates. Scaffold plank soleplates may not be sufficient under some heavy duty scaffolds, or very high scaffolds. (See Figures 8.3(A) and 8.3(B)).

Where scaffolds require special design by a competent person, the soleplates should also be subject to special design. Advice must be obtained from a competent person, such as an engineer experienced in structural design, before scaffolds are erected on verandahs, suspended flooring systems or compacted soil. Where the scaffold is founded on sloping ground (see Figure 8.3(C)), each standard must have a stable foundation. Slopes steeper than 1 in 10 should be assessed by a competent person. On any other surfaces, the advice of a competent person is needed (see Figure 8.3(D)).

8.4 STABILITY

A scaffold must have the stability to prevent it from overturning.

Stability may be achieved by:

- Tying the scaffold to a supporting structure.
- Guying to a supporting structure.
- Increasing the dead load by securely attaching counterweights near the base.
- Adding back-up bays to increase the base dimension.

Where dead load alone is used to provide stability, the stability must comply with the requirements of AS/NZS 1576.1 (Clause 2.7 in the 1995 edition). Where the stability of a scaffold is in doubt, assessment should be carried out by a competent person.

8.5 TYING

Suppliers' information about tie methods and spacings should be followed. Where no specific information is supplied, use the relevant requirements of AS 1576.3 Supplement 1 for tying of tube-and-coupler scaffolds.

Drilled-in anchors, such as friction and chemical anchors, may only be used to secure ties where it is not practicable to use other methods. Where drilled-in anchors are used, they must have a safety factor of 3 and a competent person must assess the suitability of the supporting material.

Ties must not obstruct clear access along the full length of the working and access platforms.

Figure 8.5 shows some tie assemblies.

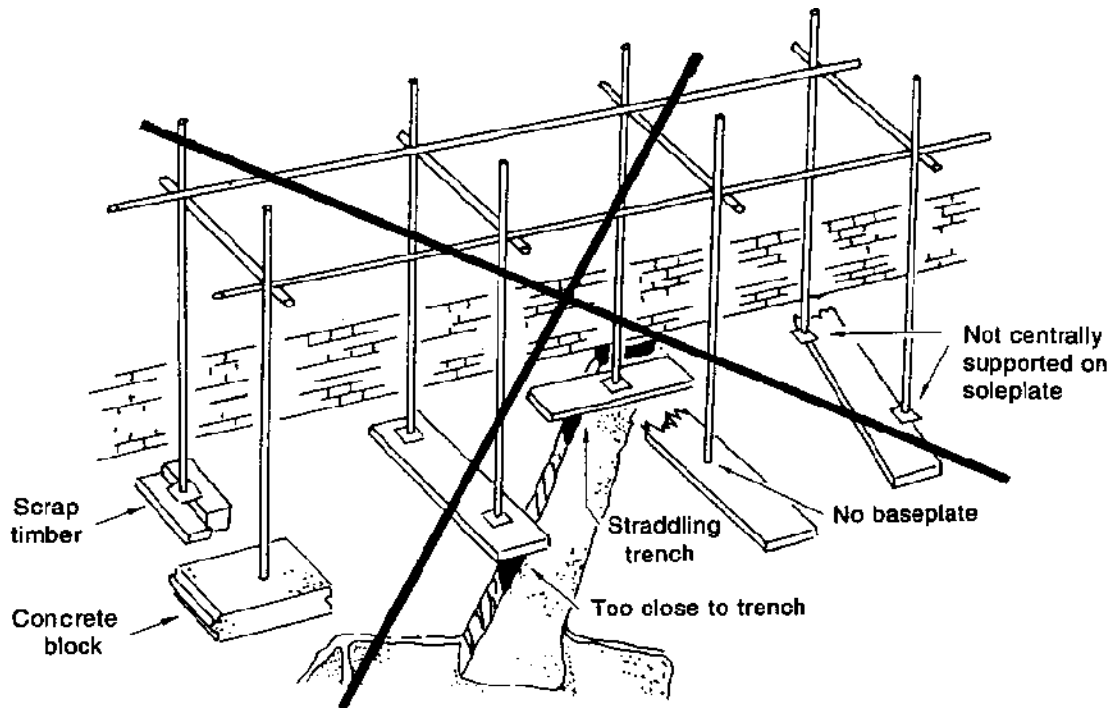


FIGURE 8.3(A) UNSAFE FOUNDATION

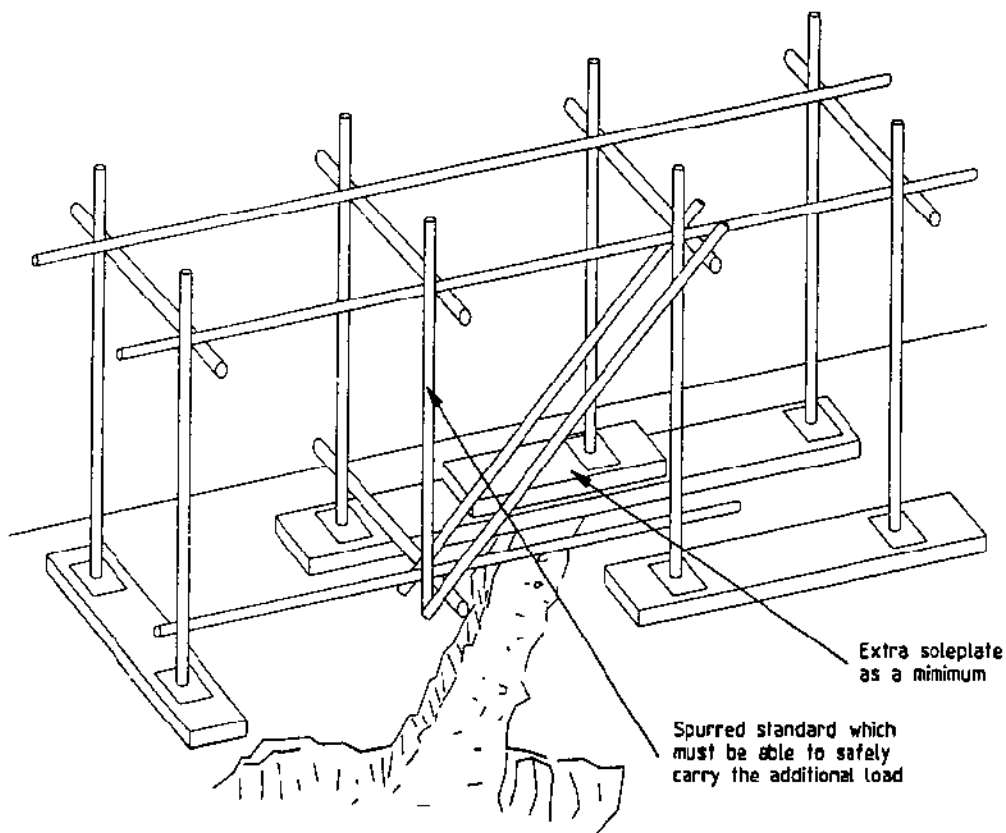
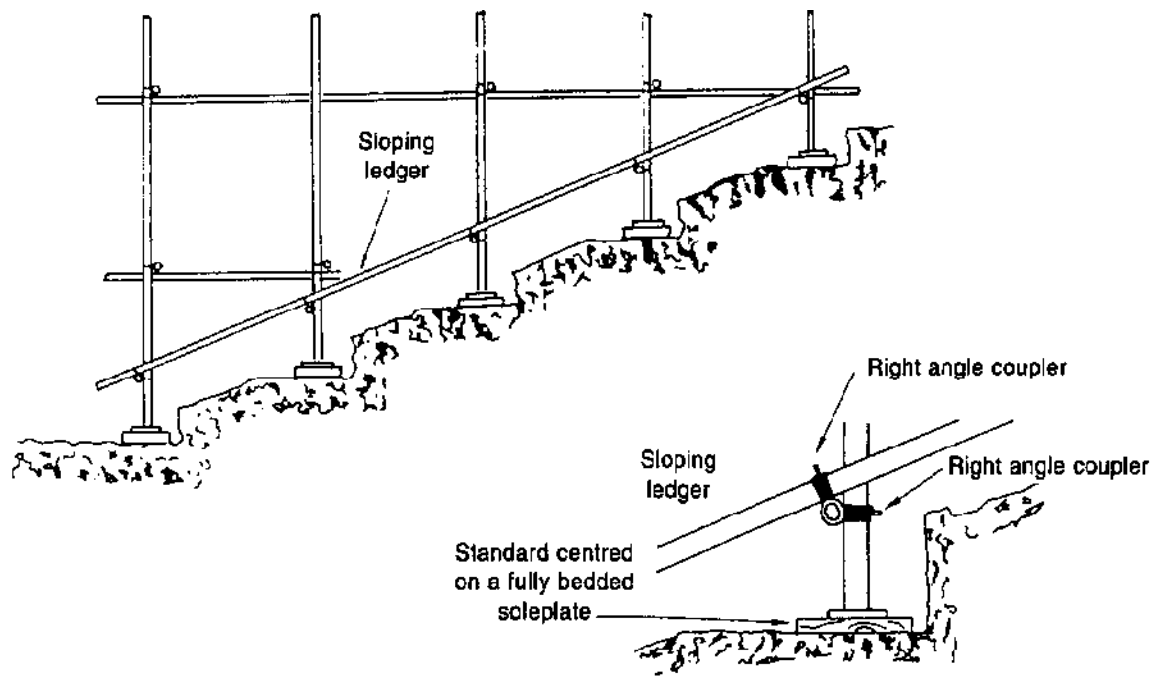
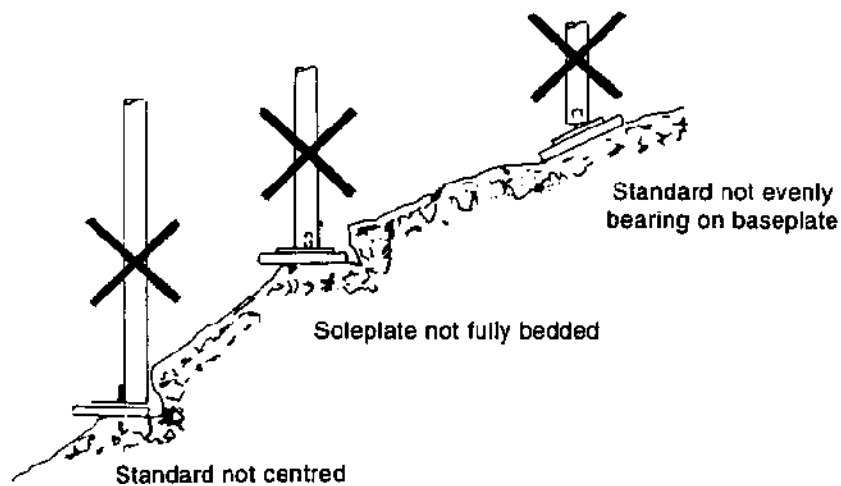


FIGURE 8.3(B) ADEQUATE FOUNDATION

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(a) Good practice



(b) Unsafe practice

FIGURE 8.3(C) FOUNDATIONS ON SLOPING GROUND

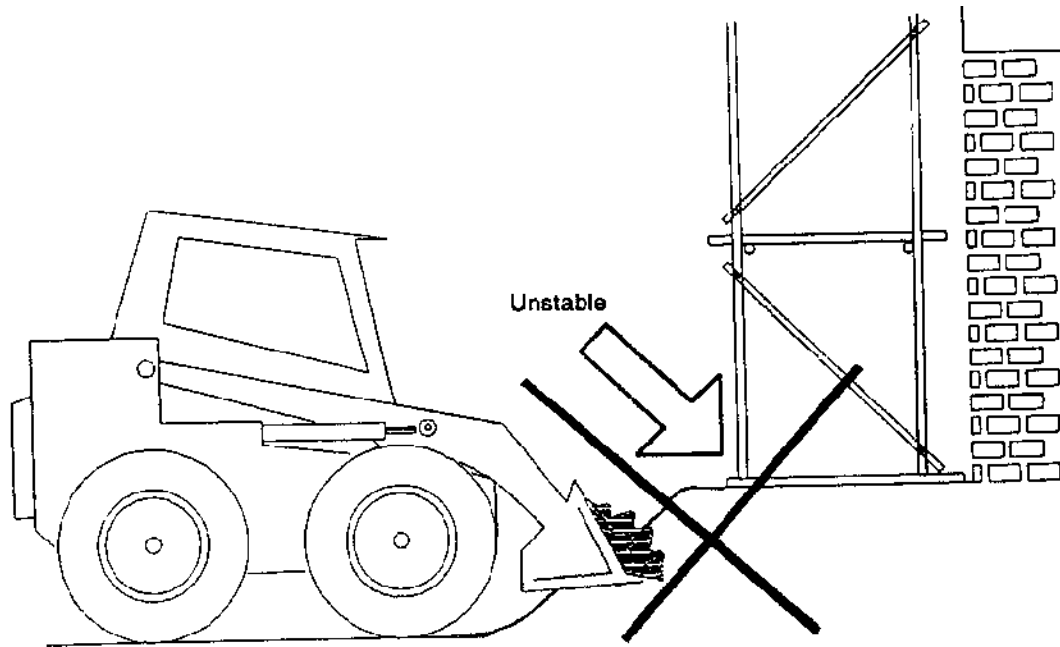


FIGURE 8.3(D) UNDERMINING OF SUPPORTING FOUNDATION

8.6 RIGIDITY

Rigidity is achieved through the use of fabricated frame units, fixed mesh panels or diagonal bracing systems. Where diagonal bracing systems are used, they should extend from the base of the scaffold to the top lift. Bracing does not have to extend to the height of the top guardrail. Typical transverse bracing is illustrated in Figure 8.6.

8.7 WORKING PLATFORMS

Each scaffold should be designed to carry the required number of working platforms and to support its live loads.

Working platforms should be constructed from either prefabricated platform units or scaffold planks.

The working platform should be wide enough to accommodate materials and plant, and allow clear and unobstructed access along its entire length.

Clear and unobstructed access should be not less than 450 mm wide, where passage is required by persons and hand tools only.

Working platforms, except suspended scaffolds should have a duty classification and dimensions complying with Table 8.7. Scaffolds designed for working platforms that support loads in excess of heavy duty should be provided with prominent signs that display the rated working load limit per platform per bay.

Working platforms should not be pitched at an angle steeper than 7° (slope of 1 to 8) to the horizontal and should have a slip-resistant surface.

Planks or decking forming the surface of a working platform should be of uniform thickness, fixed to prevent uplift or displacement in normal use and positioned to avoid significant gaps and tripping hazards.

Planks should be butted not lapped, except at returns, curved faces or unusual profiles.

Examples of unsafe working platforms are given in Figure 8.7.

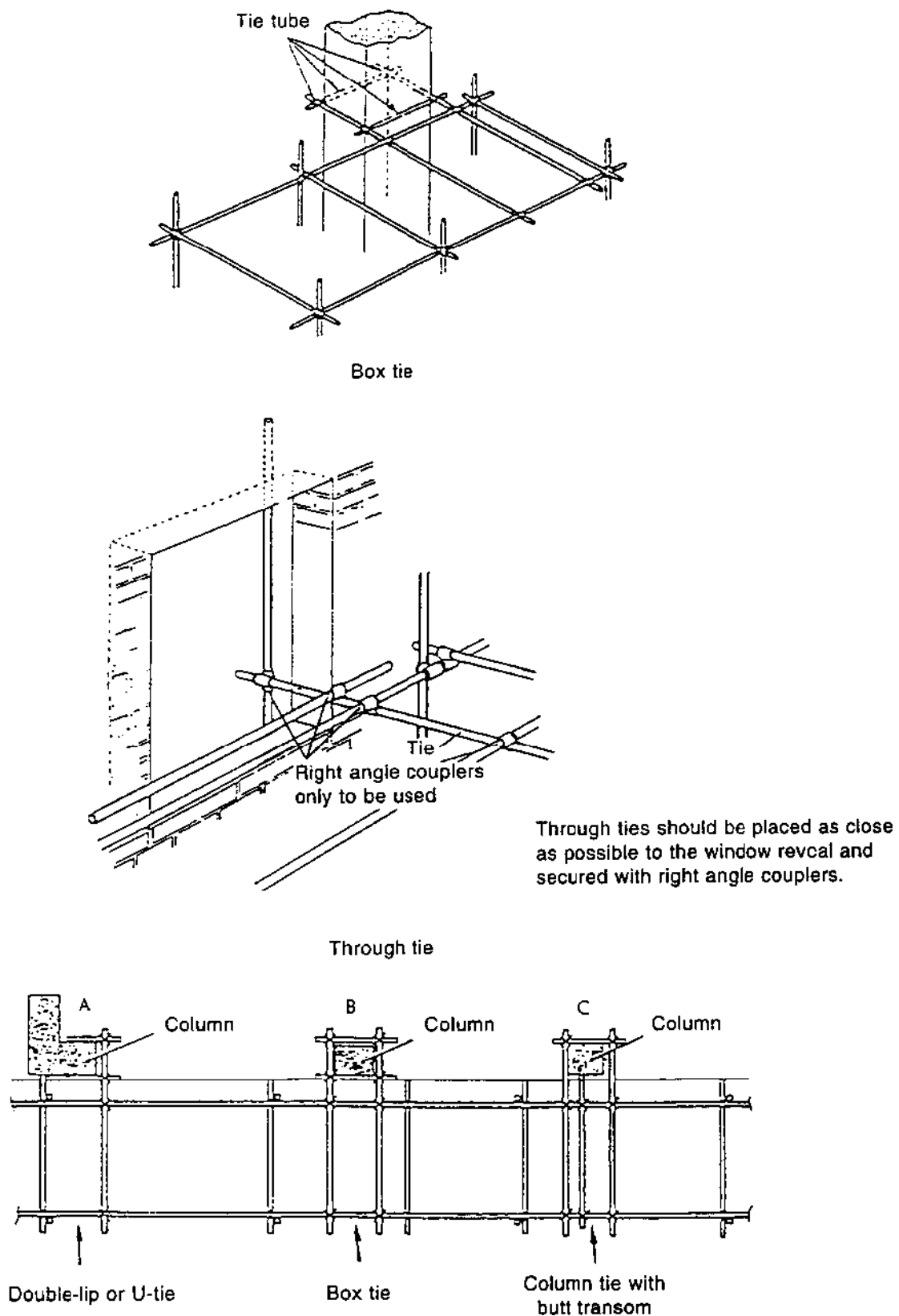


FIGURE 8.5 SOME TIE ASSEMBLIES

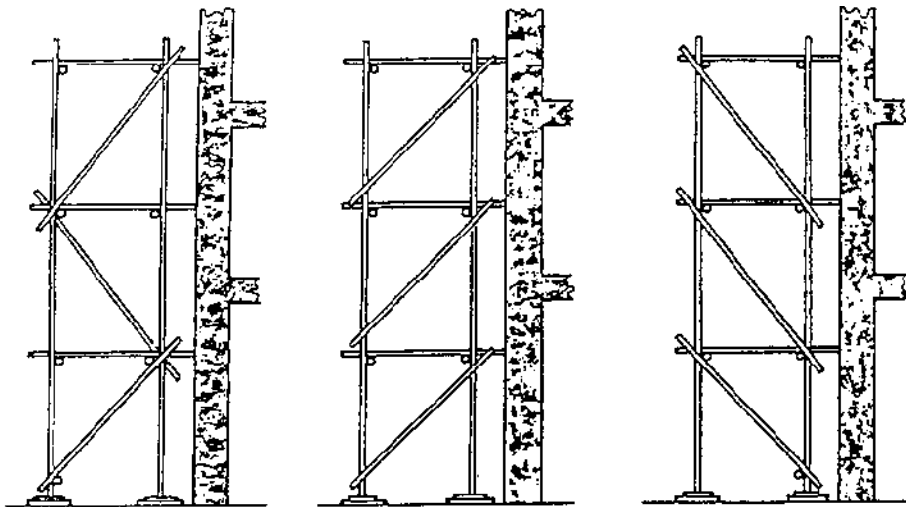


FIGURE 8.6 TYPICAL TRANSVERSE BRACING FOR A SCAFFOLD

TABLE 8.7
REQUIREMENTS FOR WORKING PLATFORMS

Duty classification as specified in AS/NZS 1576.1	Approximate maximum total load for persons and materials kg per platform per bay	Approximate maximum mass of any single concentrated load of materials or equipment (as part of total load) kg	Minimum length and width of platform mm
Light duty*	225	100	450
Medium duty	450	150	900
Heavy duty	675	200	1 000

* Materials must not be stored on light duty working platforms that have the minimum allowable width.

8.8 EDGE PROTECTION

Edge protection should be provided to the open sides and ends of any platform from which a person or object could fall 2 m or more.

Where the nature of the work makes it difficult for a person to be fully aware of the proximity of the platform edge (e.g. overhead work or welding), edge protection should be provided, regardless of the height of the platform.

Suitable forms of edge protection are:

- Guardrails, midrails and toeboards.
- Guardrails and toeboards, together with suitable infill such as brickguards or 17 mm plywood.
- Mesh panels performing the function of a guardrail and incorporating kickplates.

Do not use fibre rope or steel wire rope as guardrailing. Only chain should be used to close off access openings in guardrailing.

Guardrails and midrails should be supported at intervals not exceeding 3 m, parallel with the platform and not further than 100 mm outside the platform edge. The guardrail should be between 900 mm and 1100 mm above the platform. The midrails should be positioned approximately midway between the guardrail and the toeboard.

Guardrails, midrails and stanchions may be constructed from one of the following:

- Scaffold tube.
- Purpose designed components.
- Oregon, hardwood or other timber of equivalent strength and characteristics with nominal cross-sectional dimensions of 100 mm × 50 mm.

Toeboards and kickplates should be as least as strong and as rigid as timber scaffold planks and should be securely fixed. They should extend not less than 150 mm above the platform surface. The gap between the platform and the toeboard or kickplate should not exceed 10 mm.

Brickguards should be made of mesh having steel wire with a minimum diameter of 4 mm with an aperture not exceeding 50 mm × 50 mm (see Figure 8.8(A)). They should be securely fixed. Brickguards may incorporate a kickplate.

Fabricated mesh panels that are used instead of guardrails should be at least as strong as a guardrail. They should be made of mesh consisting of steel wire with a diameter of not less than 4 mm and apertures not exceeding 50 mm × 50 mm. They should also incorporate a strong kickplate with a height of at least 150 mm.

Self-closing gates should be provided where fixed edge protection is absent due to a ladder or stairway, unless the openings are a safe distance from the working platforms.

Where there is not a guardrail or a midrail provided adjacent to the working face of a building or a structure, the face should:

- Be less than 225 mm from the platform edge.
- Extend at least 900 mm above the top surface of the platform.
- Have a strength and rigidity of not less than that of a guardrail.
- Perform the function of a guardrail and midrail in all other respects.

Where a toeboard or kickplate is not provided adjacent to the working face of a building or structure, the gap between the platform edge and face should be less than 225 mm. A safeguard to prevent anyone being endangered by debris falling from the platform should also be installed.

Where necessary, cantilevered catch platforms should be provided to prevent unintended spillages from falling to the ground. (See Figure 8.8(B)).

8.9 ACCESS AND EGRESS

Every working platform must have safe and suitable access and egress (see Figures 8.9(A) and 8.9(B)).

Common means of access and egress include existing floor levels, permanently installed platforms, ramps, stairways, ladders, personnel hoists, temporary access ways, temporary stair systems and portable ladders.

The form of access and egress for working platforms on a scaffold depends upon the nature of the work, the site conditions and restrictions, the height of the platforms, the number of people required for the work and the time the scaffold will be standing.

Where access is provided by mechanical means, such as a personnel hoist, an alternative form of egress, such as a ladder or stair tower, should also be provided for emergency use.

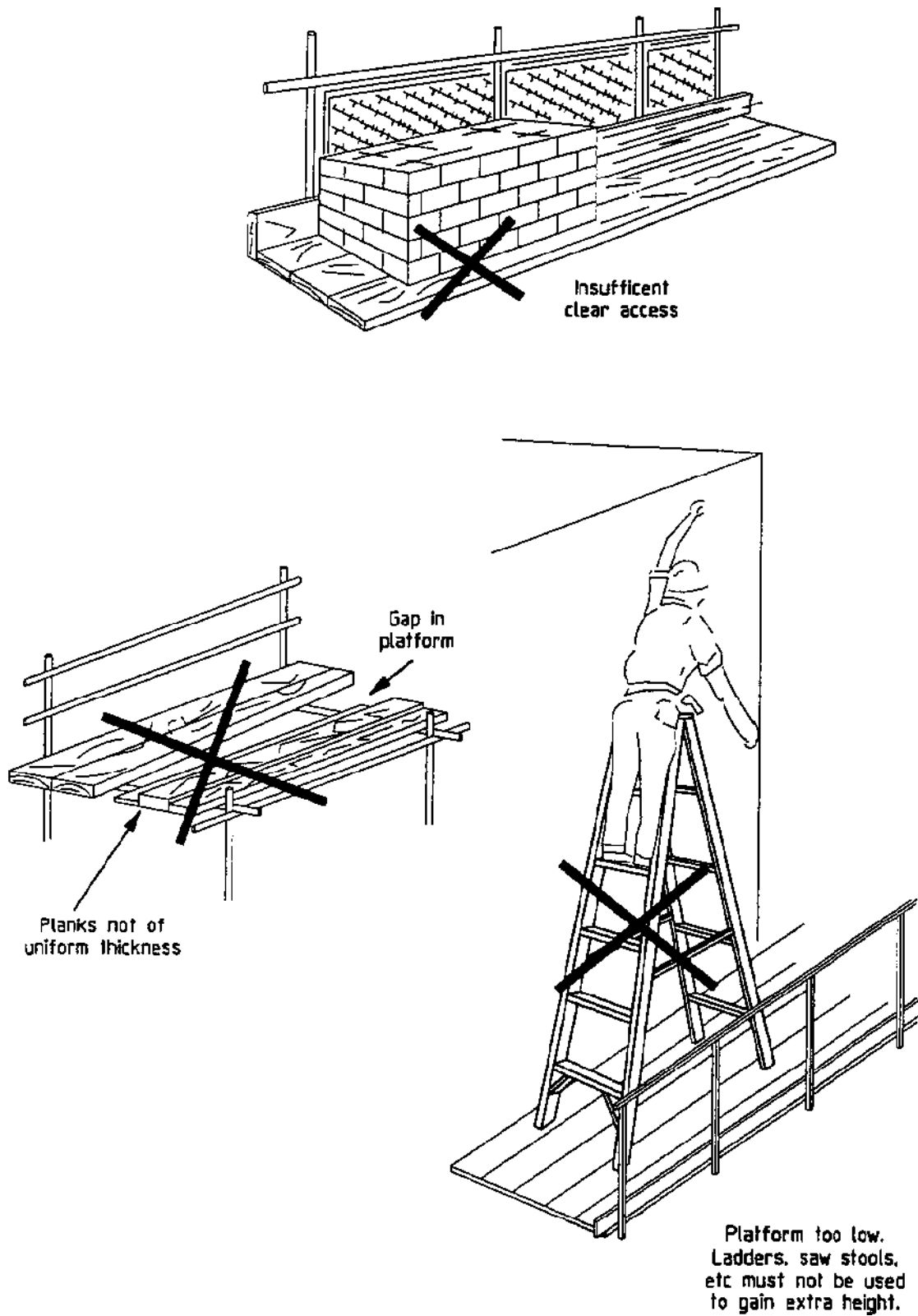


FIGURE 8.7 UNSAFE WORKING PLATFORMS

Access ways can be flat or ramped so as to give access from permanent floors. They must be built to the same requirements as heavy duty working platforms, except that their width can be reduced to:

- 675 mm, for transporting materials.
- 450 mm, when used by persons with hand tools only.

The slope of a ramped accessway, such as a barrow ramp must be not greater than 20° (or 1:3) to the horizontal. Where the slope exceeds 7° (or 1:8), the upper surface must be cleated to stop people from slipping.

Cleats should be 25 mm thick, 50 mm wide and extend across the full width of the platform. A 100 mm gap may be left in the centre of the platform for the wheel of a barrow. Cleats should be fixed every 450 mm along the length of the ramp.

Temporary stair systems can be constructed using tube-and-coupler scaffolding. Most prefabricated modular scaffolding systems include stairway parts. Modular stair systems are generally available in multi-bay forms with landings every 2 m and in single-bay forms with landings every 1.5 m.

Ladder access may be used where access to the working platform is needed by only a few persons and where tools and equipment can be delivered separately to the working platform (such as by a rope and gin wheel, materials hoist or crane). Portable ladders intended for access to or within scaffolds must be industrial grade single ladders.

Ladders should be within a separate ladder access bay of the scaffold wherever space permits. Ladders may be fixed to the external face of a scaffold, provided that the stability of the scaffold is not adversely affected and there is unobstructed access to and from the ladder without having to climb over or through guardrails.

Rules for ladder access systems include:

- Pitch ladders at a horizontal to vertical slope of not less than 1:4 nor more than 1:6.
- Secure ladders against displacement in any direction.
- Unless the base is at ground level or on a fully-covered supporting structure, provide ladder landings at the head and at the base of each ladder.
- Make sure the ladder extends at least 900 mm above the landing.
- Make sure the height between successive ladder landings is never more than 6 m.
- Keep openings for ladders as small as practicable and provide trapdoors over or guarding around any openings that may be in or directly beside a working platform.
- Offset the base of a ladder from the head of any ladder that may be directly below it, so that the ladders cannot take the form of a single continuous ladder.
- Make sure there is adequate access to and egress from ladders at each landing.
- Make sure ladders on mobile scaffolds are clear of the supporting surfaces.

Ladder landings and stairway landings require the same level of edge protection adjacent to their open sides and ends as working platforms.

Where a ladder encroaches on a working platform, an unobstructed access of at least 450 mm width along the full length of the working platform should be provided.

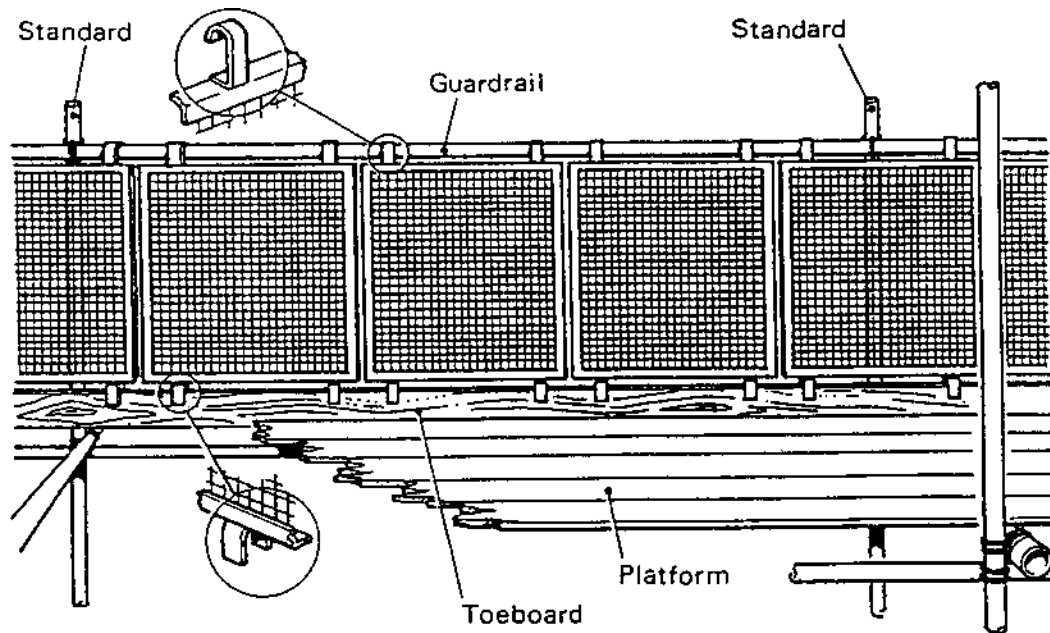
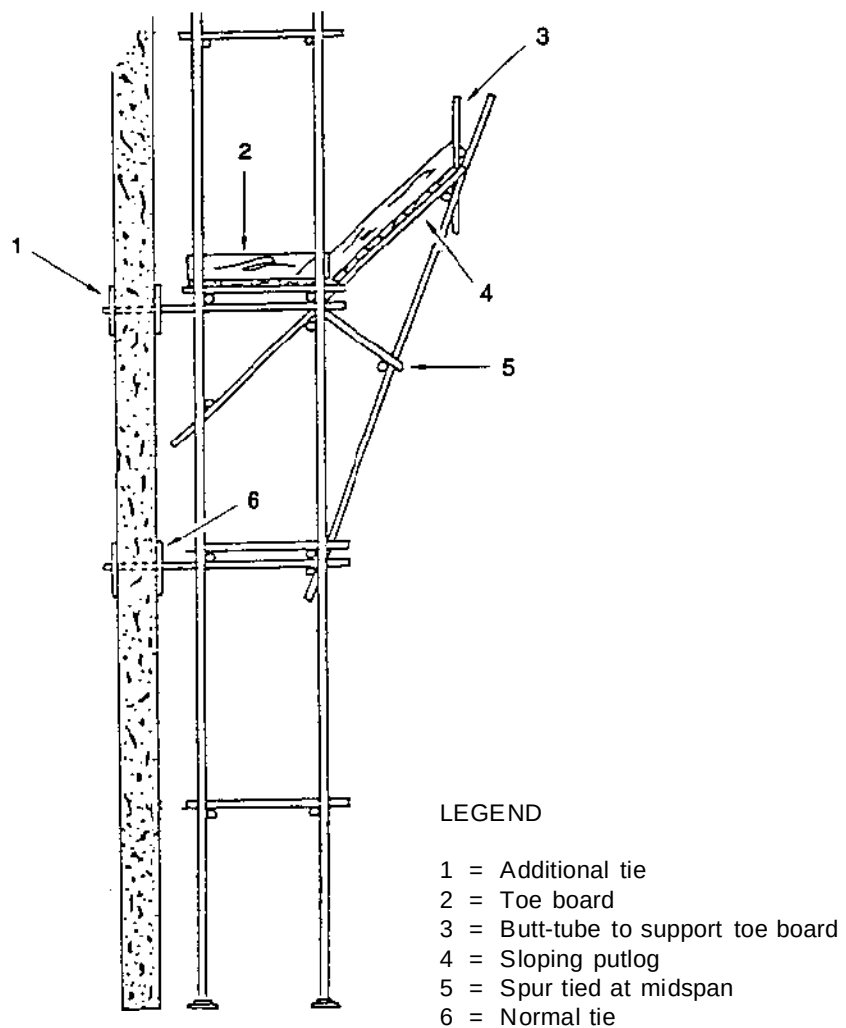


FIGURE 8.8(A) TYPICAL BRICKGUARDS

FIGURE 8.8(B) TYPICAL CANTILEVERED CATCH PLATFORM
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8.10 CONTAINMENT SHEETING

Containment sheeting is used for both safety and environmental purposes. Where work is carried out close to pedestrian or vehicular access, scaffolds that are sheeted down to hoarding level can minimize both the risk to the public and the area lost to public access.

When selecting containment sheeting, consider:

- Degree of protection required from rain or washing down operations.
- Ability to contain dust during abrasive blasting operations.
- Need to contain airborne dust and debris from surface treatments.
- Possible reaction to chemicals used in facade cleaning.
- Flammability of the material.
- Need for light transmission.
- Ventilation of the contained space.
- Need for mobility.
- Size of sheet.
- Pattern and frequency of fixing points.

Hessian is not suitable for use as containment sheeting. It has a low strength and is a high fire risk.

Scaffolds fitted with containment sheeting have increased dead loads and are exposed to increased wind and rain loads. The design of such scaffolds and ties must be approved by a competent person, such as an engineer experienced in structural design. The design of a sheeted scaffold should consider:

- The weight of the sheeting supported by the scaffold.
- The wind load on the scaffold and the supporting structure.
- Position of the sheeted scaffold in relation to adjacent structures and the possible local increase in wind speeds through narrow gaps between such structures.
- The compatibility of fixings with respect to the strength of the sheeting.
- Specification of additional fixings at returns of the scaffold and at upper levels where wind loads are greater.
- Ability of the fixings or sheeting to fail at wind speeds below those that would cause damage to the scaffold or supporting structure.
- Where a failure of fixings cannot relieve the wind load on the scaffold, whether sheets can be fixed inside the guardrails and toe boards.

The following advice should be followed when fixing containment sheeting to a scaffold:

- The advice given in Figures 8.10(A), 8.10(B) and 8.10(C).
- On tube-and-coupler scaffolds, ensure that transoms and putlogs do not project more than 150 mm over the outside ledger. Cap or pack around ends of tubes in contact with sheeting.
- Use fully decked platforms with guardrails while erecting sheeting.
- Sheeting should be fixed to the outside of the scaffold, unless otherwise permitted by the design.
- Sheeting should be continuous, by using sufficient overlap.
- Tightly tie butt joints if overlap is not possible.

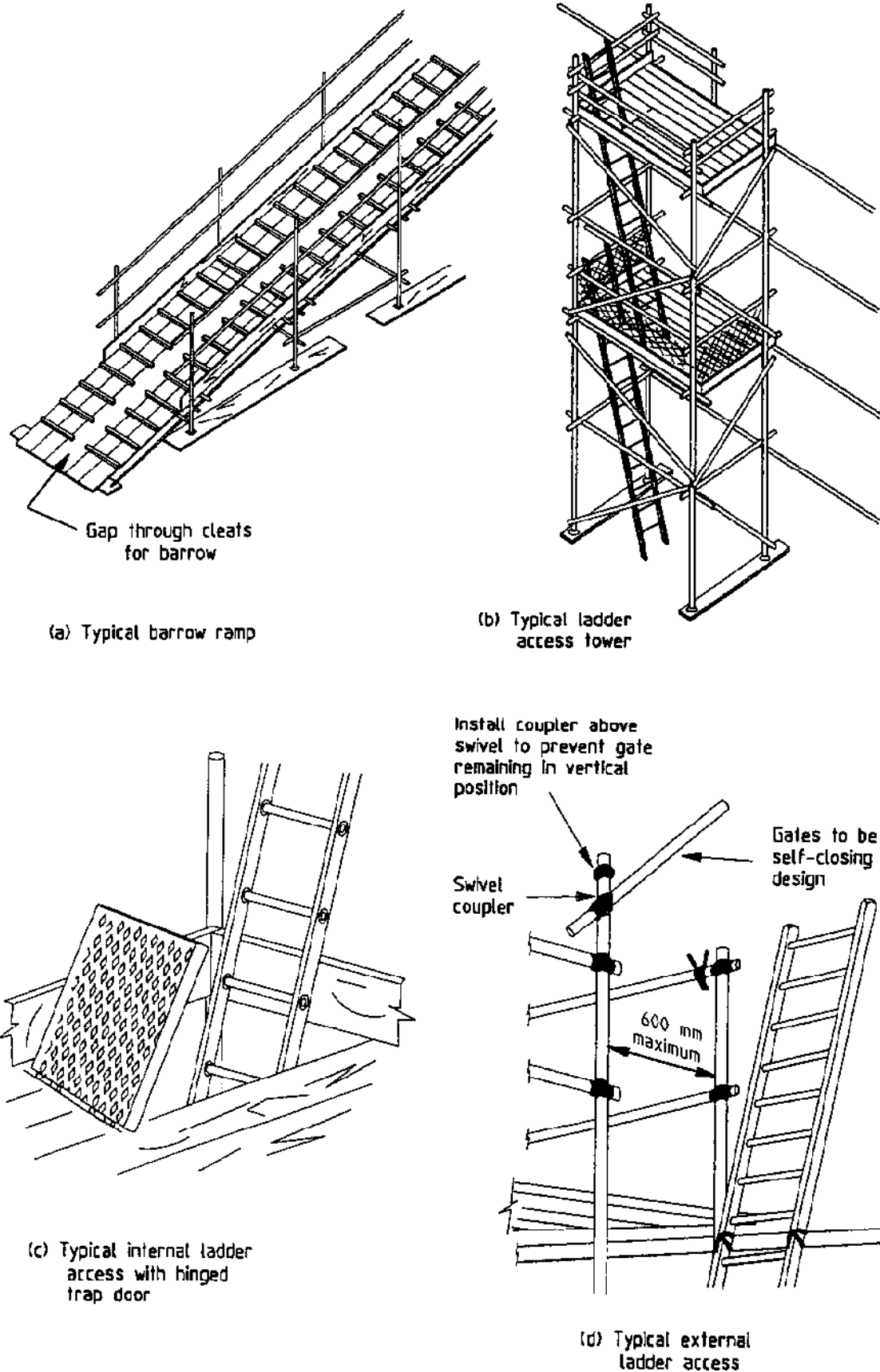


FIGURE 8.9(A) TYPICAL MEANS OF ACCESS

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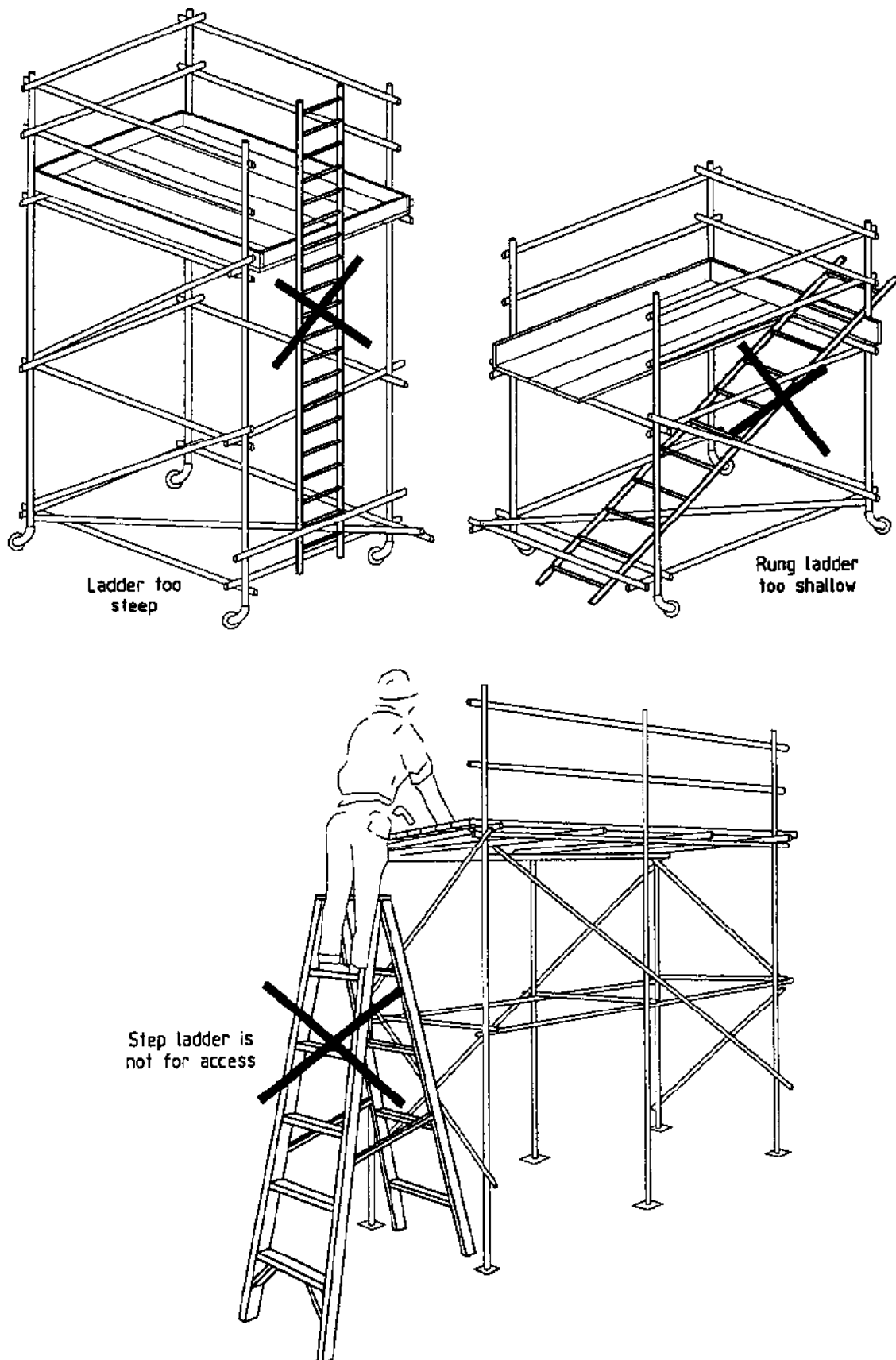


FIGURE 8.9(B) UNSUITABLE FORMS OF LADDER ACCESS

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- Begin by securing the top edge then lower the sheet on the outside of the scaffold. In windy conditions, attached tag lines to the bottom edge. Tightly tie the bottom edge to the scaffold.
- Where practicable, the lower edges of sheets should be tucked inside the lower sheets.
- Ensure that sheeting is sufficiently taut and fixed tight against the scaffolding to prevent chafing.
- Where containment sheeting has inbuilt fixing points, ensure that the layout and position of these points is compatible with the scaffolding framework.
- Use every applicable fixing point.
- Ensure that sheeting is in direct contact and tied back to the open edges of the platform and guardrails.
- Ensure that there are as few gaps as possible between sheeting and the platform edge.

8.11 STEEL WIRE ROPE (SWR)

Figure 8.11(A) illustrates a typical construction of SWR. Figure 8.11(B) shows a correct method of measuring the diameter of a SWR.

Where SWR is used as a static load-bearing member in a scaffold, it must not be subjected to a load greater than one sixth of its breaking load. Suspension ropes and secondary ropes for suspended scaffolds require higher safety factors, as detailed in Section 11.

The manufacturer's guaranteed minimum breaking load should be stated on a test certificate, which should come with each new SWR. If this information is not available, assume that the rope is constructed from the lowest quality steel (i.e. normally 1570 MPa).

Most working load tables for SWR are based on one fifth of the breaking load, which is acceptable for general rigging; however, for scaffolding multiply the working loads in these tables by 5/6 (i.e. 0.83), to provide the required factor of safety of one sixth of breaking load.

If a SWR does not have a test certificate, its working load limit (WLL) for a scaffolding application may be attained by calculation, using the formula:

$$WLL = 7.5 \times (D \text{ in mm})^2, \text{ in kilograms}$$

For example, for rope with a diameter of 12 mm

$$\begin{aligned} WLL &= 7.5 \times (D \text{ in mm}) \times (D \text{ in mm}) \\ &= 7.5 \times 12 \times 12 \\ &= 1080 \text{ kgs} \end{aligned}$$

NOTE: This formula should not be confused with the formula used for general rigging applications, which is $8 \times \text{diameter squared}$.

To select the smallest diameter of a rope needed to support a known load, use the formula:

$$\text{Diameter} = \sqrt{[(\text{Load in kg}) \div 7.5]}, \text{ in millimetres}$$

For example for a load of 750 kg

$$\begin{aligned} D &= \sqrt{(750 \div 7.5)} \\ &= \sqrt{100} \\ &= 10 \text{ mm} \end{aligned}$$

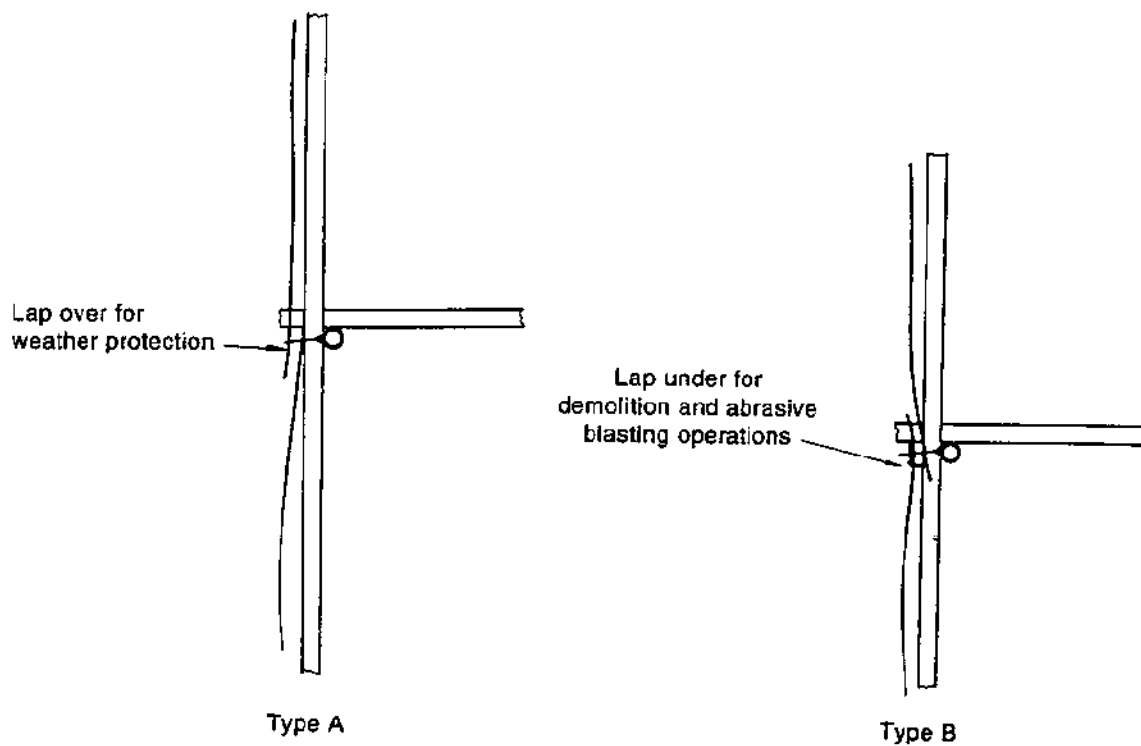


FIGURE 8.10(A) TYPICAL LAP DETAILS OF CONTAINMENT SHEETING

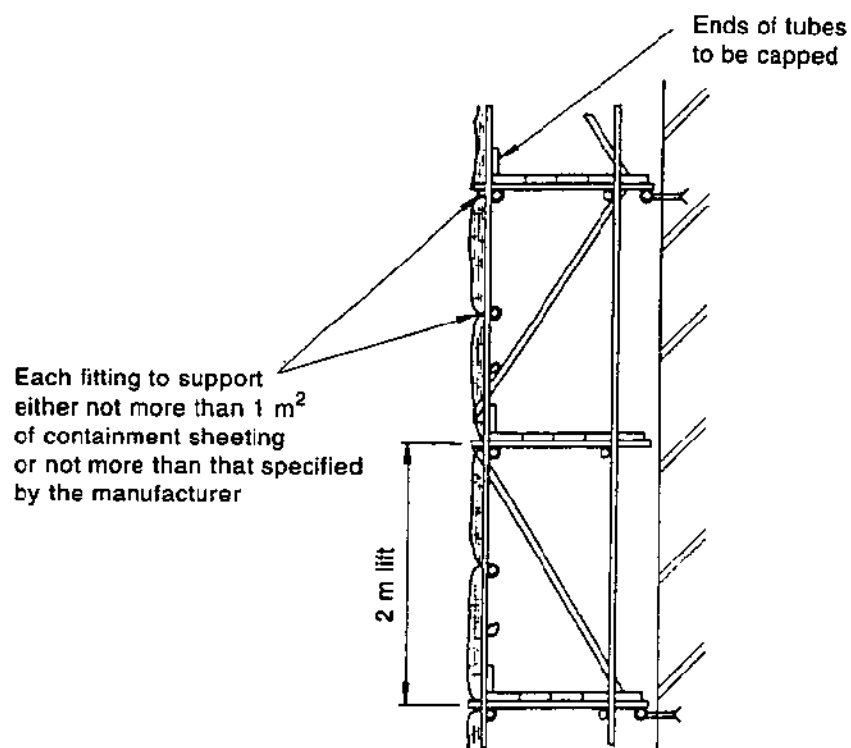


FIGURE 8.10(B) TYPICAL FIXING ARRANGEMENT OF CONTAINMENT SHEETING

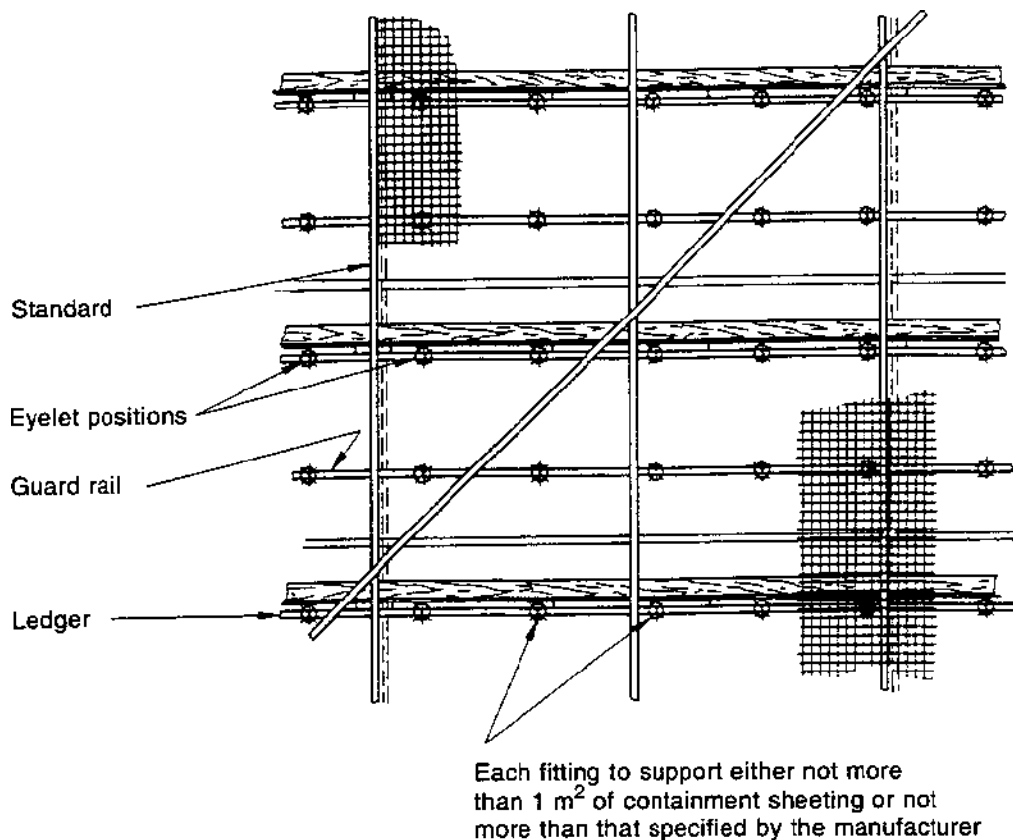


FIGURE 8.10(C) TYPICAL POSITIONING OF EYELETS TO SUPPORT CONTAINMENT SHEETING

Where the SWR is at an angle to the vertical, reeved or choked, the lifting capacity is reduced. In these cases, the WLL is reduced by a load factor. The reduced capacity is called the safe working load (or SWL).

Below are some common load factors:

Vertical unreeved rope	= 1.0
30° to the vertical	= 0.85
45° to the vertical	= 0.70
60° from the vertical	= 0.50
Reeved (around beam)	= 0.50

Therefore, to calculate the SWL of a 12 mm SWR reeved around a beam:

Rope diameter (D) = 12 mm

Load factor = 0.50

$$\begin{aligned}
 \text{WLL} &= 0.50 \times 7.5 \times D(\text{mm}) \times D(\text{mm}) \\
 &= 0.50 \times 7.5 \times 12 \times 12 \\
 &= 540 \text{ kg}
 \end{aligned}$$

Further advice on the care and use of steel wire ropes is given in AS 2759.