



Appendices

Appendix (i) Personal safety equipment and first aid

Riggers often have to wear helmets, gloves, eye protection, face masks and respirators and steel capped boots to protect themselves from injury.

It is the responsibility of your employer to provide the necessary protective equipment. It is the responsibility of riggers to wear and use the equipment properly and where and when necessary.

Safety helmets

Safety helmets with chin straps must be worn wherever there is a risk of objects falling from above and on any work site where the hard hat sign is displayed.

Helmets should comply with AS 1801 *Industrial safety helmets*.

Gloves

Riggers should wear close fitting pigskin gloves to protect hands from:

- heat and abrasion
- molten metal
- sharp edges.

Special purpose gloves may be required for protection against chemicals including acids, alkalis, solvents, fats and oils.

Eye protection

Wear eye protection that conforms to AS 1337 *Eye protectors for industrial applications* if you are likely to be exposed to:

- physical damage caused by – flying particles, dust, molten metal
- chemical damage caused by – toxic liquids, gases and vapours dusts
- radiation damage caused by – sunlight, visible light, infra red, laser.

Respiratory protection

Riggers should wear a face mask that conforms to AS 1716 *Respiratory protective devices* if you are likely to be exposed to:

- toxic gases and vapours
- irritating dusts, such as silica.

Inhalation of some chemical vapours and gases can cause death or a wide range of unpleasant symptoms including narcosis and headaches.

Common dusts such as silica can cause lung disease later in life and is found wherever there is excavation, ie building sites, road works, tunnelling and mining.

Hearing protection

Hearing damage is likely if you are exposed to long periods of industrial noise above 85 decibels. This is the noise level of a large truck or loader.

A chainsaw for example has a noise level of about 92 decibels.

If you think it is likely that you are being exposed to dangerous noise levels ask your employer to provide you with hearing protectors complying with AS 1270 *Acoustics – Hearing protectors*.

Footwear

Riggers should be careful to choose footwear which are comfortable, gives maximum grip and provides protection from pinching, jamming and crushing.

A range of lightweight flexible boots with steel or plastic caps is available that comply with AS 2210 *Safety footwear*.

Sun protection

Riggers spend a great deal of time exposed to direct sunlight. To prevent permanent damage caused by ultra violet rays always wear a hat, long sleeves, long trousers and use UV cream when working outside.

First aid

Riggers work in a high risk industry. Not only are there many minor injuries but there are also serious injuries where the injured person will need first aid to restore breathing, heart beat or to stem blood flow.

Know the location of the first aid room and the nearest first aid kit. There should be a first aid kit on every alternate floor of a multi-storey building site or within 100 metres of any part of the workplace.

The standard first-aid symbol in Australia is a white cross on a green background.

First-aid kits on construction sites should have a carrying handle. There should be a notice near to the first-aid room with the name(s) of those in the workplace who hold an approved occupational first-aid certificate.

It is recommended that riggers take the time to do an approved first-aid certificate course.

Appendix (ii) Communication and signals

Two way radios

An effective means of communication when out of line of sight from the crane operator and other crew members on site is two way radio.

It is important that the two way system provides clear and immediate signals without interference.

The two types of two way radio are conventional and trunked.

For mobile cranes the rigger should stay in line of sight from the crane driver ready to use hand signals if the radio fails.

Conventional radio

Great care is taken when allocating frequencies to make sure that there are no other operators using the same frequency in the area. It is not possible, however, to control radio users in the field who may be using a frequency in the wrong area.

Always use a good quality system from a reputable company with a properly allocated frequency for the area.

Interference on your frequency can be a safety hazard. Stop using the system if there is interference, until the system is checked or a new frequency allocated.

Trunked radio

Trunked radio is a computer controlled two way system that locks other radio users out of your frequency. No other operator can cut in and overpower your signal.

With trunked radio it is possible to have several separate groups on one site communicating by radio without interfering with each other. Trunked radio is recommended for large sites.











Directions for crane or hoist operators

Riggers must give crane or hoist operators clear signals when directing crane movements. The noise of the crane motor and distortion over the radio can make it difficult to hear directions.

The following are the standard directions for crane operators:

Hook movement	'Hook up' and 'Hook down'
Boom Movement	'Boom up' and 'Boom down' 'Boom extend' and 'Boom retract'
Slewing	'Slew left' and 'Slew right'
OK to raise	'All clear'
Do not move	'Stop'

Speak clearly and say the name of the part of the crane to be moved first – then the direction of movement.

Motion	Hand Signal	Whistle, bell or buzzer signal	Motion	Hand Signal	Whistle, bell or buzzer signal
Hoisting raise		2 short ..	Hoisting down		1 long —
Luffing boom up		3 short ...	Luffing boom down		4 short
Slewing right		1 long 2 short — ..	Slewing left		1 long 1 short — •
Jib-trolley out: telescoping boom extend		1 long 3 short — ...	Jib-trolley in: telescoping boom retract		1 long 4 short —
Travel and traverse		Not applicable	STOP		1 short •

Creep speed: Appropriate hand signal for motion with hand opening and close

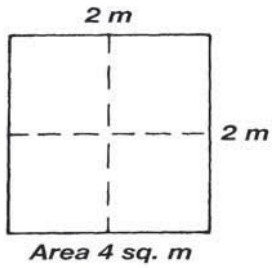
Appendix (iii) – Areas and volumes

Areas

Area of a square = length x width

For example:

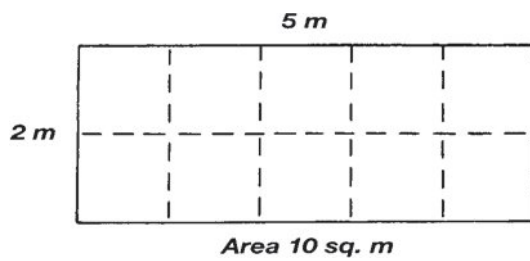
$$2\text{m} \times 2\text{m} = 4 \text{ square metres}$$



Area of a rectangle = length x width

For example:

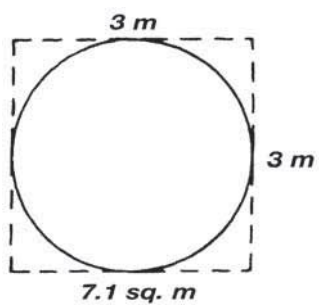
$$2\text{m} \times 5\text{m} = 10 \text{ square metres}$$



Area of a circle = diameter² x .79

For example:

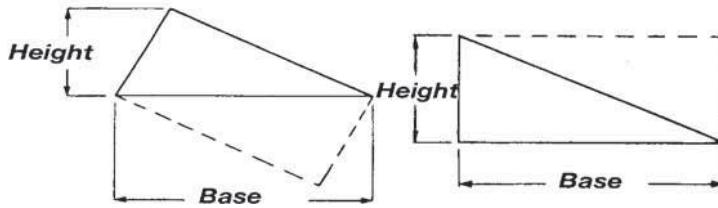
$$3\text{m} \times 3\text{m} \times .79 = 7.1 \text{ square metres}$$



Area of a triangle = base x height ÷ 2

For example:

$$3\text{m} \times 3\text{m} \div 2 = 4.5 \text{ square metres}$$

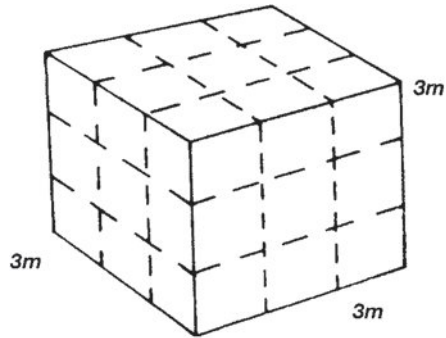


Volumes

Volume of a cube = length x height x width

For example:

$$3\text{m} \times 3\text{m} \times 3\text{m} = 27 \text{ cubic metres}$$

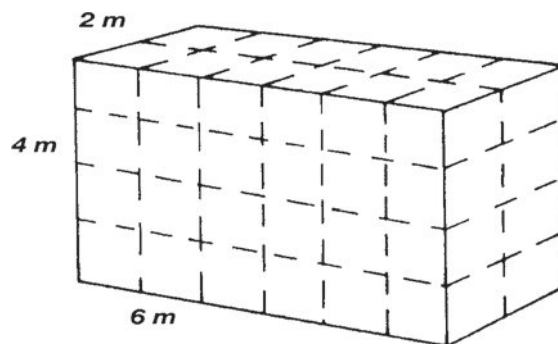


Volume 27 cubic metres

Volume of a rectangular solid = length x height x width

For example:

$$2\text{m} \times 4\text{m} \times 6\text{m} = 48 \text{ cubic metres}$$

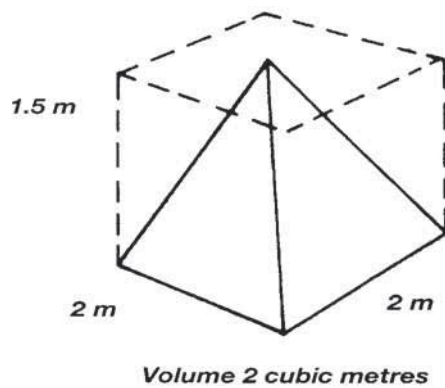


Volume 48 cubic metres

Volume of a cone or pyramid = area of base x height ÷ 3

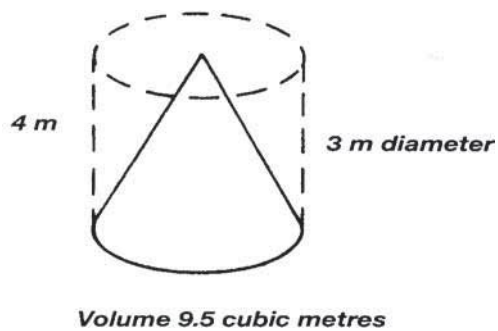
For example (pyramid):

$$2\text{m} \times 2\text{m} \times 1.5\text{m} \div 3 = 2 \text{ cubic metres}$$



For example (cone):

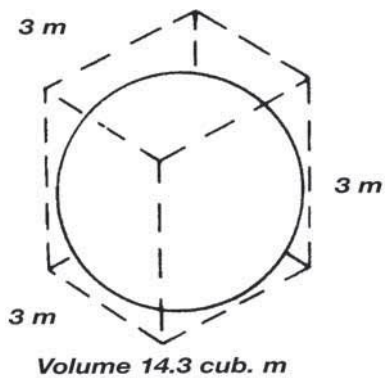
$$3\text{m} \times 3\text{m} \times .79 \times 4\text{m} \div 3 = 9.5 \text{ cubic metres}$$



Volume of a sphere = diameter³ x 0.53

For example:

$$3\text{m} \times 3\text{m} \times 3\text{m} \times 0.53 = 14.3 \text{ cubic metres}$$



Calculating the weight of a load

To calculate the weight of a load, if it is unknown, you must multiply the volume of the load by the unit weight of the material.

For example:

A rectangular stack of hardwood 3 metres long – 1 metre high – 0.5 metre across.

Volume of rectangular solid = length x width x height

$$3\text{m} \times 1\text{m} \times 0.5\text{m} = 1.5 \text{ cubic metres}$$

Unit weight of hardwood is 1120kgs per cubic metre

$$1.5 \times 1120 = 1680$$

Therefore the total weight of the load is 1680kgs.

Appendix (iv) – Tables of masses

Acid (crated maximum)	200kg	Galvanised flat iron 0.5mm sheet	
Ale, beer, 160 litre	250kg	1.8m x 90mm	7kg
Aluminium, cu m	2.7t	Glass, 10mm thick, sq metre	27kg
Aluminium ingot	5-15kg	Granite, cu m	2.6t
Asbestos cement sheet, plain, 2m x 1m	18kg	Grease (44 gal) 200 litre	200kg
Ashes, coal, cu m	800kg	Gypsum, cu m	2.3t
Asphalt, 200 litre, drum	200kg	Gypsum, 1 bag	50kg
Barbed wire, coil	50kg	Hardwood (see Timber)	
Blue metal, cu m	2.0t	Hermatic ore, cu m	5.4t
Beer (see Ale)		Hemp, bale	300kg
Bitumen, 200 litre, drum	200kg	Ice, cu m	930kg
Bolts, various, bag	50kg	Iron, cast m	7.25t
Brass, cu m	8.5t	Iron, ore, cu m	5.4t
Bricks, common, 1,000	4t	Jute, bale	150kg
Bronze, cu m	8.5t	Kerosene (44 gal) 200 litre	200kg
Cast iron, cu m	7.2t	Lead, cu m	11.4t
Cast steel, cu m	7.9t	Lead, 3mm thick, sq m	34kg
Clay, cu m	1.9t	Lead, pig or ingot	36kg
Cement, 1 bag small	20kg	Lime (stone), 12 bags	1t
Cement, 1 bag larg	40kg	Lime (stone), cu m	2.6t
Coal, 1 cu m	864kg	Lime, hydrated, 1 bag	22kg
Concrete, cu m	2.4t	Nails, case	50kg
Copper, cu m	9.0t	Netting, wire 1m roll, 50m	25kg
Copper, 3mm thick, sq m	27kg	Oils, all types (44 gal drum) 200 litre	200kg
Doors, 50	1t	Paint (except red and white lead) 4 litre	0.4kg
Dog spikes, 100	50kg	Palings, H.W. 1.5m sawn, 400	1t
Drums, empty 200 litre	13kg	Palings, H.W. 2m sawn, 360	1t
Earth, 1 cu m	1.9t	Particle board 18mm thick, sq metre	12kg
Fat, tallow, etc (44 gal barrels) 200 litre	200kg	Petrol (44 gal) 200 litre	200kg
Fencing wire, coil	50kg	Pig iron	50kg
Fibrous plaster, sq m	9kg	Pipes –	
Fibre board, sq m	0.6kg	Stoneware –	
Fibro cement sheets –		100mm 55m	1t
Flat –		150mm 32m	1t
4.5mm thick, sq metre	7kg	225mm 20m	1t
6mm thick, sq metre	11kg	300mm 15m	1t
Corrugated –		Cast iron, 3.6m long, lined –	
standard, sq metre	11kg	80mm nominal inside dia	18kg/m
deep corrugations, sq metre	12kg	100mm pipe	28kg/m
Compressed –		150mm pipe	54kg/m
15mm thick, sq metre	26kg	200mm pipe	84kg /m
Fish bolts, 24mm dia	1kg	225mm pipe	115kg/m
Fish plates, 4-hole	13kg		
Fish plates, 6-hole	18kg		

300mm pipe	148kg/m	Sand, beach, dry, 1 cu m	2.0t
Steel, galvanised –		Sand, beach, wet, 1 cu m	2.3t
8 N.B.O.D. 13.5mm	0.7kg/m	Sand, river, wet, 1 cu m	1.5t
10 N.B.O.D. 17mm	0.9kg/m	Screws, case	50kg
15 N.B.O.D. 21mm	1.28kg/m	Shale, cu m	2.6t
20 N.B.O.D. 27mm	1.69kg/m	Sisal, bale	200kg
25 N.B.O.D. 34mm	2.5kg/m	Sleepers, 225mm x 114mm x 2.4m	80kg
32 N.B.O.D. 42mm	3.2kg/m	Sleeper plates, 200	1t
40 N.B.O.D. 48mm	3.8kg/m	Tallow (44 gal), 200 litre	200kg
50 N.B.O.D. 60mm	5.3kg/m	Tar (44 gal), 200 litre	200kg
Copper, 13g internal diameter – approx.		Terracotta, cu m	1.8t
12.7mm O.D.	0.35kg/m	Tiles, Marseilles, terracotta, 100	350kg
16mm O.D.	0.5kg/m	Tiles, Marseilles, concrete, 100	375kg
25mm O.D.	0.8kg/m	Tin, cu m	7.3t
38mm O.D.	1.25kg/m	Tin, ingot	32kg
50mm O.D.	1.7kg/m	Timber, ironbark, cu m	1.4t
Pitch and tar, (44 gal) 200 litre	200kg	Timber other hardwoods, cu m	1.1t
Plywood 6mm, 2m x 1m	7kg	Timber, softwoods, cu m	640kg
Plasterboard (Gyprock) 13mm thick –		Tubular scaffolding (1½ in bore)	
sq metre	27kg	–48mm O.D. 4.8mm thick	5.2kg/m
Rails, steel (masses are branded on side)		Water, fresh, 1 litre	1.0kg
–HEIGHT mm BASE width mm		Water, fresh, 1 cu m	1.0t
157 229	192kg/m	Weatherboards, rusticated –	
102 165	86kg/m	Hardwood, 180mm x 25mm x 200m	1t
157 146	73kg/m	Woolpacks, pack average	150-160kg
173 140	59kg/m	Zinc, cu m	7.0t
137 127	41kg/m	Zinc, ingot	26kg
94 94	22kg/m		
65 60	10kg/m		

Appendix (v) Glossary

Below is a glossary of terms used in this guide and general rigging terms.

ACID: Substance which when concentrated will burn the skin. Neutralises and the opposite to alkali. Examples include battery acid, sulphuric acid and hydrochloric acid.

ALKALI: Substance which when concentrated will burn the skin. Neutralises and the opposite to acid. Examples include, caustic soda and potash.

AS: Australian Standard followed by a number which denotes a particular publication.

ANGLE FACTOR: The factor by which the WLL of a multi-legged sling is de-rated to give its SWL at a particular angle between the sling legs.

ANTI-TWO-BLOCK DEVICE: See hoist-limiting device.

BS: British Standard followed by a number which denotes a particular publication.

BACK HOOKING: A method of slinging using slings with hooks where the sling is passed around the load and the hook is secured back onto the ring or hook above the load.

BACK SPLICE: A splice in the end of a fibre rope to prevent it from unlaying.

BALD EYE: An eye in a rope which is not protected by a thimble. It is also called a 'soft eye'.

BARROW HOIST: See cantilever platform materials hoist.

BASKET HITCH: A method of securing a sling around an object by bringing both eyes back together with an angle factor = 1.

BAYONET: A jib extension used with the auxiliary winch on a hydraulic boom crane and often extending from a fly jib to increase the crane's operating radius and drift.

BEARING JOINT: A bolted joint in steel erection designed to allow for some joint slip for alignment.

BECKET: An anchorage point on a sheave block when reeving a tackle or purchase.

BECKET LOAD: The load in any fall of rope in a multiple fall tackle or purchase. It equals the total load being lifted divided by the number of falls supporting the load.

BEND: A tie made in fibre rope to create a temporary eye (such as a bowline bend) or to join ropes (such as a sheet bend).

BIGHT: The middle portion of a length of rope. For example, a 'bowline on the bight' means a bowline formed in the middle of a rope.

BILL: The lower end point of a hook.

BIRDCAGING: A rope defect, springing or enlargement of a FSWR – usually in Lang's Lay.

BLACK WIRE: See bright wire.

BLOCK: An appliance which supports one or more sheaves.

BLOCK AND TACKLE: A sheave block or blocks used with fibre rope.

BOATSWAIN'S CHAIR: A suspended scaffold where the platform is a chair or similar device suitable for use by one person.

BODY BELT: A safety belt designed to be worn around the waist and which does not have shoulder straps or leg straps.

BOOM: A member attached to and cantilevered from the crane structure from which the load is suspended. Can be luffed or sleeved while the crane is handling a load.

BOOM BUTT: The end of the boom nearest to the crane.

BOOM HEAD: The end of the boom furthest from the crane.

BOOM LIFT: See boom type elevating work platform.

BOOM TYPE ELEVATING WORK PLATFORM: A powered telescoping device, hinged device or articulated device or any combination of these used to support a platform on which personnel, equipment and materials may be elevated to perform work. Also known as 'cherry pickers'.

BORDEAUX CONNECTION: A fitting used to connect a chain to FSWR where the connection is required to pass over a sheave.

BOTTLE SCREW: See rigging screw.

BOW SHACKLE: A shackle with bowed sides.

BOWSING: See frapping.

BOWSTRING: A rope tensioned to a structural member to prevent it from distorting during lifting.

BREAKING FORCE: See guaranteed breaking strain (GBS).

BRIDGE CRANE: A powered crane consisting of one or more bridge beams mounted at each end to an end carriage that can travel along elevated runways. It may be cabin controlled or remote controlled (such as pendant control).

BRIGHT WIRE: Uncoated steel wire used in the construction of FSWR. Also known as 'black wire'.

BRITISH DOCKS SPLICE: Orthodox 5 tuck eye splice in FSWR.

BUSH ROLLER CHAIN: Chain constructed with parallel flat links and cylindrical rollers, such as bicycle and motorcycle drive chains.

BUILDER'S HOIST: A hoist incorporating a mast or guides which is used on building and construction projects. It includes a cantilever platform materials hoist and a personnel and materials hoist.

BULLDOG GRIP: A wire rope grip consisting of a U-bolt, two nuts and a saddle.

CCLP: Cantilevered crane loading platform.

cm: Symbol for centimetre.

CABLE LAID ROPE: Three hawser laid fibre ropes laid up together in an opposite lay to form one rope. Cable laid ropes are often used for moorings.

CABLE PULLING STOCKING: A device used as a temporary join for two ropes where the join needs to pass over a sheave. It is used to haul a new rope onto a crane.

CALIBRATED CHAIN: Short link chain with parallel link sides constructed to very exact link lengths so it can ride smoothly over a gypsy. Commonly used on chain blocks. Also called 'pitched short link chain'.

CANTILEVER: A beam, structural member or similar which is anchored at one end and which is free at the other end.

CANTILEVER PLATFORM MATERIALS HOIST: A powered builder's hoist which has the lift platform cantilevered from the hoist tower. It moves materials only, up and down the face of a building or structure. Also called a 'barrow hoist'.

CANTILEVERED CRANE LOADING PLATFORM: A temporary loading bay cantilevered from the face of a building or structure to land or lift crane-handled loads.

CAPSTAN WINCH: See warping drum.

CAT HEAD: The sheave assemblies on the top mast section of a builder's hoist or the top of the A-frame on a tower crane.

CENTIMETRE: A unit for measuring distance. 10mm equals one centimetre. 100cm equals 1m.

CHAIN BLOCK: A geared portable appliance used for hoisting a load suspended on a chain.

CHAIN PULLER: A geared portable appliance incorporating a load chain which is operated by a lever handle.

CHERRY PICKER: See boom type elevating work platform.

CHOKE HITCH: A method of securing a load to a sling or a sling to an anchorage by reeving the sling back through its eye, or fixing the eye back to the sling leg with a shackle.

CIRCUMFERENCE: The distance around the outside edge of a circle.

CLEVIS: An eye with a removable pin.

CLIMBING FRAME: An internal or external frame used to lift the crane from the tower sections of a tower crane for climbing up or down.

COME-ALONG: See chain puller or creeper winch.

CRADLE: The part of a suspended scaffold that incorporates the working platform.

CRANE: An appliance intended for raising and lowering a load and moving it horizontally, but excluding industrial lift trucks, earthmoving machinery, amusement structures, tractors, industrial robots, conveyors, building maintenance equipment, suspended scaffolds and lifts.

CRANE CHART: See load chart.

CRAWLER CRANE: See track mounted crane.

CREEPER WINCH: A portable manually operated winch for hoisting or haulage where an FSWR is moved through the winch by a gripping jaw mechanism.

CRIBBING: See pigsty.

CROSBY CLIP: See bulldog grip.

CUT SPLICE: A splice joining two fibre ropes which incorporates an eye.

DEAD END: The tail of a rope which does not take load.

DEAD LOAD: The self weight of a crane, hoist or scaffold before it is loaded.

DEBRIS NET: A fine mesh net usually laid over an industrial safety net in order to catch small light items of falling debris.

DEE SHACKLE: A shackle with parallel sides, resembling the letter D on its side.

DERRICK CRANE: A slewing strut-boom crane with the boom pivoted at the base of a mast which is either guyed (guy-derrick) or held by backstays (stiff-leg derrick). Can luff under load.

DIAMETER: The distance across a circle measured through its centre.

DIVERTING SHEAVE: A sheave set up to change the direction of the lead rope between the winch and the head sheave.

DOG KNOTTING: A method of finishing a splice in a fibre rope by halving each strand and knotting each half to the adjacent half strand. It prevents the splice from loosening during use.

DOGGING: The application of slinging techniques, including the selection or inspection of lifting gear, or the directing of a crane or hoist operator in the movement of a load when the load is out of the operator's view.

DOMESTIC GRADE LADDER: A portable ladder designed and manufactured for light loads and intended for use by home handymen. It is not intended for industrial work.

DOUBLE BASE CLAMP: A wire rope grip with two or more bolts along a split barrel to minimise damage to the FSWR.

DOUBLE ROPE SUSPENDED SCAFFOLD: A scaffold where the cradle is suspended using two hoists and two suspension ropes at each support point.

DOUBLE THROAT WIRE ROPE GRIP: A wire rope grip which uses a saddle on each side to minimise damage to the FSWR.

DOUBLE WRAP: A method of slinging where the sling legs are passed twice around the load with the eye choked back to the sling. Often called a round turn.

DRAGLINE: A crane fitted with a bucket or scoop which is thrown outwards and retrieved by a drag cable arrangement.

DRIFT: 1. A steel handtool consisting of a tapered shaft which is used to align bolt holes in structural steel connections. It is sometimes driven in with a flogging hammer to 'drift' the bolt holes into alignment.

OR 2. The distance between the upper and lower blocks of a tackle or purchase. The drift determines the maximum height a load can be lifted.

DROIT: A brandname for excavators and loaders.

DRUM: The cylinder of a winch around which the rope is wound and stored. It may be plain or grooved.

DUAL COVERAGE: Work which can be performed by someone who holds either the appropriate class of rigging certificate or the appropriate class of scaffolding certificate, because the work is within the scope of both types of certificate.

DUAL LIFT: See multiple crane lift.

DUCK: A light canvas material similar to calico.

DUNNAGE: Packing under loads to allow the removal or placing of slings.

EOHTC: Electric overhead travelling crane – an electric powered bridge or gantry crane.

EWP: Elevating work platform.

EGG RING: The main (or master) ring to which the legs of a chain sling assembly are attached.

ELEVATING WORK PLATFORM: A telescoping device, scissor device or articulating device used to support a working platform.

END SPLICE: See back splice.

EQUALISING BEAM: A lifting beam which can be used with two cranes to ensure that each crane is supporting its correct portion of the load.

EQUALISING SHEAVES: Sheaves used to equalise the load.

EXTENSION LADDER: A portable ladder constructed in two or more stages which can be adjusted to vary the height of the ladder.

EYE SPLICE: A splice in the end of a rope which forms an eye.

EYEBOLT: A lifting ring fixed to a threaded rod which can be screwed into a load or anchorage.

FC: Symbol used to indicate a fibre core in the construction of an FSWR.

FSWR: Flexible steel wire rope.

FW: Filler wire. It is used in some FSWR constructions to space and support the main wires in a strand.

FABRICATED HUNG SCAFFOLD: A pre-assembled scaffold hung from another structure but which is not capable of being raised or lowered when in use. It is sometimes used for large steel erection projects.

FACTOR OF SAFETY: The ratio of the minimum breaking load (or GBS) to the WLL or actual working load. For example, an FSWR with a safety factor of five has a WLL which is one fifth of its GBS.

FALLS: The separate parts of rope in a purchase or tackle.

FELLING: Various methods of demolition where a winch or earthmoving equipment is used to drag over a part of the building or structure.

FERRULE: A metal collar used in an FSWR eye splice to hold the rope parts together.

FLEET ANGLE: The angle formed from the centre line of the drum to the centre of the first lead sheave then back to the inside centre of the drum flange.

FLEETING: A method of moving an object by using two hoists, purchases or tackles to lift, haul and lower the load.

FLEMISH EYE: A method of forming an eye in FSWR by separating and re-marrying the strands without tucks.

FLOGGING HAMMER: A hammer designed to be held in one hand for driving drifts, cold chisels and the like. Commonly used in steel erection.

FLY: A secondary jib mounted at the head of the crane's main boom or jib, increasing the crane's operating radius and drift. Also called a 'goose neck'.

FLYING FOX: An arrangement where a rope is suspended between two tower structures and which supports a carriage (or 'fox') from which a load may be raised, traversed and lowered.

FRAPPING: A lashing where several turns are passed around parts to pull a rope tighter. Also called a 'bowsing' lashing.

GBS: Guaranteed breaking strain.

GANTLINE: A fibre rope reeved through a single sheave block.

GANTRY CRANE: A powered crane with one or more bridge beams. The beams are supported at each end by legs mounted on travelling end carriages. They have a crab with one or more hoisting units that are able to travel across the bridge beam or beams. Used where there is no supporting building for the crane.

GEARED JACK: A geared mechanical device used to raise or lower loads.

GERMAN JACK: See geared jack.

GIN POLE: A guyed derrick without a pivoted strut-boom. It can raise and lower a load and a limited amount of slewing can be achieved by adjusting the guys.

GIN WHEEL: A purpose designed single sheave tackle block often used as a gantline during the erection and dismantling of scaffolds.

GIRDER CLAMP: An appliance designed to be fixed to the lower flange of a universal beam or RSJ to provide an anchorage for a sling, suspension rope, purchase or tackle.

GIRT A horizontal structural member in a wall of a steel structure which supports the wall cladding sheets.

GOOSE NECK: See fly.

GUARANTEED BREAKING STRAIN: The load (or force) stated by the rope manufacturer as the rope's breaking load when tested to failure in a new condition. The ratio between the GBS and the WLL is the factor of safety.

GRADE: Indicates the strength of chain, FSWR or other items manufactured from steel. The higher the grade of steel, the higher the tensile strength.

GROMMET An endless sling constructed with a single rope strand layed up onto itself.

GUN TACKLE: A fibre rope tackle which uses an upper block with two sheaves and a lower block with two sheaves (two double blocks).

GUY: A tensioned rope fixed at one end to a mast, tower or structure and anchored some distance from the base to stabilise the structure.

GUYED DERRICK: A derrick (or derrick crane) stabilised by guys.

GYPSY: A sheave with pockets formed into its groove to take a load chain, such as on a chain block.

HAMBONE: See wedge socket.

HAMMERHEAD CRANE: A tower crane with a counterweighted horizontal boom which supports a traversing crab for hoisting.

HAMMERLOCK: An attachment for joining hooks or rings to a chain.

HANDY BILLY: A fibre rope tackle where one block has two sheaves and the other block has three sheaves (double and treble blocks). It is also called 'light gin tackle'.

HAWSER LAID: A fibre rope construction which uses three strands.

HEAD BLOCK: The top block in a purchase, tackle or block at the head of a crane boom or hoist.

HEADACHE BALL: A spherical overhauling weight.

HEAVY DUTY WORKING PLATFORM: A scaffold platform with a duty live load capacity of 675kg per bay. This is three times the capacity of a light duty platform.

HEAVY GIN TACKLE: A fibre rope tackle where the upper block has three sheaves and the lower block has three sheaves (two treble blocks).

HELIX: The spiral put into a rope construction.

HIGH STRANDING: Rope damage indicated by one strand sitting up higher than the others in a portion of the rope.

HITCH: A tie made in a fibre rope to fix it to an anchorage or to a load. Common examples include the clove hitch, rolling hitch, becket (or buntline) hitch and timber hitch.

HOIST: An appliance used to raise or lower a load with no horizontal movement.

HOISTING: Raising or lowering a load.

HOIST-LIMITING DEVICE: A device used in a crane or hoist to stop the winch or warn the operator before the hook block jams into the head block (two-blocking) while the hook is being raised. It is also called an 'anti-two-block device'.

HOOK BLOCK: The lower block on a crane which incorporates a hook for slinging loads.

HYDRAULIC BOOM CRANE: A crane which has a boom which luffs using hydraulic power and usually also telescopes using hydraulic power.

IWRC: Wire rope core in the construction of an FSWR.

IWS: Wire strand core in the construction of an FSWR.

INBOARD: The portion of a needle or other cantilevered beam between the fulcrum and end anchorage or centre of the counterweights.

INDUSTRIAL GRADE LADDER: A portable ladder designed and manufactured for general industrial use. This is the type of ladder for use in rigging work.

INDUSTRIAL SAFETY NET: A purpose designed net intended to catch a person falling from a building or structure.

INERTIA REEL: A self-locking device with a retractable line intended for use with a safety harness.

JACK: An appliance which is placed under a load to raise or lower it.

JIB: A member attached to the crane structure from which the load is suspended. It can not be luffed while the crane is under load. **Please note:** In the past, 'jib' was often used to mean the same thing as 'boom'.

JIB TROLLEY: A crab or saddle from which the load is suspended and which can traverse along the jib.

JOCKEY SHEAVE: A diverting sheave which can freely run along the length of an axle to reduce the fleet angle of the lead rope.

kg: Kilogram.

kPa: Kilopascal.

kN: Kilonewton.

KERNMANTLE CONSTRUCTION: A method of constructing synthetic fibre rope where a plaited sheath is layed over a parallel or twisted core. Kernmantle ropes are used with abseiling equipment and emergency rescue lines.

KIBBLE: A crane lifted vessel normally used for hoisting and pouring wet concrete.

KIDNEY BELT: See body belt.

KINKING: Damage to a rope indicated by a sharp permanent twist.

KILOGRAM: A unit for measuring mass (or weight). One litre of water weighs one kilogram. There are 1000kg in a tonne.

KILONEWTON: A unit for measuring force. One kilonewton is approximately equivalent to a weight of 100kg.

KILOPASCAL: A unit for measuring pressure or stress. One kilopascal is approximately equal to 100kg per square metre.

KNEE BRACE: A diagonal brace used to stiffen a column in a steel structure.

L: Indicates Grade 30 mild steel chain.

LH: Indicates left hand lay in a rope construction.

LL: Indicates Lang's lay in an FSWR rope construction.

LANG'S LAY: A construction method for FSWR where the rope strands are laid in the same direction as the wires.

LANYARD: A short length of synthetic fibre rope used to attach a safety harness or body belt to an anchorage.

LATTICE BOOM CRANE: A crane with an open-web boom, usually in sections. It does not telescope. Sometimes called a 'pin-jib crane'

LAY: The way a rope is constructed.

LEAD BLOCK: A block which diverts the line of pull in a winch hauling rope.

LEAD ROPE: The portion of rope between the lead block and the winch drum.

LEFT HAND LAY: A method of rope construction where the strands are laid up in an anti-clockwise direction. Sometimes called an 'S twist' because the strands run the same direction as the central part of the letter S.

LEVER HOIST: See Chain puller.

LIFELINE: A vertical, or near vertical rope to which a safety harness can be attached using a device that will grab the lifeline if the wearer slips.

LIFTED LOAD: See live load.

LIFTING CLAMP: See plate clamp.

LIGHT DUTY WORKING PLATFORM: A platform on a scaffold with a duty live load capacity of 225kg per bay.

LIGHT GIN TACKLE: See 'handy billy'

LIVE LOAD: The load being lifted (also called the 'lifted load') or the load of persons and materials supported by a scaffold platform in each bay.

LIVE ROPE: A moving rope.

LOAD BINDER CHAIN: Chain designed for securing loads to the trays of trucks. It is not designed for lifting.

LOAD CHART: A manufacturer's notice fixed to a crane or hoist which specifies the SWLs in all normal operating configurations. It is also called a 'load plate' or 'crane chart'.

LOAD FACTOR: The fraction of a sling assembly's WLL created by a particular slinging method. It includes the angle factor and the reeve factor.

LOAD LIMITING DEVICE: Used with a power-operated scaffolding hoist, which cuts the hoist motor at a pre-set load to avoid overloading the rope or the suspension rig.

LOAD WEIGHT INDICATOR: A device which indicates the weight of the load being lifted.

LOCOMOTIVE CRANE: A crane designed and intended for use on railway tracks.

LONG SPLICE: A method of joining two ropes so that they can travel over sheaves without obstruction.

LOWER BLOCK: The bottom block in a tackle or purchase from which the load is suspended.

LUFF TACKLE: A fibre rope tackle where the upper block has two sheaves and the lower block has a single sheave (single and double blocks).

LUFFING: Raising or lowering the boom head of a crane.

M: The symbol used to indicate the diameter of a structural bolt in millimetres. For example, M16 indicates a 16mm bolt.

m: A metre – the unit for measuring distance.

mm: Millimetres. 1000mm equal one metre.

MPa: Megapascal.

MSDS: Material safety data sheet.

MAN AND MATERIALS HOIST: See personnel and materials hoist.

MANILA: Natural fibre used for rope construction. Has a creamy brown appearance when new.

MARLIN SPIKE: A tapered hand tool used to prise open the strands of an FSWR during splicing or during rope inspection.

MARLINE: Tarred hemp cordage used for seizings, mousings and whippings. Also called 'small stuff'.

MAST CLIMBER: A hoist with a working platform used for temporary purposes to raise personnel and materials to the working position. It has a drive system mounted on an extendable mast which may be tied to a building.

MATERIALS HOIST: A builder's hoist used for raising and lowering materials (not personnel) including a cantilevered platform materials hoist.

MATERIAL SAFETY DATA SHEET: Manufacturer's or supplier's information about a substance, including any hazards associated with its transportation, storage and use.

MECHANICAL LOADSHIFTING EQUIPMENT: When used in connection with rigging, this term includes specified cranes, hoists, cableways, flying foxes, winches, blocks and purchases which incorporate sheaves, jacks and airbags.

MEDIUM DUTY WORKING PLATFORM: A platform on a scaffold with a duty live load capacity of 450kg per bay. This is twice the capacity of a light duty platform.

MEGAPASCAL: A unit for measuring pressure or stress. 1000 kilopascals equals 1 megapascal. 1 megapascal is approximately equal to 100 tonnes per square metre.

MOBILE CRANE: A crane which can travel over a supporting surface without the need for fixed runways or railway tracks and which relies on gravity for stability.

MOBILE SCAFFOLD: An independent free standing scaffold mounted on castors.

MOBILING: Moving a mobile crane over its supporting surface while it is under load.

MULTI-LEGGED SLING: A sling assembly with more than two sling legs.

MULTIPLE CRANE LIFT: The movement of a load where the load is suspended from two or more cranes.

NR: Symbol used to indicate non-rotating rope.

NEEDLE: A cantilevered structural member that supports a scaffold or load.

NIP: The point at which a rope or sling is gripped by a hitch.

NON-ROTATING ROPE: FSWR in which adjacent layers of strands are layed in opposite directions, ie alternatively right hand and left hand, to prevent the rope from spinning under load. Commonly used as a crane hoist rope.

NON-SLEWING MOBILE CRANE: A mobile crane which has a boom or jib that cannot be slewed. It includes an articulated type mobile crane and a locomotive crane.

OL: Symbol used to indicate ordinary lay rope construction.

ON RUBBER: The operation of a truck mounted or rough terrain mobile crane without the aid of outriggers.

OPEN WEDGE SOCKET: See wedge socket.

ORDINARY LAY: A method of FSWR construction where the strands are laid in the opposite direction to the outer layer of wires. Referred to in North American manuals as 'regular lay'.

OUTBOARD: The portion of a needle or other cantilevered beam between its fulcrum and its outermost attachment point.

OUTRIGGER: A stabilising extension for a mobile crane.

OVERHAULING WEIGHT Counterweight to overhaul the self-weight of an unloaded hoisting rope.

OVERWOUND: Rope winding on and off the top side of a winch drum.

P: Symbol used to indicate Grade 40 chain.

PARBUCKLING: A method of moving a large cylinder up or down a ramp using one or more ropes to haul it or control its descent.

PARCELLING: Covering a splice with strips of duck or canvas before serving.

PARACHUTE HARNESS: See 'safety harness'.

PARTS OF ROPE: See 'falls'.

PENDANT: A rope used to provide support to a length of crane boom or jib.

PENDANT CONTROL: A hand held set of motion controls attached to a crane or hoist by an extension cable to provide remote operation. Particularly used with some types of bridge cranes and power operated chain blocks.

PERSONNEL AND MATERIALS HOIST: A powered builder's hoist which hoists personnel, goods or materials.

PIGSTY: A method of placing bearers on top of each other at right angles to provide a stable temporary support for a load.

PIN-JIB CRANE: See 'lattice boom crane'

PITCHED SHORT-LINK CHAIN: See 'calibrated chain'.

PLATE CLAMP: A purpose designed appliance for lifting steel plate and similar items.

PLATE SHACKLE: A shackle with two side plates used to connect boom pendants.

PODGER SPANNER: A spanner with a tapered handle used to field bolt structural steel members.

POWER TAKE-OFF WINCH: A winch powered by the engine of the vehicle to which it is attached.

PORTAL BOOM CRANE: A powered jib or boom crane mounted on a portal frame that is supported on runways allowing the crane to travel. Commonly used in waterside ports.

PREFORMED ROPE: FSWR where the spiral of the strands and wires is formed before the rope is laid up.

PROOF-COIL CHAIN: Unmarked chain of uncertain grade and construction.

PROTECTIVE DEVICE: A device used with a suspended scaffold which will arrest the descent and support a cradle or boatswain's chair in the event of a failure of a suspension rope or scaffolding hoist.

PURCHASE: A series of sheaves reeved up to form a mechanical advantage in the FSWR.

PURLIN: A longitudinal member spanning between roof trusses or beams to which roofing sheets are fixed.

RL: See 'ordinary lay'

RSJ: Rolled steel joist.

RADIUS: The distance between the centre of a circle and its outside edge.

REEVE: To thread rope through lifting gear such as sheaves or put one eye through the other for slinging.

REEVE FACTOR: The factor by which the WLL of a sling is adjusted to give its SWL for a particular manner in which the sling is reeved.

REGULAR LAY: See 'ordinary lay'

REMOTE-RELEASE SHACKLE: A purpose designed shackle with an operating rope enabling it to be disconnected by a person standing below the lifting point. Often used to lift columns during steel erection.

RIGGING: The use of mechanical loadshifting equipment and associated gear to move, place or secure a load including plant, equipment or members of a building or structure and to ensure the stability of those members, and for the setting up and dismantling of cranes and hoists, other than the setting up of a crane or hoist which only requires the positioning of integral outriggers or stabilisers.

RIGGING SCREW: An enclosed device with an anchorage point and a threaded rod in each end. Used to tension an FSWR or to provide fine adjustment to a sling assembly.

RIGHT HAND LAY: A method of rope construction where the strands are laid up in a clockwise direction. Sometimes called a 'Z twist' because the strands run in the same direction as the central part of the letter Z.

ROLLED STEEL JOIST: A structural steel member with an I-section, now largely superseded by universal beams (UB's) and universal columns (UC's).

ROOF RIG: See 'suspension rig'.

ROOSTER SHEAVE: The head sheave for the auxiliary winch on the top of the boom head of a hydraulic boom crane.

ROUGH TERRAIN CRANE: A mobile crane designed to operate on unimproved natural terrain and disturbed terrain of construction sites.

ROUND SLING: An endless synthetic fibre sling constructed with a circular cross-section.

RUNNING GEAR: Flexible ropes which run over sheaves or drums and the gear used with such ropes.

S: The symbol used to indicate seale construction in an FSWR.

S TWIST: See 'left hand lay'

SF: The symbol used to indicate seale filler wire in the construction of an FSWR.

SW: The symbol used to indicate seale warrington construction in an FSWR.

SWL: Safe working load.

SAFE WORKING LOAD: The maximum load which may be applied to a crane, hoist, rope, chain or sling for particular conditions of use.

SAFETY HARNESS: A body harness to which a lanyard or inertia reel can be attached to protect a person from falling or arrest a fall.

SAFETY HOOK: A hook provided with a safety latch across its throat intended to prevent a sling being accidentally dislodged.

SAFETY LINE: A horizontal rope or webbing anchored to two or more points of a building or structure and tensioned to provide an anchorage for a person wearing a safety harness to attach a lanyard or inertia reel.

SAFETY NET See 'industrial safety net'.

SAG ROD: A stiffening member fixed between purlins or girts, generally at their mid span.

SEALE: A multi-layered strand construction method in FSWR where equal sized wires in one layer are laid over an equal number of smaller equal sized wires in the next layer.

SEALE WARRINGTON: A multi-layered strand construction method in FSWR where a seale laid layer is laid over a warrington laid centre.

SCAFFOLD: A temporary structure specifically erected to support access platforms or working platforms.

SCAFFOLDING HOIST: A serial hoist used with a suspension rope to raise and lower a cradle or boatswain's chair during normal operation.

SCISSOR HOIST: An elevating work platform where the platform is raised and lowered using a scissor mechanism.

SECONDARY ROPE: A rope sometimes used on a suspended scaffold which does not normally support the cradle but which is rigged for use with a protective device.

SEIZING: A lashing for holding two ropes, or two parts of a rope together. Common types include round, square, flat, racking, throat and end seizings.

SENHOUSE SLIP: A tongued quick release device for chains or ropes. Often used to secure the anchor of a vessel.

SERVING: Winding marline, twine or annealed wire tightly around a rope, usually to protect a splice from damage and to protect the user's hands from cuts.

SHEAVE: A grooved wheel or roller over which a rope or chain passes.

SHEERLEGS: A derrick like appliance consisting of two legs in an 'A' formation, with a sheave block fixed to its apex and the framework stabilised with guys.

SHORT SPLICE: A method of joining two ends of fibre rope. It is used where the spliced section does not have to travel over a sheave.

SHROUD LAID: A method of constructing a fibre rope using four strands layed around a core.

SIMPLY SUPPORTED BEAM: A beam which is fixed at each end.

SINGLE LADDER: A non-self supporting portable ladder whose length cannot be adjusted.

SINGLE WHIP: A fibre rope tackle where both the upper and lower blocks have single sheaves (two single blocks).

SISAL: Vegetable fibre obtained from the sisal plant. Sometimes used to construct natural fibre ropes.

SLEWING: The rotation of a crane's boom or jib in the horizontal plane.

SLEWING CRANE: A crane with a boom or jib which has slewing capability.

SLEWING MOBILE CRANE: A powered mobile slewing crane. It does not refer to a front-end loader, backhoe, excavator or similar equipment when configured for crane operation.

SLING: Detachable lifting gear made from FSWR, natural fibre, chain, or synthetic fibre.

SNATCH BLOCK: A sheave block with a drop side to permit the bight of a rope to be placed or removed without reeving it through.

SNATCH LOADING: The sudden application of power to lift a load, causing large impact forces on the load and the running gear.

SNIGGING: Dragging a sling or dragging a load.

SNOTTER: A fibre rope sling.

SPANISH WINDLASS: A dangerous method of twitching tight the parts of a rope by placing a bar between them and taking several turns.

SPREADER BAR: A rigid member used to connect two trolleys from which a scaffold is suspended. It keeps the suspension points aligned when the cradle or working platform is traversed.

SPREADER BEAM: A beam with a central lifting attachment and with slinging points at each end. Used to reduce the angle of slings or to sling loads with large surface areas or to reduce the strain on a load.

SPECIAL DUTY WORKING PLATFORM: A platform on a scaffold designed for live loads greater than 675kg per bay.

SOCK: See 'cable pulling stocking'.

SOFT EYE: See 'bald eye'.

STANDING GEAR: Ropes such as guys and stays which do not run or work over sheaves or drums, and the gear used with such ropes.

STATIC LINE: See 'safety line'.

STEP LADDER: A self-supporting portable ladder of fixed length having flat steps or treads and hinged back legs.

STIFF-LEG DERRICK: A derrick crane stabilised by rigid backstays and sleepers.

STOCKING: See 'cable pulling stocking'.

STRAND: A number of wires or fibres layed in a spiral which are then layed up with other strands to form a rope.

STRETCHING SCREW: See 'turnbuckle'.

STRONGBACK: A temporary member fixed to a load to strengthen or stiffen it during lifting.

STROP: An endless sling.

STUD-LINK CHAIN: Chain constructed with a stud across the centre of each link. Commonly used for marine purposes, the stud prevents the chain from jamming when it comes out of ships' lockers. Unsuitable for general lifting purposes.

SUPER DUTY HOIST: A materials tower hoist with a WLL greater than one tonne. It is sometimes constructed as a dual tower with a materials platform in one tower and a concrete bucket in the other.

SUSPENDED SCAFFOLD: A scaffold incorporating a suspended platform which can be raised and lowered in normal use, including a boatswain's chair.

SUSPENSION RIG: The portion of a suspended scaffold (including a trolley track) which is mounted at a higher level than the cradle and which supports and positions the cradle. Sometimes called a 'roof rig'.

SUSPENSION ROPE: A rope used in a suspended scaffold to support a cradle.

SWAGED FITTING: A metallic fitting attached to FSWR using radial pressure to form an eye.

SWING STAGE: A suspended scaffold with a single row of suspension ropes.

SWIVEL: A rotating item of lifting gear which can rotate without spinning the rope, hook or load.

SYNTHETIC FIBRE: Manufactured fibre used in the construction of fibre ropes and slings, such as polyamide (nylon), polyester, polyethylene, polypropylene, etc.

T: Symbol indicating Grade 80 chain.

t: Symbol for tonne.

TFB: Tapered flange beam

TACKLE: Fibre rope reeved through sheaves to form a mechanical advantage.

TAGLINE: A fibre rope attached to a suspended load to control the load during lifting.

TAPERED FLANGE BEAM: A largely obsolete type of steel I-beam. UB's are now generally used.

TARE WEIGHT: The unloaded weight of a crane, lifting box or other container. It is also called the 'self-weight'.

TELESCOPING: The extension or retraction of a crane's boom or jib by the movement of the boom or jib sections during normal operation. A feature of most hydraulic boom cranes.

THIMBLE: A grooved piece of metal, circular or pear-shaped, used to protect an eye splice. It forms a 'hard eye'.

TONNE: A unit for measuring mass (or weight). 1000kg equals 1 tonne.

TOWER CRANE: A boom or jib crane mounted on a tower structure.

TRACK-MOUNTED CRANE: A mobile crane mounted on a crawler track base. It is not usually fitted with outriggers.

TRAVEL: Movement of a complete crane along a surface or track.

TRAVEL TOWER: A boom-type EWP mounted on a truck tray.

TRAVERSE: Movement of a crab or other part of a crane along runways forming part of the crane structure, or horizontal movement of a scaffold platform hung from or suspended from a trolley track.

TRAVERSING ROPE: A fibre rope used with a suspended scaffold or hung scaffold supported from a trolley track to provide controlled horizontal movement of the platform. Also the rope used to traverse the fox across the main cable of a flying fox.

TRESTLE LADDER: A portable hinged self-supporting ladder designed and intended to support scaffold planks.

TRUCK-MOUNTED CRANE: A mobile crane mounted on a truck-type chassis and cab system, with the crane base forming part of the truck chassis.

TUCK: A rope strand tail passed under a strand in the construction of a splice.

TURNBUCKLE: An open framed attachment with an anchorage and threaded rod at each end used to tension a rope or to provide fine adjustment.

UB: Universal beam.

UC: Universal column.

UNDERWOUND: Rope winding on and off the underside of a winch drum.

UNION SCREW: See turnbuckle.

UNIVERSAL BEAM: An I-section steel beam commonly used in steel structures.

UNIVERSAL COLUMN: An I-section steel column commonly used in steel structures.

VEHICLE LOADING CRANE: A powered slewing crane mounted on a vehicle for the principal purpose of loading and unloading the vehicle.

W: Symbol used to indicate a warrington construction in an FSWR.

WLL: Working load limit.

WALKING: Mobiling a load with track mounted cranes.

WARPING DRUM: A powered winch with a dished drum used with a fibre or wire rope which is turned around the drum using friction to lift or haul a load. Also called a 'capstan winch'.

WARRINGTON: A multi-layered strand construction method for FSWR where the strand is laid up parallel with alternate large and small wires in one layer.

WEBBING SLING: A flat woven synthetic fibre sling.

WHIP UPON WHIP: A fibre rope tackle with two moveable single blocks and one fixed single block.

WHIPPING: A method of preventing the end of a rope from unlaying by securing yarn, marline, twin or wire around it. Forms of whipping used with fibre ropes include Common whipping, American whipping, West-Countryman's whipping and Palm-and-Needle whipping.

WINCH: An appliance which provides a means of hoisting or hauling a load.

WIRE: A single continuous steel filament. In FSWR, a number a wires make up a strand, and several strands form a rope.

WIRE ROPE GRIP: A removable device incorporating nuts and bolts designed to be fixed to FSWR.

WORK CAGE: A suspended scaffold cradle supported by a single suspension rope. Usually designed for one person.

WORK BOX: A crane lifted box designed to carry personnel and provide them with a working platform. Often used to service tower crane booms and during large-scale steel erection.

WORKING LOAD LIMIT The maximum load which can be applied under general conditions of use to a crane, hoist, rope, chain, sling or item of lifting gear.

WORMING: The laying of lengths of spun yarn into the valleys between the strands of a rope to make the rope completely circular before it is served.

Z TWIST: See right hand lay.

Appendix (vi) Sample assessment questions

Introduction

The questions in this Appendix are typical of those set for riggers' certificate assessments and are grouped into dogging, basic rigging, intermediate rigging and advanced rigging. You will find the answers in the text of this guide.

Dogging

1. Which has the greater bearing pressure—shale or dry sand?
2. What type of tagline would you use operating near powerlines—natural fibre rope or synthetic fibre rope?
3. Which type of two-way radio is recommended for dogging on large city building sites—a trunked radio or a conventional radio?
4. What is meant by 6 x 24 FC RHOL FSWR?
5. Are the strands of a right hand lay rope laid clockwise or anti-clockwise around the core?
6. Does the lay of a rope affect the WLL?
7. Which letter is often used to mark Grade 80 chain?
8. What is the WLL of a synthetic sling colour-coded green?
9. What is the recommended maximum angle between two legs of a sling?
10. When a three legged sling is used to lift a rigid load, how many legs are assumed to be taking the weight?
11. How would you protect a sling from damage caused by the sharp edges of a load?
12. What can happen if a kibble of concrete is dumped in one spot?
13. What minimum clearance around stacked loads would you keep for truck access?
14. What is the minimum diameter FSWR you would use for two vertical slings fixed to a spreader for lifting a tank filled with water where:
the tank's tare weight is 200kg
the tank diameter is 850mm
and the tank height is 1600mm?
15. If you are using a 13mm Grade (P) four-legged chain sling with an included angle of 60 degrees between the diagonally opposite sling legs, what is the maximum load that can be lifted?
16. If you are using a pair of 14mm reeved FSWR slings with an included angle of 90 degrees to lift a universal beam which weighs 147kg per metre, what is the maximum length the beam can be?

Basic rigging

1. Is a person with a Basic Rigging certificate allowed to carry out dogging work?
2. Is a person with a Basic Rigging certificate allowed to supervise dual lifts?
3. Is a person with a Basic Rigging certificate allowed to install a safety net?
4. What identification marks would you find on the head of a high strength structural bolt?
5. What type of shackle can be used from a lower level to release the running gear from a column?
6. Would you sling a roof truss away from the panel points or at the panel points?
7. Can FSWR be safely used in a fibre rope tackle block?
8. What is the minimum groove depth in a wire rope purchase block?
9. What type of damage is caused by sheaves where the groove is too large for the rope?
10. What is a gun tackle?
11. On what side of an underwound winch drum would you fix a left hand lay rope?
12. What are the two maximum fall distances you might find marked on the label of a safety net?
13. What maximum spacing would you use between ties along the border cord of a safety net?
14. What is the maximum distance you would use between lateral ties or guys of a cantilevered platform materials hoist?
15. What is the minimum distance from the lead block to a plain winch drum which is 900mm wide?
16. Allowing 5 per cent per sheave for friction, what is the load in the lead rope when a purchase with 5 sheaves is used to lift a total load of 8t?

Intermediate rigging

1. Is a person with an Intermediate Rigging certificate allowed to plan and direct a multiple crane lift?
2. Is a person with an Intermediate Rigging certificate allowed to use load equalising gear?
3. Is a person with an Intermediate Rigging certificate allowed to erect and dismantle a cableway?
4. How often are proof tests required on lifting clutches used for tilt-slab erection?
5. What is the maximum recommended height of packing under the edge of a tilt up panel?
6. What type of indicator must be fitted to a crane used for lifting tilt slabs?
7. When lifting a tilt slab panel from its casting bed, what increase in the dead load would you allow for the effect of suction?
8. On a tilt slab shop drawing, what does a blocked-in circle mean?
9. If you are using a 2 x 2 rigging configuration with equalising sheaves to raise a tilt-slab and the distance between the anchor points for each sling is 2.4m, what is the minimum length of the slings you need?

10. Does a crane used for demolition work require a hoist limiting device?
11. What is the minimum diameter of a felling chain for demolition work?
12. How close to the sides of a felling rope can a person stand during demolition work?
13. If you are demolishing reinforced concrete columns, what is the maximum allowable freestanding height if they are left without lateral support outside working hours?
14. What is the minimum number of temporary guylines needed to control the felling of a steel column?
15. An equalising beam which is 8m long with lifting points located at each end and at every metre along its length will be used in a dual lift. The total load to be lifted is 40t. One crane has an SWL at the working radius of 25t.
 - (a) How far along the equalising beam from this crane's lifting point would you sling the load?
 - (b) What is the minimum required SWL of the second crane at the working radius?

Advanced rigging

1. What is the maximum duty live load per bay for a medium duty fabricated hung scaffold?
2. What is the minimum width of a heavy duty working platform on a fabricated hung scaffold?
3. What is the minimum distance a toeboard must extend above the top surface of a working platform on a fabricated hung scaffold?
4. Would you use a fibre rope as a guardrail on a scaffold?
5. What is the minimum and maximum height from a scaffold platform to the guardrail?
6. At the edge of a scaffold platform, what must be provided between the guardrail and the toeboard?
7. What are the minimum and maximum slopes at which a portable ladder can be pitched to provide access to a scaffold?
8. What is the minimum cradle width for a double rope suspended scaffold?
9. What is the maximum width of a swing stage cradle?
10. Can bags of sand be used to counterweight the needles of a suspended scaffold?
11. Where two trolleys are used to support a swing stage, how would you stop them spreading?
12. When a drum type scaffolding hoist is at its lowest point, how many full turns of rope should remain on the drum?
13. When a climber type scaffolding hoist is at its lowest point, what is the minimum length of spare rope?
14. What type of scaffolding hoist must be fitted with a load limiting device?

15. A swing stage cradle of one bay is set up with two electric scaffolding hoists. Each hoist has a rated working load of 500kg using 50m of suspension rope weighing 30kg per 100m. The cantilever needles have an inboard of 3m and an outboard of 500mm. Each counterweight weighs 30kg.
- (a) Calculate the maximum rope tension.
 - (b) Calculate the minimum guaranteed breaking load of the suspension ropes.
 - (c) Calculate the minimum number of counterweights needed at the inboard end of each needle.
16. A chain block is set up on a span rope fixed between two beams which are 25m apart. The load to be lifted is 600kg and the weight of the lifting gear and load in the hauling part is 70kg. When the span rope sag is at the recommended minimum, what is the tension in the span rope?
17. A 6m gin pole has been set up at the maximum recommended lean with the guys anchored at the minimum recommended distances from the pole foot. The lead rope is parallel to the pole. When a 6t load is lifted there is a 1.2t load in the lead rope.
- (a) Calculate the load on the back guy.
 - (b) Calculate the forward lean of the top of the pole.
 - (c) Calculate the distance between the pole heel and the back guy anchor.

Index

Page numbers in *italics* refer to illustrations

- abrasion, of flexible steel wire rope, 8, 16, 16-18
- advanced rigging, 6, 181-207, 239-40
- American whipping, 40
- anchorages and fittings
 - Bordeaux connections, 66
 - daily inspection of, 73
 - eyebolts, 70-1, 71
 - hooks, 68-9, 68
 - safety line systems, 140
 - shackles, 69-70, 69
 - single and double base clamps, 66, 66
 - socketed terminal fittings, 64, 64-5
 - turnbuckles, 66-7, 67
 - wedge rope sockets, 62-3, 62-3
 - wire rope grips, 65, 65-6
- anchored needle suspension rigs, 191
- area, calculation of, 215-6
- Australian Standards
 - bolts, 116
 - builder's hoists and equipment, 128
 - chain slings, 59
 - collared eyebolts, 140
 - cranes, 163
 - demolition of structures, 163
 - electrical installations, 187
 - elevating work platforms, 119, 131
 - eye protectors, 211
 - fall-arrest devices, 140-1
 - hearing protectors, 212
 - portable ladders, 122
 - residual current devices, 187
 - respiratory protective devices, 211
 - rigging screws and turnbuckles, 66
 - safety belts and harnesses, 140-1
 - safety footwear, 212
 - safety helmets, 211
 - scaffolding, 119, 121, 127, 181, 183
 - serial hoists and winches, 72, 185
 - shackles, 69
 - suspended scaffolding, 184
 - tilt-up panels, 147
 - tower cranes, 175
 - wedge-type sockets, 62
- back hooking, 68-9
- back splice, 41
- bald eye splice, 62
- basic rigging, 5, 111-44, 238
- basket hitch, 80, 84, 84, 85
- beams and girders, 113-4
- becket, 32
- becket load, 33
- becklet hitch, 46
- bends and hitches, 46
- birdcaging, 11, 16
- blocks, 42-4, 42, 43
- boatswain's chair, 120, 184, 196
- bolts, 115-6, 116
- boom lengthening, mobile cranes, 172-3, 172-3
- boom lifts, 117
- Bordeaux connections, 66
- bottle screws, 66
- bow shackles, 32, 69, 69
- bowline on the bight, 46
- bowline running, 46
- bowline single, 46
- bowsing lashing, 45
- bowstrings, super duty tower hoists, 171
- bracing anchors, 147
- bracing inserts, 147
- bridle billing, 32
- BS 3913 *Industrial Safety Nets*, 134
- bulldog grips, 65, 65-6
- buntline hitch, 46
- bush roller chain, 57, 73
- butt joint, 199
- button rope, flying foxes, 206
- C hook, 68
- cable laid rope, 38
- cable pulling stockings, 35, 35
- calibrated chain, 73, 73
- cantilevered beams, 78-9, 78-9
- cantilevered crane loading platforms, 125-7
- cantilevered platform materials hoists, 128-31, 129, 130
- cantilevered platform personnel and materials hoists, 164, 164-7
- car jacks, 76
- carbon black, 50
- cargo hook, 68
- cast-in anchors, 140

certification

- cantilevered crane loading platforms, 125
- demolition rigging, 156
- elevating work platforms, 118
- erection of scaffolds, 119
- fabricated hung scaffolds, 181
- flying foxes, 205
- gin poles and derricks, 195
- handling pre-cast concrete, 143
- hoist erection, 128
- levels of, 5
- multiple crane lifting, 153
- rigging for cranes, 164
- rigging for hoists, 164
- safety line systems, 138
- safety nets, 134
- steel erection, 111
- suspended scaffolds, 184
- tilt up panels, 147

chain

- care and maintenance, 58-9
- demolition rigging, 156
- felling with, 157-9
- Grade 65 chain, 57
- Grade 70/75 chain, 57
- grade markings, 55, 56
- handling, 58-9
- inspection for defects, 57, 57-8, 58
- lifting chain, 55-7
- removing load binding chain, 89-90, 89
- rings, 61
- safe working loads, 56
- working load limit, 81-3

chain blocks, 72, 72-3

chain hooks, 57

chain pullers, 73, 73-4

chain sling assembly, 55, 59-61, 60

chain sling links, 60, 60-1

chemical and friction type anchors, 140

chemicals, effect on synthetic fibre rope, 51

cherry-pickers, 118-9

choke hitch, 80, 85

clevis type turnbuckle, 67, 67

clove hitch, 46

cock billing, 32, 70

coir ropes, 37

collared eyebolts, 70-1, 71, 140

common whipping, 40, 40

communications and signals, 213, 214

concrete walls, demolition of, 159

conventional radios, 213

cordage, 37

core slippage, 11, 11

cotton ropes, 37

counterweighted needle suspension rigs, 191, 191

counterweighting, of cantilevered beams, 79, 79

counterweights, 191, 191

coupling links, 61

Coventry chain, 57

crab, hammerhead cranes, 174-5, 175

cradles, suspended scaffolds, 187, 189

crane hook, 68

crane lifted work boxes, 122-3

crane operators, directions for, 213, 214

crane ropes, 24

cranes

- auxiliary winch capacity, 152
- demolition rigging, 156
- electrical hazards, 97-8, 97-8
- flexible steel wire rope, 8, 8
- lengthening of the boom, mobile cranes, 172-3, 172-3
- lifting tilt up panels, 150-1, 151
- locomotive cranes, 102
- mobiling, 93-5, 94
- outriggers, 99-102, 99-101
- overturning, 96, 101
- rotating panels from truck trays, 152
- safety, 95, 95-97, 96
- soil load bearing pressure, 101
- tower cranes, 174-8
- see also multiple crane lifting;
- rigging for cranes

crawler cranes, 95

creeper type lever operated pullers, 73, 73-4

cribbing, 103, 103

cut splices, 20, 41

'D' ring end fittings, 52

'D' shackles, 32, 69, 69

dacron-terylene ropes, 48

dead eye anchorage, 62

demolition rigging

- certification, 156
- concrete walls, 159
- cutting and removal of beams, 157
- estimating loads and forces, 156
- felling with winches, ropes and chains, 157-9

- guidelines for felling, 157-8
- lattice towers and masts, 160-1, 160
- masonry walls, 159
- multi-storey buildings, 159-60
- overview, 156
- pre-stressed concrete members, 161-3
- recognising pre-stressed members, 162
- reinforced concrete columns, 158, 158
- tilt up panels, 159
- unattended partially demolished structures, 162-3
 - use of cranes and rigging gear, 156
- derricks, *see* gin poles and derricks
- dog knot, 41
- dogging, 5, 237
- double base clamps, 66, 66
- double rope suspended platforms, 184
- double sheet bend, 46
- double shortener, 47
- drag lines, 63
- drum type lever operated pullers, 73
- drums
 - calculating capacity of, 33-4
 - fleet angles, 29-30, 30
 - function, 28
 - laying onto, 19, 19, 28-9, 29-30
 - measurement of, 28
 - multiple layers on, 34
 - overwound versus underwound, 29
 - raising very heavy loads, 29
- electrical wires
 - cantilevered platform hoists, 166
 - crane safety, 97-8, 97-8
 - demolition of lifts, 160
 - erecting hoists, 130, 130
- elevating work platforms, 117, 118, 118-9
- end for choke hitching, 52
- endless sling, 52, 84, 84
- equalising gear, 75, 75
- equalising sheaves, 147, 148
- extension ladders, 121
- external climbing cranes, 176, 176-7
- eye protection, 211
- eye splice, 20-3, 41
 - see also* wedge rope sockets
- eye type turnbuckle, 67, 67
- eyebolts, 70-1, 71
- fabricated hung scaffolds
 - access to working platform, 183
 - certification, 181
 - design compliance, 181-2
 - duty classifications, 182
 - general use, 181, 181
 - platform construction, 182
 - scaffold anchorages, 183
- facade panels, *see* pre-cast concrete
- fall arrest systems, 141-2, 142
- fastenings, 115-6
- fatigue, 8, 16, 16-8, 64-5
- Fibre Core, 9
- fibres (rope), 37
- figure of eight knot, 47
- filament (synthetic fibre rope), 48
- Filler construction, 13, 13
- first aid, 212
- fisherman's bend, 46
- fittings, for anchorages, *see* anchorages
- five tuck splice, 22-3, 23
- fixed cantilevered beams, 78-9, 78-9
- flat eye sling, 52
- flat seizing, 40, 40
- flat spin taniklon fibre, 49
- flat throat seizing, 20, 21
- flat webbing and round synthetic slings, 52, 54, 83
- flax ropes, 37
- fleet angles, 29-30, 30
- flexible steel wire rope
 - construction, 8, 8-10, 9, 12-3, 4-5
 - demolition rigging, 156
 - fatigue and abrasion of, 8, 16, 16-8
 - felling with, 157-9
 - hand splicing, 20-4
 - handling new rope, 19-20
 - inspection for defects, 16, 16-8
 - lays, 8-10
 - not to be used in tackle blocks, 35
 - size, 9-10
 - table of safe loads for wire rope purchases, 31, 31
 - types of lever operated pullers, 73-4
 - uncoiling, 19, 20
 - working load limit, 80, 81
 - see also* non-rotating ropes; post-formed ropes; pre-formed ropes

flying foxes, 205, 205-7, 206
 folded eye sling, 52
 foot diversion sheave, 169, 169
 footwear, 212
 four leg slings, 85
 frapping, 45

 gantline, derrick poles, 196
 GBS, 39
 gin poles and derricks
 calculating load, 197-8, 199
 certification, 195
 guy loads, 198, 198
 lifting with, 197-8
 marine type derrick, 203-4, 204
 rules for use, 198
 set up, 195, 195-6, 196
 splicing, 199, 199
 tripods, 201-3
 use and construction, 195, 195
 see also sheerlegs
 girder grip devices, 118
 girls, 115
 gloves, 211
 gluts, 103
 grips, *see* wire rope grips
 grommets, 42, 84, 84
 guaranteed breaking strain, 39
 gunning-up, 116
 guy derricks, 202-3, 202
 guy loads, derrick poles, 198, 198
 guys
 cantilevered platform materials hoist,
 129, 130
 demolition of masts, 160, 160-1
 derrick poles, 195, 195, 196
 erecting roof trusses, 115
 steel erection, 111
 gypsies, 55, 55, 72

 hammerhead cranes, 174, 175, 175
 Hammerlok links, 61
 hand signals, 214
 hand splicing
 crane ropes, 24
 definition of splice, 20
 five tuck splice, 22, 23
 Lang's lay, 24
 making the splice, 21, 21
 serving, 24, 24
 slings, 24
 standing ropes, 24
 tools for, 21
 hard fibre ropes, 37
 harnesses, *see* safety
 harnesses hawser laid rope,
 37, 37
 hearing protection, 212
 heat, effect on ropes, 38, 39, 50
 hemp ropes, 37
 hitches, 46
 hoist brake, 29
 hoist operators, directions for, 213, 214
 hoists, *see* cantilevered platform materials hoists;
 cantilevered platform personnel and materials
 hoists; internal guided platform materials
 hoists; rigging for hoists; scaffolding hoists
 hooks, 68, 68
 horn type safety hook, 68
 hung scaffolds, 119
 hydraulic jacks, 77, 77-8

 impact wrenches, 116
 Independent Wire Rope Core, 9
 industrial safety nets, *see* safety nets
 inertia reels, 141-2, 142
 intermediate rigging, 5, 147-78, 238-9
 internal climbing cranes, 178, 178
 internal guided platform materials hoists, 167-70,
 167-9

 jacks, 76, 76-8, 77
 jibs, super duty tower hoists, 171-2
 jockey sheaves, 28, 28
 jute ropes, 37

 knots, 46-7
 Kuplex links, 61
 kuralon ropes, 49

 ladders, portable, 121-2, 183
 laid shattered film rope, 49
 Lang's lay, 9, 9-10, 13, 24
 lanyards, 140-1
 lattice girders, 114, 114-5
 lattice towers, demolition of, 160, 160-1
 lay, 9, 9-10
 laying onto a drum, 19, 19
 lead blocks, 32, 33
 left hand Lang's lay, 9, 9
 left hand ordinary lay, 9, 9-10, 28
 lever operated pullers, 73, 73-4

- lifelines, 45
- lifting, *see* slings and slinging; spreader beams
- lifting chain, 55-7
- lifting clutches, 147
- lifts, demolition of, 160
- links, chain sling assembly, 59-61, 60
- Liverpool hook, 68
- load factors, slinging, 83-7
- loading formwork, 92
- loads, safe, for wire rope purchases, 31, 31
- locking, of turnbuckles, 66, 67
- locomotive cranes, 102
- long link chain, 57
- long splice, 41
- luffing, use of Lang's lay, 10
- luffing boom cranes, 174, 174
- luffing down, dangers of, 154

- manila ropes, 37
- marine type derrick, 203-4, 204
- marlin spike hitch, 47
- marlin spikes, 21
- marline, 37
- masonry walls, demolition of, 159
- masses, table of, 219-20
- mast climbers, 131-3, 132
- mast frapping, 45
- masts, demolition of, 160-1, 160
- mobile cranes
 - electrical hazards, 97-8, 97-8
 - lengthening of the boom, 172-3, 172-3
 - locomotive cranes, 102
 - mobiling procedures, 93-4, 94
 - outriggers, 99, 99-102, 101
 - overturning, 96, 101
 - safety, 95, 95-7, 96
 - soil load bearing pressure, 101
- mobile scaffolds, 120
- Morse chain, 57
- multi-leg tag, 60
- multi-storey buildings, demolition of, 159-60
- multilink assembly, 60
- multiple crane lifting
 - calculating load-share, 154-5
 - certification, 153
 - directing a multi-crane lift, 155
 - planning and coordination, 153
 - selection and siting of cranes, 153-4
 - slinging loads, 154-5, 155
 - when required, 153
- multiple slings, load factor, 84, 84
- natural fibre rope
 - as tag line for load control, 98, 98
 - assessing capacity of, 39
 - bends and hitches, 46
 - blocks and tackles, 42-4
 - construction, 37-8
 - guys and lifelines, 45
 - handling, 39-40
 - inspection for defects, 38
 - maintenance, 39
 - parcelling, 41
 - safe load table for blocks, 43-4
 - seizings, 40, 40
 - serving, 41
 - shorteners, 47
 - slings, 42
 - splicing, 41
 - storage, 39
 - thimbles, 41
 - uncoiling, 39-40
 - whipping, 40, 40
 - working load limit, 82
 - worming, 41
- needle suspension rigs, 191, 191
- needles, 78
- new rope, *see* flexible steel wire rope
- non-rotating ropes, 11-12, 11-12
- nuts, 116, 116
- nylon ropes, 48

- occupational health and safety, 6
- ordinary lay, 9, 10, 13
- outriggers, 99-102, 99, 101, 132, 171
- overhand knot, 47

- packing, in outriggers, 99-100
- packing loads, 103
- pallets, 91-2
- Palm and needle whipping, 40, 40
- panel braces, 147
- parbuckling, 104, 104
- parcelling, natural fibre rope, 41
- pendulum effect, inertia reels, 142, 142
- phormium tenax ropes, 37
- pigsties, 103, 103
- pile drivers, 63
- plain rope, 37, 37

- Plastic Core, 9
- plate clamps, 90, 90
- plate shackles, 69-70
- pneumatic equipment, suspended scaffolds, 188
- polyamide filaments, 48, 51
- polyester filaments, 48, 51
- polyethylene filaments, 48, 51
- polypropylene rope, 49, 51
- polyvinyl alcohol, 49
- portable ladders, 121-2, 183
- post-formed ropes, 10
- post-tensioned concrete members, 161-2
- pre-cast concrete
 - certification, 143
 - demolition of, 161-3
 - pre-cast concrete facade panels, 144
 - pre-stressed concrete beams, 143-4, 143
 - pre-stressing methods, 161-2
 - recognising pre-stressed members, 162
- pre-formed ropes, 10
- pre-stressed concrete beams, 143-4, 143
- pre-tensioned concrete members, 161-2
- precast wall panels, demolition of, 160
- prefabricated scaffolding, 119
- proof coil chain, 57
- pull lifts, 73, 73-4
- purchases
 - calculating capacity of drums and reels, 34-5
 - calculating the load in a single part, 33-4
 - contrasted with tackle blocks, 34-5
 - defined, 32
 - multiple layers on drums, 34
 - reverse bends, 34
 - sheave blocks, 32
 - snatch blocks, 32
 - table of safe loads for, 31, 31
- purlins, 114-5
- ratchet jack, 76
- racking seizing, 40, 40
- radios, 213
- ramshorn hook, 68
- rattle-guns, 116
- reels, calculating capacity of, 34-5
- reeving, 26-7, 26-7, 44
 - see *also* cable pulling stockings
- reinforced concrete columns, felling, 158, 158
- remote-release shackles, 117
- respiratory protection, 211
- reveal propped needle suspension rigs, 191
- reverse bends, 34
- reverse eye sling, 52
- Reynolds chain, 57
- rigger's belts, 117
- rigging, defined, 5
- rigging for cranes
 - certification, 164
 - lengthening mobile crane booms, 172-3, 172-3
 - tower cranes, 174-8
- rigging for hoists
 - cantilevered platform (personnel and materials) hoist, 164, 164-7
 - certification, 164
 - internal guided platform (materials) hoists, 167, 167-70
 - super duty tower hoists, 170-2, 171
- rigging screws, 66-7, 67
- right hand Lang's lay, 9, 9
- right hand ordinary lay, 9, 9, 28
- rings (chain), 61
- rolling hitch, 46
- rolling objects, 104-5, 105
- rolling platforms, 127
- roof trusses, 114-5, 114
- rope, see flexible steel wire rope; natural fibre rope; synthetic fibre rope
- rope luffing cranes, 174, 174
- round seizing, 40, 40
- round synthetic slings, 52, 52-3, 54, 83
- round throat seizing, 20
- round turn and two half hitches, 47
- rubbish bins, 90
- saddle grips, 66
- safe working load (SWL), 83, 84-5, 89, 156
 - see *also* working load limit (WLL)
- safety
 - cranes, 95, 95-7, 96
 - lengthening of crane booms, 172-3, 172-3
 - materials hoists, 128
 - personal safety equipment, 211-2
 - safety factor, in general rigging, 80
 - suspended scaffolds, 188-9
 - tower cranes, 175-6
 - working aloft, 117-24
- safety harnesses, 124, 134, 140-1, 141, 188-9
- safety helmets, 211

safety hook, 68

safety line systems, 177, 124, 138-42, 139, 141

safety nets, 124, 134-7, 135-6

scaffold clips, 90

scaffolding hoists, 185

scaffolds, 119, 119-21
 see also fabricated hung scaffolds;
 suspended scaffolds

scissor hoists, 117

screw jacks, 76, 77, 77

Seale construction, 15, 15

Seale-Filler, 13

secondary ropes, scaffolds, 185-6, 186

seizings, natural fibre rope, 40, 40

serving, 24, 24, 41

shackles, 69-70, 69, 117

sheaves
 damage to, 18
 diameters, 25, 25-6
 equalising sheaves, 75, 75
 flare angle and groove depth, 25, 25
 for purchases, 32
 function, 25
 inspection of, 27-8, 27-8
 reeving, 26-7, 26-7
 sheave blocks, 32, 42-3, 44

sheerlegs, 200

sheet bend, 46

shims, 147

short link chain, 55

short splices, 20, 41

shorteners, 47

shortening clutch, 60

shroud laid rope, 38

signals, 213, 214

silver rope, 49

single base clamps, 66, 66

single ladders, 121

single leg tag, 60

single slings, 84, 84, 85

single snotter shortener, 47

sisal ropes, 37

skates, 107

skidding, 105-6, 106

sling hook, 68

slings and slinging
 beams and girders, 113-4
 common sling arrangements, 85
 direct lifting, 88

 fabricated hung scaffolds, 183
 general principles, 88-9, 88-9
 hand splicing, 21-24
 handling steel plate, 90, 90-1, 91
 inspection for defects, 52-3, 54
 load factors, 83-7
 load position, 88
 loading formwork, 92
 loose items, 90
 multiple crane lifting, 155
 natural fibre rope, 37-47
 packing sharp edges, 88, 88
 pallets, 91-2
 rubbish bins, 90
 steel columns, 111-2, 112
 synthetic fibre rope, 52, 48-53, 54
 tilt up panels, 147-52, 148
 turning over loads, 92, 92
 use of ordinary lay ropes for, 10
 weight of the load, 87-8
 working load limits, 80-3
 see also spreader beams; working load
 limit (WLL)

slivers (rope), 37

slopes, mobilising up and down, 94-5, 94

snatch blocks, 32

snotters, 42, 47

snubber turn, 46

socketed terminal fittings, 64, 64-5

soft fibre ropes, 37

soil, load bearing pressure of, 101

spans ropes, 207, 207

splicing
 gin poles and derricks, 198-9, 199
 natural fibre rope, 41
 types, 41
 see also hand splicing

spooling, effect of fleet angle on, 29-30, 30

spreader beams
 applications for, 74, 74
 erection of tilt up panels, 147 148
 handling pre-stressed concrete beams, 144
 handling steel plate, 90-1, 90-1
 lifting lengths of timber and steel, 88-9, 88-9

stack frapping, 45

standards, *see* Australian Standards

standing ropes, hand splicing, 24

static line spans, 139

stays, 196, 202, 203

- steel erection
 - beams and girders, 113-4
 - certification, 111
 - columns, 111-2, 112, 113
 - fastenings, 115-6
 - roof trusses, 114-5
 - working aloft, 117-24
- steel plate, handling of, 90, 90-1, 91
- steel wedges, 106, 112, 112
- stepladders, 121
- stopping, of slings, 32
- strands, 8, 37
 - see also lay
- stretching screws, 66
- strongback applications, 149
- strops, 41, 42
- structural steel, removing load binding chains
 - from, 89-90, 89
- stud link chain, 57
- sun protection, 212
- super duty tower hoists, 170-2, 171
- suspended scaffolds
 - advanced riggers able to erect, 118
 - anchored needle suspension rigs, 191
 - calculating maximum rope tension, 192-3
 - certification, 185
 - construction of suspension rigs, 189, 190
 - counterweighted needle suspension rigs, 191, 191
 - cradles, 187, 188-9
 - electrical equipment, 187
 - general construction, 188-9
 - inspection of, 194
 - overhead fixing, 191-2
 - overview, 184, 184
 - pneumatic equipment, 188
 - protective devices for hoists, 185
 - record keeping, 194
 - reveal propped needle suspension rigs, 191
 - safety, 188-9
 - scaffolding hoists, 185
 - suspension ropes and secondary ropes, 185-6, 186
 - traversing tracks and trolley, 192
 - working load limit (WLL), 187, 191-2
- suspension ropes, scaffolds, 185-6, 186
- swing stage scaffolds, 120, 184, 184
- SWL, see safe working load (SWL)
- synthetic fibre rope
 - advantages of, 49
 - construction, 48
 - effect of chemicals on, 51
 - flat webbing, 52, 54
 - inspection for defects, 49-50, 52-3, 54
 - round synthetic slings, 52, 52-3, 54, 83
 - types, 48-9
- tackle blocks, 35
- tackles, 42, 43, 44
- tag lines, 98, 98
- taniklon ropes, 48
- tension wrenches, 116
- terminal link, 60
- thimbles
 - in anchorages, 63, 64, 64
 - in splicing, 20, 41
 - preventing core slippage, 11
- three leg slings, 85
- tilt up panels
 - bracings for, 149, 149-50, 151
 - certification, 147
 - common configurations, 148
 - demolition of, 159
 - fixing, 151
 - job planning, 150
 - lifting, 150-1, 151
 - overview, 147
 - panel design and casting, 147
 - rigging gear for, 147
 - rotating panels from truck trays, 152
 - shop drawings for, 149, 149-50
 - strongback applications, 149
- timber and half hitch, 46
- top walking, 118
- torquing bolts, 116
- torquing nuts, 116
- tower cranes, 174-5, 174-8, 176, 178
- tower demolition, 160-1, 160
- tower-frame scaffolds, 119
- transfer beams, 143-4
- traverse rope, flying foxes, 205
- trestle ladders, 121
- tripods, 201-3
- trolleys, suspended scaffolds, 192
- trunked radio, 213
- trusses, see roof trusses
- turnbuckles, 66-7, 67, 140
- turning over, of loads, 92, 92

two leg slings, 85

two way radios, 213

uncoiling, of ropes, *see* flexible steel wire rope;
 natural fibre rope

uncollared eyebolts, 70, 71

union screws, 66

volume, calculation of, 216-8

wall ties, 140

Warriflex, 13

Warrington construction, 13

washers, 116, 116

wedge rope sockets, 62-3, 62-3

weights, table of masses, 219-20

West-Countryman's whipping, 40, 40

whippings, 11, 40, 40

'white knuckle', 116

winches, felling with, 157-9

wire hoisting, for materials hoists, 130

wire rope, *see* flexible steel wire rope

wire rope grips, 63, 65, 65-6

wires
 broken, 17, 17
 contrasted with strands, 8
 reduction in diameter, 18, 18

WLL, *see* working load limit (WLL)

work cages, 120, 184, 187

work platforms, *see* mast climbers

work boxes, crane-lifted, 122-3

working aloft
 crane-lifted work boxes, 122-3
 elevating work platforms, 118-9
 minimising risk, 117, 118
 portable ladders, 121-2
 safety line systems, 124
 safety nets, 124
 scaffolds, 119-21
 work practices, 117

working limit switches, 166

working load limit (WLL)
 cantilevered platform materials hoist, 130
 chain, 60, 81-2
 defined, 80
 flat webbing and round synthetic slings, 83
 flexible steel wire rope, 80, 81
 girder trolleys, 183
 hooks, 68
 internal guided platform hoists, 170

jacks, 76

natural fibre rope, 39, 82

pallets, 92

rule of thumb tables, 80

shackles, 69-70

spreader beams, 74

static line spans, 140

suspended scaffolds, 187, 191-2

synthetic fibre rope, 48

turnbuckles, 67

worming, natural fibre rope, 41

yarns, in rope, 37

