DEPARTMENT *of* INFRASTRUCTURE, ENERGY *and* RESOURCES, TASMANIA

BRIDGEWORKS SPECIFICATION

B55 - TIMBER CONSTRUCTION April 2003

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B55.1 SCOPE

This Specification sets out the requirements for the construction of timber structures.

The timber names used, are those recommended in the Australian Standard, and include the botanical and trade names.

B55.2 REFERENCES

The following Standards shall form part of this Specification:

AS 1148 Timber - Nomenclature - Australian, New Zealand and imported species

AS 1605 Methods for the sampling and analysing timber preservatives and preservative-treated timber.

AS 2082 Visually Stress-Graded hardwood for structural purposes.

AS 2159 Piling - Design and installation.

AS 2269 Structural plywood.

AS 2271 Plywood and block board for exterior use.

AS 4491 Glossary of terms used in timber standards.

B55.3 BASIS OF GRADING OF TIMBER

All timbers to this Specification shall be graded on strength and no piece shall contain a defect or combination of defects that would reduce the strength of that piece to less than 75 percent of the strength of a clear piece of the same species. Initial visual grading shall be in accordance with AS 2082. Timber species shall be as described in AS 1148. Terms used shall be as defined in AS 4491.

B55.4 ROUND TIMBERS

B55.4.1 Species

The following timber species are those preferred for use in timber construction as round timbers. Other species may be submitted for the approval of the Superintendent.

TABLE B55.1 - ACCEPTABLE ROUND TIMBER SPECIES

STANDARD TRADE COMMON NAME	STANDARD REFERENCE NAME	LOCAL NAME	STRENGTH GROUP	DURABILITY CLASS
Ash, Silvertop	Eucalyptus sieberi (E. sieberiana)	Silvertop	S3	3
Gum, Tasmanian Blue	Eucalyptus globulus	Southern Blue Gum	S3	3
Messmate	Eucalyptus obliqua	Messmate Stringybark	S4	3

B55.4.2 Supply

The timber shall have been cut from live trees and be approximately circular in cross-section. It shall have a continuous natural taper and be cut from above the ground swell. All timber shall be cut square at the ends. Bark shall only be stripped from the green timber immediately prior to installation. Limbs shall be trimmed flush.

The timber shall be free from major defects, including live insects, short crooks, shakes of all description, fractures, splits at toe, and decay pockets, except as provided below. Provided there has been prior scrutiny and assessment of the timber the following defects may be permitted:

(i) Insect holes, if free of insect life, provided they are less than 8 mm in diameter and not clustered in such a manner as to appreciably reduce the strength of the piece.

(ii) Pipe and heart rot (separately or in combination) not exceeding 40 mm in diameter at the butt in timbers up to 450 mm butt diameter and 50 mm diameter at the butt in timbers over 450 mm butt diameter, and 25 mm diameter at the toe, providing the surrounding wood is sound.

(iii) Decay pockets, in the butt only, but not more than one in number and then not exceeding 40 mm in thickness nor 150 mm in total width, and that the pocket does not occur more than 150 mm from the outside of the timber.

(iv) End splits, in aggregate at each end must not exceed 3% of the length of the unit, except for piles, where the aggregate length of split at the toe end shall not exceed 1.5% of the length of the timber.

(v) Sound knots, there shall not be more than one significant knot at any point around the circumference more frequently than once every 1.5 metres.

(vi) Gum pockets, surface rot pockets and unsound knots, provided that the maximum dimension of any of these defects does not exceed 7% of the circumference of the timber at the section where the damage occurs.

(vi) Sapwood damage, provided that the depth of damage does not exceed 20 mm and is carefully dressed out.

(viii) Spiral grain may be accepted, provided that the grain spirals not more than one full turn per 20 m log length.

B55.4.3 Dimensions

All measurements shall be made after the timbers have been stripped of bark.

The diameters specified in the following tables, unless stated otherwise on the Drawings, shall be the minimum except that in up to 20% of the timbers, diameters may be up to 5 mm below the specified diameter for each 100 mm of timber diameter. In timbers with oval section, the least diameter shall not be less than 80% of the greatest diameter at the measured section, and their average shall comply with the specified diameter.

For beams, the specified diameter shall be the diameter measured at mid-length of the beam, and the average diameter at any section shall not be more than 100 mm greater than the specified diameter.

Timbers may taper naturally and uniformly at a rate not more than:

(i) 1 in 100 or 10 mm/m for beam timbers longer than 6m.

(ii) 1 in 75 or 7.5mm / m for beam timber shorter than 6m.

TABLE B55.2 - ROUND BEAMS - DIAMETERS

LENGTH (m)	Up to and including 3.3m	3.4 to 3.6	3.7 to 4.1	4.2 to 4.6	4.7 to 5.2	5.3 to 5.8	5.9 to 6.5	6.6 to 8.1	8.2 to 8.9
Specified diameter at mid-length (mm)	400	425	450	475	500	525	550	600	650

TABLE B55.3 - PILES - DIAMETERS

LENGTH (m)	Up to and including 11m	12 to 15	16 to 19	20 to 23	24 to 26	27 to 29
Minimum diameter at toe (mm)	350	300	300	300	300	300
Minimum diameter at butt (mm)	420	420	450	450-	450-	450-
Maximum diameter at butt (mm)	500	500	550	600	675	750

B55.4.4 Straightness

All timbers shall be substantially straight. Straightness shall be measured by stringing a line between the midpoint of the butt and of the toe. The centreline of the timber shall not deviate from this line by more than 0.8%, ie. 8 mm/m, of the length of the timber.

B55.4.5 End Protection

The ends of all round timbers shall be heavily coated with timber grease. Gang-nail anti-splitting plates shall be used in addition to the timber grease.

B55.4.6 Preservative Treatment

Where specified on the Drawings, timbers shall be preservative-treated.

Treatment shall be vacuum-pressure impregnation with Tanalith 'C' to a net dry salt content of 40 kg per cubic metre of sapwood. A minimum retention of 75% of this figure shall be achieved in individual timbers when tested in accordance with the appropriate procedure described in Australian Standard AS 1605.

The pattern of penetration of the preservative shall be such that full penetration of the sapwood is achieved. When tested in accordance with AS 1605, no more than one out of six specimens shall show less than 15 mm penetration.

B55.4.7 Preparation of Round Timber for Beams and Corbels.

Side and underside squaring of timber beams (and side squaring of timber corbels), shall not be carried out, unless authorised by the Superintendent. Adzing of the crown of beams should only be sufficient to provide for the uniform support of, and offset spiking of, the decking. The adzing of crowns and soffits of corbel timbers, and the haunching of beam-ends, shall be the minimum required for the positive seating and correct design geometry. Haunch shoulders shall be made without over cut and be at 3 : 1 (or flatter) angle with the beam underside. Over depth saw cutting, as a preparation for adzing, shall not be permitted. Localised dressing of the outer beam side for correct alignment of fence posts shall be the minimum required at each post fixing point.

B55.5 SAWN TIMBER

All sawn timbers used in the structure, shall conform, in all respects, to the relevant parts of this Specification.

B55.5.1 Species

The following timber species are those preferred for use in timber construction as sawn timbers. Other species may be submitted for the approval of the Superintendent.

TABLE B55.4 - ACCEPTABLE SAWN TIMBER SPECIES

STANDARD TRADE COMMON NAME	STANDARD REFERENCE NAME	LOCAL NAME	STRENGTH GROUP	DURABILITY CLASS
Ash, Silvertop	Eucalyptus sieberi (E. sieberiana)	Silvertop	S3	3
Gum, Tasmanian Blue	Eucalyptus globulus	Southern Blue Gum	S3	3
Messmate	Eucalyptus obliqua	Messmate Stringybark	S4	3
Peppermint, Smithton	Eucalyptus nitida	Smithton Peppermint	S4	3

B55.5.2 Supply

Timber shall be backsawn square to the full section required with a cutting tolerance of +2mm, with ends properly docked. Timber shall only be sawn from logs with substantially straight grain, or where the grain spirals not more than one full turn per 20m length of log.

The timber shall be free from major defects, including live insects, enclosed termite galleries, decay, brashness, gum pockets, pipe, heart, shakes, twists, want, wane and sapwood, except as provided below. Provided there has been prior scrutiny and assessment of the sawn timber the following defects will be permitted:

(i) Holes not exceeding 2mm diameter - provided they are not clustered in such a manner as to appreciably reduce the strength of the piece.

(ii) Holes exceeding 2mm diameter but not exceeding 6mm diameter - provided that not more than three such holes occur in any 300 mm x 300 mm or equivalent face area.

(iii) Surface termite galleries - provided that the depth of any gallery does not exceed 10 percent of the narrow face of the piece or 13 mm whichever is the lesser, and provided also that the total length of the galleries does not exceed one quarter of the length of the piece.

(iv) Tight gum veins not exceeding 5 mm wide measured radially - provided that they do not extend from one face to another of the piece; that the length of any individual vein does not exceed one third of the length of the piece; and that the combined length of the veins on any face does not exceed the length of the piece.

(v) Sound intergrown knots - provided that the diameter does not exceed one seventh of the width of a wide face or one quarter of the width of a narrow face of the piece, whichever is the face on which the knot occurs, and provided also that the average number of knots does not exceed one per two metre length of the piece.

(vi) End splits not exceeding 6 mm wide - provided that not more than 10 percent of the pieces in a parcel are so affected, and that the individual length of any such split does not exceed 3 percent of the length of the piece.

(vii) Sloping grain - provided that the slope does not exceed 1 in 16.

(viii) Surface checks - provided that they do not exceed 2 mm wide.

(ix) Bow - provided that it does not exceed the equivalent curvature of 27 mm in 4 m (1 in 150).

(x) Spring - provided that it does not exceed the equivalent curvature of 13 mm in 4 m (1 in 300).

B55.6 HANDLING OF TIMBER

B55.6.1 Stacking

Immediately upon milling or delivery to the works site, all timber shall be carefully stacked, clear of the ground, and properly supported at intervals commensurate with good trade practice.

If the timber is to be moved or used within two weeks stacking using separation may not be required.

Sawn timber shall be stacked, using battens of 25 mm minimum thickness, between layers and vertically aligned. Any one layer of battens shall be of uniform thickness. Individual pieces of timber shall also be separated, in the horizontal, by at least 25 mm, to allow proper ventilation and seasoning.

The ends of both round and sawn timber shall be coated with timber grease immediately after stacking.

All timber shall be properly stacked and protected from damage by plant and machinery and other hazards, and any pieces that have become damaged or otherwise unsuitable for use, will be rejected by the Superintendent and shall be replaced by the Contractor at his own expense.

B55.6.2 Handling

Timbers of length less than 6m, may be lifted by fork-lift or slings. Timbers of length greater than 6m shall be lifted by slings, carefully-positioned to ensure no damage to the pieces.

Slings shall be suitably sleeved or padded-off, to minimise arris damage and bruising. The use of arris-protecting steels under the slings will be permitted.

Unprotected chain slings shall not be used.

The practice of 'barring' or 'levering' timbers off trucks, is not acceptable, and timbers so handled, may be rejected.

B55.7 DRIVING OF TIMBER PILES

B55.7.1 General

This Specification and AS 2159 set out the requirements for the driving of timber piles. An allowance for the squaring of ends shall be added to the specified lengths, plus a one metre cut-off length.

B55.7.2 Preparation

All piles shall be pointed as shown on the Drawings and shall be shod with standard 11.5kg shoes firmly attached to the toes.

Care shall be taken when pointing the piles to ensure that the point is central.

Pile heads shall be protected during driving with either an approved helmet or mild steel ring not less than 75 mm deep and 50 mm thick and fitting tightly, but not shouldered. After being prepared for driving piles shall have the measured length from the toe clearly marked at 1m intervals.

B55.7.3 Equipment for Driving Timber Piles

Piles shall be held in fixed leads such that the hammer will be adequately supported throughout the entire driving operation. The Contractor shall select equipment appropriate to achieve the pile penetration and set as specified.

B55.7.4 Driving Timber Piles

Piles shall be pitched accurately in position prior to the commencement of driving.

The Contractor shall give the Superintendent 4 days notice of his intention to carry out pile driving. The Contractor shall be responsible for checking pile sets and shall take all records to ensure that the Specification is satisfied. The Contractor shall submit one signed copy of these records to the Superintendent not later than noon of the next working day after the pile has been installed.

The Contractor shall keep the following records of the installation of each pile:

(i) Contract Number

(ii) Pile reference number

(iii) Nominal cross-sectional dimensions

(iv) Length of pile

(v) Date and time of driving and/or redriving

(vi) Pile tip level at the commencement of driving

(vii) Working level

(viii) Depth of working level to pile toe

(ix) Toe level

(x) Number and type of packing used and type and condition of dolly used driving the pile

(xi) Set of pile in mm per 10 blows

(xii) Sets taken at intervals during the last 3 m of driving

(xiii) Blows per 500 mm intervals, when required

(xiv) All information regarding obstructions, delays, and other interruptions to the sequence of work.

Piles shall be effectively guided and held, during the driving operation. Piles shall not be sprung into place. Should any pile crack or split during driving ,or become damaged in any way or swerve out of position in excess of the given tolerances, it shall be withdrawn and replaced by a sound pile or an additional pile, driven at the Contractor's expense.

The Contractor shall take all measures necessary to ensure that piles are driven to the accuracy specified and shall maintain a continuous check on pile alignment during driving.

B55.7.5 Penetration and Set

Piles shall be driven until the minimum penetration and the final set as shown on the Drawings have both been achieved, unless the resistance to driving is such that further driving would damage the pile.

Should the required set not be achieved at the specified minimum penetration, driving shall cease and the need to splice an additional pile length be carefully assessed and determined.

B55.7.6 Splicing

Splicing of piles shall not be permitted without the approval of the Superintendent.

When preparing piles and extension pieces for splicing, the Contractor shall take care to ensure that all mating faces are dressed true so that they maintain contact over the full area of the splice.

B55.7.7 Cutting Off

When the piles have been driven to the requirements of this Specification, they shall be cut off to the levels shown on the Drawings. All pile cut-offs shall be made parallel with the crosshead.

After cutting off, all piles shall be shouldered to receive the crossheads, as shown on the Drawings.

B55.7.8 Tolerance on Finished Pile Positions

Piles shall be driven to comply with the following tolerances:

Maximum variation from specified position in plan	75 mm
Maximum variation from vertical or specified rake *	1:25

* Docked pile head to be within 75 mm of design location.

Maximum variation from specified cut-off level	20 mm

B55.7.9 Non-conformity

Where adverse latent conditions preclude adherence to the tolerances specified, the Contractor shall prepare a Non-conformance Report, setting out the reasons for the non-conformance, and nominating viable remedial options. Remedial work shall not proceed until agreed with the Superintendent.

B55.8 CARPENTRY

All joints shall be made neatly in order to obtain a tight fit without wedging or packing. Unless otherwise specified or shown on the Drawings, each piece of timber shall be without joints for its full length and shall have the ends sawn square and wrought true at all contact surfaces.

The holes for bolts and spikes and other fasteners shall be drilled accurately and all mortice holes, tenons, scarfs and incidental joints, shall be cut so as to fit accurately and tightly. Holes for bolts shall be bored with augers of the same size as, or up to 2mm larger in diameter than, the bolt.

The holes for dumbolts for beams and corbels shall be drilled tight (-2mm on diameter) to allow for shrinkage of the timber.

Where slotted holes are shown on the Drawings, the bolt shall be so positioned in the slotted hole that it may move in the direction of shrinkage. Holes for cup-head bolts, placed through the bridge decking, shall be the same diameter as the bolt. Squared timber shall be so fixed that the surface which was furthest from the heart of the tree, will be the outer surface of the work. The heart side of all squared timber shall be placed downwards except in the case of bracing and similarly situated members, when it shall be placed next to the timber to which is fastened.

Cut ends of timbers shall be re-coated with timber grease.

B55.9 SUPERSTRUCTURE

B55.9.1 Dampcourse

The timber shall be assessed by the Contractor prior to delivery to confirm the use and/or the type of dampcourse. On high moisture timbers the dampcourse may accelerate timber deterioration.

When dampcourse it to be used it shall conform to the following:

Sawn timber bearing surfaces shall be covered with a strip of stiff, non-adhesive bituminous waterproofing membrane of sufficient width to cover the bearing surface and provide 50mm overhang each side. The overhang shall not be fastened down. The bearing surfaces of round timbers shall also be covered with a similar membrane and be of sufficient width to cover the bearing surface and project a minimum of 50mm beyond the diameter of the member. The overhang should be formed down onto the crown but not fastened.

Waterproofing membrane shall be laid continuously along each bearing line. Joints shall be lapped 50 mm.

B55.9.2 Crossheads

Crossheads shall be placed in position and holes bored through the crosshead and pile as shown on the Drawings. All crossheads shall be checked into supporting round timbers for a distance not less than half the width of the crosshead timber.

B55.9.3 Decking and Running Planks

(i) Decking

Deck planks shall be laid flush and cramped close. The ends of deck planks shall be held down securely by the kerbs and kerb bolts. Decking shall be secured using deck spikes 10mm diameter by 250mm long. Two spikes shall be used at every plank/beam intersection.

Preboring using 8 mm holes shall be performed where spikes are within 150 mm of the ends of the planks.

After installation, all abrupt irregularities between adjacent planks shall be adzed to provide a smooth surface.

(ii) Running Planks

Running planks shall be laid flush and cramped close. Running Planks shall be secured using 10 mm diameter by 175 mm long deck spikes.

Preboring using 8 mm holes shall be performed where spikes are within 150 mm of the ends of the planks.

After installation, all abrupt irregularities between adjacent planks shall be adzed to provide a smooth surface.

B55.10 STEEL CONNECTIONS

Bolts shall have square, hexagonal or round heads as required and square or hexagonal nuts. Bolt threads to be cut to metric standards, for a minimum length of four diameters, or 100 mm whichever is the greater.

Bolts, nuts and washers for use on structures in the coastal zone shall be hot dip galvanised.

Lengths of bolts shown on the Drawings are approximate only and the Contractor shall supply bolts of the correct lengths, adequately threaded such that post construction bolt tightening may be undertaken after initial shrinkage has stabilised. Ends of bolts shall be cut-off not more than one half the diameter beyond the nut.

Where washers are bearing against round timber the minimum amount of timber shall be removed from around the bolthole, to provide sufficient bearing area for the washers.

Single washers shall be used against timber, under all nuts and bolt heads. All recessed bolts shall be tightly packed with bitumen and sand, or approved alternative, to prevent ingress of water. Wood packing under nuts or bolt heads shall not be used. The sizes of washers shall generally be as follows:

TABLE B55.5 - SIZES OF WASHERS

Diameter of bolt	24 mm	20 mm	16 mm
Size of square washer	75 x 75 x 5	75 x 75 x 5	50 x 50 x 3
Size of hole	26	22	18

B55.11 PAINTING

B55.11.1 Painting

Where painting is specified the sawn timber shall be sanded to a smooth finish and painted with one coat of a wood primer, and two coats of heavily pigmented low gloss white latex ranch finish for exterior timber. The paints shall comply with Australian Paint Approval Scheme (APAS) specifications 0183 and 0280 / 5. The Manufacturer's instructions in regard to preparation for painting and the interval between coats shall be complied with.

B55.11.2 Delineators

Where specified on timber bridge fences delineators shall be provided and installed in accordance with Specification R62.

B55.12 DECK TREATMENT

B55.12.1 Spray Seal

If a spray seal is to be applied to the timber deck Specification R51 shall be used. Spray sealing shall not be undertaken within 9 months of the bridge redecking and shall be carried out during the sealing season when ambient temperatures are above 15^{o}C

B55.12.2 Concrete Overlay

When specified a concrete overlay shall be constructed in accordance with the Standard Drawings. An overlay shall not be constructed until the bridge timbers have stabilised following initial shrinkage.

B55.13 PAYMENT

The rates in the Bill of Quantities for timber shall include full payment for providing all labour, materials, fittings, tools and equipment for the supply, transport, storage and fitting of these timber items.