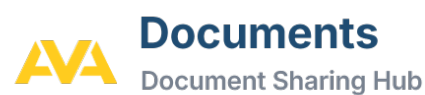


Australian/New Zealand Standard™

Scaffolding

Part 2: Couplers and accessories



AS/NZS 1576.2:2016

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Engineered Wood Products Association of Australasia
Engineers Australia
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Australian/New Zealand Standard™

Scaffolding

Part 2: Couplers and accessories

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PREFACE

This Standard was prepared by the Standards Australia Committee BD-036, Scaffolding, to supersede AS/NZS 1576.2:2009.

The objective of this Standard is to provide manufacturers and suppliers of couplers and accessories with requirements that will ensure the proper operation of couplers and accessories for light, medium, heavy and special duty scaffolding.

Tubes, couplers and accessories that have been tested to AS/NZS 1576.2:2009, *Scaffolding*, Part 2: *Couplers and accessories*, are deemed to be compliant provided they have been tested and documented in accordance with the relevant Standard.

This edition incorporates the following major changes to the 2009 edition:

- (a) Couplers that meet the performance requirements of EN 74-1, *Couplers, spigot pins and baseplates for use in falsework and scaffolds*, Part 1: *Couplers for tubes—Requirements and test procedures*, for similar type couplers are deemed to comply with this Standard without the need for type testing.
- (b) Introduction of performance requirements for aluminium adjustable baseplates and aluminium adjustable swivel baseplates.
- (c) The scope of the vertical load test in Appendix H has been extended to cover both aluminium and steel baseplates.

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

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Scaffolding

Part 2: Couplers and accessories

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for couplers and accessories for scaffolding complying with AS/NZS 1576.3 and AS/NZS 1576.6.

NOTE: Guidance on means for demonstrating conformity with this Standard is given in Appendix P.

1.2 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

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

AS

- 1111 ISO metric hexagon bolts and screws (all parts)
- 1112 ISO metric hexagon nuts (all parts)
- 1237 Plain washers for metric bolts, screws and nuts for general purposes (all parts)
- 1444 Wrought alloy steels—Standard, hardenability (H) series and hardened and tempered to designated mechanical properties
- 1450 Steel tubes for mechanical purposes
- 1874 Aluminium and aluminium alloys—Ingots and castings

AS/NZS

- 1163 Cold-formed structural steel hollow sections
- 1554 Structural steel welding
- 1554.1 Part 1: Welding of steel structures
- 1576 Scaffolding
- 1576.1 Part 1: General requirements
- 1576.3 Part 3: Prefabricated and tube-and-coupler scaffolding
- 1576.6 Part 6: Metal tube-and-coupler scaffolding—Deemed to comply with AS/NZS 1576.3
- 1594 Hot-rolled steel flat products
- 1665 Welding of aluminium structures
- 1734 Aluminium and aluminium alloys—Flat sheet, coiled sheet and plate
- 1866 Aluminium and aluminium alloys—Extruded rod, bar, solid and hollow shapes
- 2451 Bolts, screws and nuts with British Standard Whitworth threads (rationalized series)

AS/NZS

3678 Structural steel—Hot-rolled plates, floorplates and slabs

3679 Structural steel (all parts)

EN

74 Couplers, spigot pins and baseplates for use in falsework and scaffolds

74-1 Part 1: Couplers for tubes—Requirements and test procedures

1.3 DEFINITIONS

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

1.3.1 Adjustable baseplate

A baseplate embodying an adjustable leg.

1.3.2 Adjustable castor

A castor incorporating a height-adjusting device that fits inside the standard or vertical member of a scaffold.

1.3.3 Adjustable leg

A threaded bar or tube with nut, designed to fit inside a standard to support the load from a standard and which, in conjunction with a baseplate, U-head or castor, is for levelling purposes.

1.3.4 Adjustable swivelling baseplate

An adjustable baseplate incorporating a hinge between the baseplate and the leg.

1.3.5 Adjustable U-head

A U-head embodying an adjustable leg.

NOTE: An adjustable U-head is also known as an adjustable fork head.

1.3.6 Baseplate

A plate to distribute the load from a vertical loadbearing member to the supporting structure.

1.3.7 Castor assembly

A wheel rotating on an axle fixed into a housing capable of being connected to the lower end of a standard for the purpose of supporting and moving a scaffold.

NOTE: The housing may be fixed or may be capable of swivelling to allow the scaffold to be moved horizontally in any direction.

1.3.8 Check coupler

A right angle coupler, swivel coupler or parallel coupler that is fixed hard against a loadbearing coupler to increase the slip resistance along the tube.

1.3.9 Coupler

A fitting that joins two tubes.

1.3.10 End-to-end coupler

Sleeve coupler or expanding joint pin that connects and aligns the tube end-to-end.

1.3.11 Flange clamp

A clamp that connects a tube to the flange of a structural member.

NOTE: Flange clamps may be rigid or swivelling.

1.3.12 Joint pin

An internal end-to-end coupler for joining two tubes.

1.3.13 Parallel coupler

A coupler for making a lap or spliced joint between two tubes.

1.3.14 Pintle

A projection, at the top of the castor, used to locate the vertical members of the mobile scaffold frame.

1.3.15 Putlog blade

A fitting that is fixed to the end of a putlog permitting it to be located and supported in a joint of a wall.

1.3.16 Putlog coupler

A coupler for fixing a putlog to a ledger.

1.3.17 Right-angle coupler

A non-swivel loadbearing coupler, other than a putlog coupler, that connects two tubes at right angles.

1.3.18 Screw-tightened coupler

A coupler in which the clamping force on the tubes is provided by tightening the flaps around the tube by means of a bolt and nut.

1.3.19 Sleeve coupler

An external end-to-end coupler for joining two tubes.

1.3.20 Swivel coupler

A coupler for connecting two tubes at any angle.

1.3.21 Swivelling baseplate

A baseplate that incorporates a hinge and is capable of being connected to a standard, adjustable leg or adjustable baseplate.

1.3.22 U-head

A U-shaped housing to support and locate a standard over a bearer or a bearer over a standard.

NOTE: A U-head may be fixed or adjustable.

1.3.23 Wedge-tightened coupler

A coupler in which the clamping force on the tubes is provided by tightening the flaps around the tube by means of a wedge hammered home.

1.4 ALTERNATIVE DESIGN METHODS AND MATERIALS

Alternative design methods, materials and the like, which are not specified in this Standard, may be used provided it can be demonstrated that the resulting couplers or accessories satisfy the requirements of this Standard.

Service durability shall be a consideration in any assessment of new materials.

1.5 MARKING

Each coupler and accessory, excluding baseplates, shall be marked with the manufacturer's or supplier's name or trademark, and a code traceable to a manufacturing batch.

The marking shall be impressed or embossed on the flap or body of the coupler or accessory and shall be visually legible after the protective coating has been applied. The height of the characters shall be at least 4 mm and the impressed or embossed dimension shall be at least 0.2 mm.

1.6 CONFORMITY WITH EUROPEAN STANDARD

Couplers that have been tested and have demonstrated conformity with the performance requirements of EN 74-1:2005 for Class B right-angle couplers and Class A swivel couplers, where these requirements are equivalent to the performance requirements of this Standard, are deemed to comply with this Standard and do not require further testing. Such couplers may not comply with dimensional requirements of this Standard, in which case they shall be assessed against the requirements herein before they are deemed acceptable.

1.7 INFORMATION TO BE SUPPLIED

The following documented information shall be supplied with couplers and accessories, where applicable:

- (a) Tube dimensions and material for which the coupler has been designed.
- (b) Tightening procedure for conformity with the performance requirements of this Standard.
- (c) Maximum tightening torque or force, as appropriate, to avoid overstressing of the material of the coupler or accessory.
- (d) The maximum acceptable distortion of any part of the coupler before it is deemed not to satisfy the requirements of Section 4.
- (e) Servicing procedures for couplers and accessories that will ensure continuance of the performance requirements of Section 4.
- (f) Working load limit (WLL) of adjustable legs and adjustable baseplates.

S E C T I O N 2 M A T E R I A L S

2.1 PROPERTIES

Where the properties of any material are in doubt, the material shall be subjected to such test or tests necessary to determine the properties concerned.

2.2 STEEL

Steel couplers and accessories shall be manufactured from steel complying with AS/NZS 1163, AS 1444, AS 1450, AS/NZS 1594, AS/NZS 3678 or AS/NZS 3679, as appropriate.

Welded components shall comply with the requirements of AS/NZS 1554.1.

2.3 ALUMINIUM

2.3.1 Cast components

Cast aluminium alloy components shall comply with AS 1874.

The 700 series alloy shall not be used.

NOTE: Pressure die-casting is not recommended as a method of manufacture for primary loadbearing members. Where pressure die-casting is used, the component design should include sufficient redundancy to compensate for potential reduction in capacity due to the possibility of high internal porosity within the component.

2.3.2 Wrought components

Wrought aluminium alloy components shall comply with AS/NZS 1866 for extrusions or AS/NZS 1734 for sheet and plate.

The 2000 and 7000 series alloys shall not be used.

2.3.3 Welded components

Welded components shall comply with the requirements of AS/NZS 1665.

SECTION 3 DESIGN REQUIREMENTS

3.1 GENERAL

Couplers and accessories shall be designed and manufactured so that they will firmly fix or fit their intended tubes, even after repeated use.

3.2 COUPLERS

3.2.1 General requirements

All couplers shall comply with Clauses 3.2.2 and 3.2.3.

3.2.2 Configuration

The following requirements apply to coupler design and construction:

- (a) When assembled, but before being tightened, no part shall become inadvertently detached.
- (b) When tightened, the coupler shall not be inadvertently released;
- (c) Where the thinnest section of the body or flap of any steel coupler is less than 3.2 mm thick, that section shall be hot-dip galvanized.
- (d) Threaded blind holes shall not be used. The design of a coupler shall be such that the engaged length of any threaded components can be readily determined when assembled.
- (e) Hinge pins shall be steel of not less than 8 mm diameter and shall be adequately riveted over or otherwise suitably prevented from becoming displaced.
- (f) Where fitted, closing flaps on all couplers shall have their range of movement restricted such that, when fixed to a vertical member with the other flap fully open, the open flap is horizontal (within $\pm 5^\circ$) to provide support for a horizontal scaffold tube during installation.
- (g) Where couplers incorporate nuts and bolts or screws to effect tightening, they shall comply with the following requirements:
 - (i) A tightening bolt or screw shall comply with AS 1111 (series) or AS/NZS 2451 and shall have a shank not less than 11 mm diameter and threaded overall diameter not less than 12 mm.
 - (ii) Nuts shall comply with the material requirements of AS 1112 or AS/NZS 2451 and shall be not less than 11 mm thick. Bolts shall project past the nut to a maximum of 25 mm. Nuts shall be made captive on the bolt.
 - (iii) Washers shall comply with the AS 1237 series and shall be not less than 2.5 mm thick. Washers shall be fitted beneath the nut, or be integral with the nut.
 - (iv) A screw-tightened coupler shall be designed such that, when tightened to its highest specified torque (see Clause 3.2.3), the tightening bolt or screw shall have not less than 2 mm of travel remaining.

NOTE: This requirement should produce a minimum gap of 2 mm between the flap and the coupler body when the coupler is fixed to a tube with a diameter at the lower manufacturing tolerance.
- (h) Except when the geometry of the fitting is such that, when tightened, the bolt is positively held in position, a nib or recess shall be provided on the coupler flap to prevent the nut from being displaced from the coupler flap when being tightened.

- (i) Neither the tightening wedge nor the end of the bolt or screw shall directly touch the tube in order to tighten the coupler unless the contact of wedge or bolt along the tube is greater than 18 mm in all cases. If necessary, a permanently attached spacer shall be incorporated to protect the tube.
- (j) It shall not be possible to accidentally disengage the tightening wedge during work on the scaffold. The tightening wedge shall be captive to the coupler.
- (k) When used as designed, couplers shall not distort the scaffold tube (see Clause 4.1.1).

3.2.3 Tightening requirements

The following apply to tightening of couplers:

- (a) For a screw-tightened coupler, a torque of 54 Nm shall be sufficient for the coupler to satisfy the requirements of Section 4.
- (b) For a screw-tightened coupler to achieve a slip resistance performance greater than the requirements of Section 4, a higher tightening torque than 54 Nm may be specified, provided the maximum stress in the screwed component does not exceed 70% of the minimum yield stress of the material.
- (c) The method of tightening the wedge shall enable the coupler to achieve its design performance in accordance with Section 4. In the absence of information on the method being provided by the supplier or manufacturer, the coupler shall be tightened by striking the wedge twice firmly with a 500 g hammer swung through a distance of between 300 mm and 320 mm.

3.2.4 Robustness

Couplers shall be capable of being tightened to a minimum of 80 Nm around the tube without any part of the specified coupler or its components showing any sign of permanent distortion. After release of the torque and removal of the coupler, the coupler shall be in a serviceable condition.

Where a tightening torque higher than 80 Nm is specified to achieve added slip resistance, the robustness requirement shall apply for a torque 50% above the higher specified tightening torque.

3.2.5 Swivel couplers

In addition to the requirements of Clauses 3.2.2 and 3.2.3, swivel couplers shall have a steel swivel pin not less than 200 mm² in area with a minimum tensile strength of 380 MPa. The heads of the pin shall be well formed and free from any riveting defects. The swivelling faces shall be smooth and in contact. This requirement shall not prohibit a metal washer being interposed between the faces of the coupler. Where a metal washer is inserted, the coupler shall not be less efficient.

NOTE: Swivel couplers should not be used to transfer primary loads unless specified in the installation design.

3.2.6 End-to-end couplers

3.2.6.1 General

End-to-end couplers shall comply with the following:

- (a) They shall be self-centring.
- (b) They shall ensure that the tubes are co-axial.
- (c) They shall not be used to resist tensile forces between the joined tubes.
- (d) They shall not be used in the assembly of a truss unless made redundant by an appropriately designed tension splice.

- (e) A positive stop shall ensure that the fitting accepts an equal length of each tube. The stop shall provide an even surface and effective bearing area for the end of the tube, which shall have been cut squarely.
- (f) Under normal loadings, the bearing surface shall not distort the end of any tube with which it is in contact.

3.2.6.2 Internal types

Each spigot of an internal type (joint pin) shall extend not less than 73 mm on the internal surface of each tube they connect to. The spigot shall be capable of being expanded within a tube while it is engaged.

3.2.6.3 External types

External types (sleeve coupler) shall have a length of contact not less than 73 mm on each tube they connect, and shall provide an effective grip between the tube and the coupler. They shall have not less than two tightening bolts, one on each half of the length of the fitting. Washers shall be required where the coupler does not provide a full bearing surface for the nut.

The requirements of Clause 3.2.2(g)(i) may be varied for end-to-end couplers to enable bolts less than 12 mm overall diameter to be used, provided the nuts comply with Clause 3.2.2(g)(ii).

3.3 ACCESSORIES

3.3.1 Baseplate

A baseplate shall have a minimum area of 20 000 mm², with a minimum length or width of 120 mm. A shank, of length not less than 50 mm and diameter not less than 16 mm, or equivalent cross-sectional area, shall be secured to the centre of the upper surface. The shank shall be a loose fit to allow insertion of its full length inside the tube. The upper surface of the baseplate shall provide a smooth and even bearing for the end of the tube and shall be such as not to damage or distort the tube or itself be damaged or distorted under WLL.

Steel used for baseplates shall be of a minimum thickness of 6 mm and of a minimum yield strength of 230 MPa.

Aluminium used for baseplates shall be a minimum thickness of 10 mm and a minimum yield strength of 215 MPa.

Other materials may be used provided they have been designed to achieve equivalent strength and rigidity.

3.3.2 Swivelling baseplate

A swivelling baseplate shall have the same area and thickness and material composition as a baseplate.

3.3.3 Adjustable leg or adjustable baseplate

The following apply to an adjustable leg or adjustable baseplate:

- (a) It shall have a shank with a maximum extension adjustment not exceeding 600 mm.
- (b) When fully extended, the length of the shank that remains in the scaffold standard shall be the greater of $L/4$ and 150 mm, where L is the overall length of the shank.

Where the difference between the outside diameter of the shank and the inside diameter of the scaffold standard is greater than 7 mm, a washer, spacer or other device shall be fixed at the top of the shank to reduce the difference in diameter to 7 mm or less. The adjusting nut shall incorporate a spigot, socket or other device to accommodate and positively locate the end of the scaffold standard.

Where an existing adjustable leg or adjustable baseplate design has a length of shank which does not comply with the length specified above and which remains in the tube, it may continue to be used provided it can be demonstrated that the product satisfies the load performance of the system in which it is to be used.

NOTE: The adjusting nut spigot, socket or other device should have a maximum diametral clearance of not more than 3 mm and a nominal depth of 3 mm for positive location (see Figure 3.1).

- (c) The adjusting nut shall provide a flat, even bearing surface across the full contact face of the bearing standard tube allowing for any eccentricity resulting from any difference between the spindle diameter and the inside diameter of the standard tube.
- (d) For tubular stem adjustable leg or adjustable baseplate, the minimum wall thickness shall be a nominal 5 mm.

NOTES:

- 1 The hollow stem of a steel adjustable leg or adjustable baseplate should be hot-dip galvanized internally and externally.
 - 2 A drainage hole, not less than 12 mm in diameter, should be placed near the centre of a steel baseplate that has a tubular spigot, shank or stem fixed or attached to the baseplate.
- (e) The threaded portion of the adjusting nut shall be not less than 0.875 times the nominal thread diameter (see d in Figure 3.1).
 - (f) An adjusting swivelling baseplate shall have—
 - (i) the same minimum area and thickness of a baseplate; and
 - (ii) the baseplate shall be captive to the shank.

3.3.4 Castors

Castors shall comply with the following requirements:

- (a) All castors shall be clearly marked with the WLL as assembled.
- (b) The plain pintle of a castor shall be not less than 150 mm long.
- (c) The adjustable leg of an adjustable castor shall comply with Clause 3.3.3 as applicable.
- (d) Castors fitted with plain pintles shall include means to retain them to the end of the tube so that they do not dislodge from the tube when it is lifted off the supporting surface.

NOTE: Most existing adjustable castors include this facility.

- (e) Castors fitted with plain pintles shall include the facility to attach them to the end of the tube so that they do not dislodge from the tube when it is lifted off the running surface.
- (f) The diameter of the wheel shall be not less than 125 mm, and the eccentricity of the axle relative to the pintle shall not exceed 65 mm.
- (g) A castor shall be provided with an effective wheel brake mechanism that requires a positive action to release and cannot be accidentally released due to movement on the mobile scaffold. The effectiveness of the wheel brake shall be such that the mobile scaffold is held stationary, on a supporting surface with a gradient of 5°, when the brakes are applied to all but one of its castors.
- (h) Wheels shall be either plain or fitted with resilient tyres. Tyres shall be of adequate section and properly fixed on to the wheel centre. Pneumatic tyre wheels shall not be used.

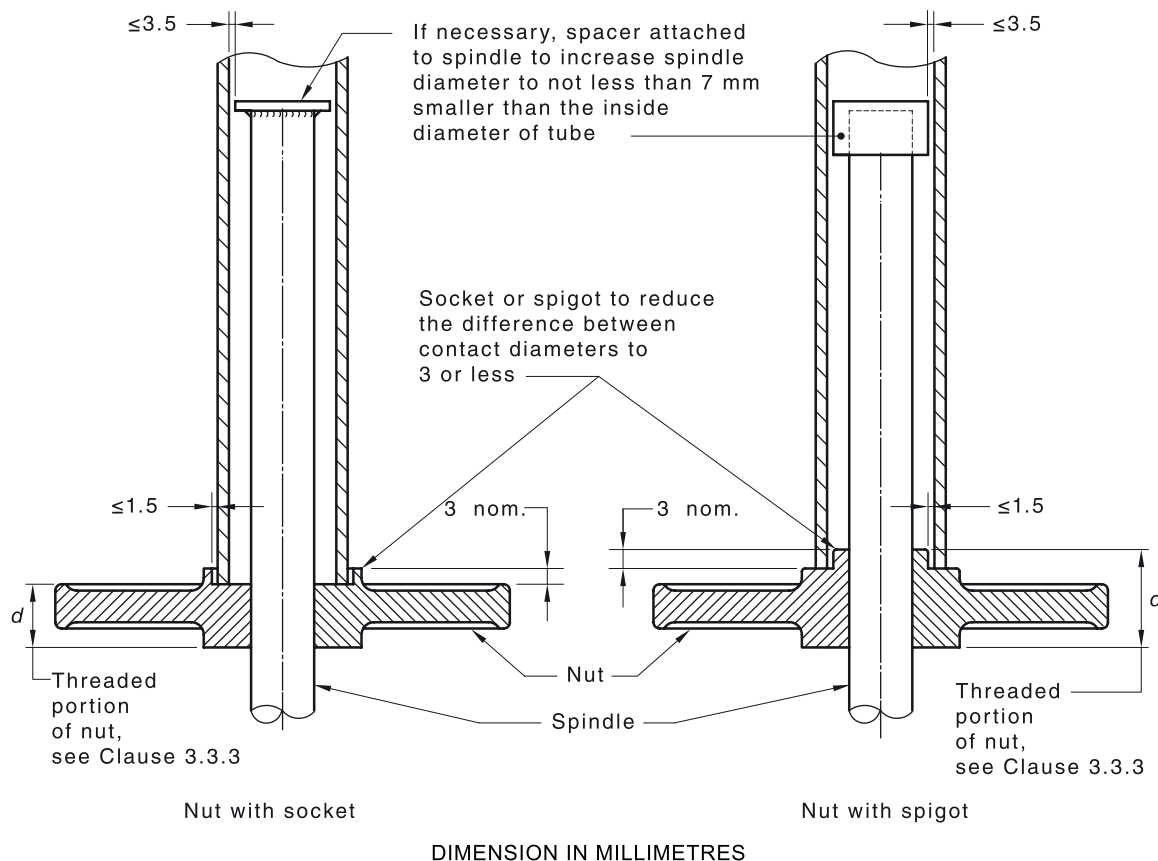


FIGURE 3.1 ADJUSTABLE LEG SHANK

3.3.5 U-head

A U-head shall be nominally concentric with the connecting member and shall have a recess not less than 75 mm deep.

The U-shape recess shall be formed from steel plate not less than 75 mm wide × 6 mm thick.

3.3.6 Putlog blade

In addition to the requirements of Clauses 3.2.2 and 3.2.3, the following requirements shall apply to putlog blades:

- The fitting shall contain a suitable stop to prevent the end of the tube from encroaching into the blade area.
- The blade section shall be constructed of minimum 75 mm long × 45 mm wide × 6 mm thick steel with the stop so positioned that the blade has at least a 75 mm long bearing surface. The bearing surface may be tapered at the end to a thickness of not less than 5 mm. It shall be not less than 60 mm long before tapering commences.

3.3.7 Spanner

The spanner for tightening couplers shall have a handle not less than 200 mm nor more than 250 mm long.

The socket of socket type spanners shall be 5 mm deeper than the bolt projection specified in Clause 3.2.2(g)(ii).

3.3.8 Flange clamp

The thinnest section, bolt, nut and pin of a flange clamp shall comply with the requirements of Clauses 3.2.2 and 3.2.3.

SECTION 4 PERFORMANCE REQUIREMENTS

4.1 GENERAL

All couplers and accessories from a sample submitted for testing shall pass the relevant performance requirements of this Section. If any coupler or accessory from the sample submitted for testing fails to meet the acceptance criteria, then the whole batch shall be rejected.

NOTE: A sample is the group of couplers or accessories selected for testing from a manufacturing batch.

4.2 COUPLERS

4.2.1 Sampling requirement

A minimum of six couplers shall be tested for each of the relevant test Appendices.

4.2.2 Acceptance criteria

4.2.2.1 General

Each coupler type shall be tested in accordance to the relevant test procedure laid out in the appendices.

After each test—

- (a) each coupler shall be capable of being reassembled onto the scaffold tube for which it has been designed;
- (b) swivel couplers and swivelling flange clamps shall freely swivel through 360°; and
- (c) distortion of the tube or tubes shall not exceed the following:

$$\text{Local distortion} = \left(\frac{\text{Maximum diameter of distorted cross-section}}{\text{Diameter of undistorted adjacent cross-section}} \right) \leq 1.03$$

4.2.2.2 Right-angle coupler

When tested in accordance with Appendix A, a right-angle coupler, in each position of the coupler, shall not slip more than 6 mm at its contact face.

When tested in accordance with Appendix B, the right-angle coupler, in each position of the coupler, shall not show a vertical rotation greater than 125 mm as indicated by the pointer.

4.2.2.3 Swivel coupler

When tested in accordance with Appendix A, a swivel coupler, in each position of the coupler, shall not slip more than 6 mm at its contact face.

When tested in accordance with Appendix B, the swivel coupler, in each position of the coupler, shall not show a vertical plane rotation greater than 175 mm as indicated by the pointer.

4.2.2.4 Putlog coupler

When tested in accordance with Appendix C, a putlog coupler shall not have a visible gap between the tubes, and the tube that was loaded shall not be able to be moved by hand in the coupler, longitudinally or rotationally.

When tested in accordance with Appendix D, the putlog coupler shall not slip on the tube.

4.2.2.5 End-to-end coupler

An end-to-end coupler shall be subjected to a bending test about the weakest bending axis or plane of the coupler.

NOTE: Preliminary testing may be required to establish the weakest bending axis or plane.

When tested in accordance with Appendix E, an external type coupler shall reach 15 kN and not deflect more than 12 mm under the test load. An internal type coupler shall reach 7.5 kN and not deflect more than 12 mm under the test load. The deflection shall be measured at the joint between the tubes.

4.2.2.6 Parallel coupler splicing test

When tested in accordance with Appendix F, parallel couplers or swivel couplers used to splice tubes shall not slip more than 6 mm at their contact face.

4.2.2.7 Check coupler

When tested in accordance with Appendix G, the load rating of a loadbearing coupler backed by a check coupler shall be limited to half the load at which a slip of not more than 6 mm along the tube occurs.

The check coupler shall not have a working slip resistance of less than 9 kN.

4.2.2.8 Used couplers

Used couplers, if requiring re-assessment, shall be tested to demonstrate conformity with the performance requirements of this Section.

4.3 ADJUSTABLE LEG, ADJUSTABLE BASEPLATE OR ADJUSTABLE SWIVEL BASEPLATE**4.3.1 General**

The test component shall be tested as follows:

- (a) Components shall be tested in accordance to Appendix H.
- (b) Components that have passed Appendix H shall be tested to failure at which load the component is unable to support an increase in load or there is a slip between the thread of the nut and the thread of the stem. This load shall be the ultimate load.
- (c) A component whose ultimate test load deviates from the mean result by more than 10% shall be discarded and an additional component shall be tested.
- (d) The ultimate test results shall satisfy the following:

$$\begin{aligned} \text{WLL} &\geq 30 \text{ kN (for steel components), or} \\ &15 \text{ kN (for aluminium components)} \end{aligned}$$

where

$$\text{WLL} = (\sum P_u / n) / 2.5$$

P_u = individual ultimate load, in kilonewtons

n = number of tests

NOTE: The stated WLL of adjustable legs, adjustable baseplates or adjustable swivel baseplates may be further reduced as governed by the scaffold system design.

4.3.2 Sampling requirement

A minimum of three components shall be tested.