

Australian/New Zealand Standard™

Scaffolding

Part 3: Prefabricated and tube-and-coupler scaffolding



AS/NZS 1576.3:2015

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Part 3: Prefabricated and tube-and-coupler scaffolding

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD-036, Scaffolding, to supersede AS/NZS 1576.3:1995.

The objective of this Standard is to incorporate changes that reflect the current practice used in the testing of, and include new requirements for, prefabricated and tube-and-coupler scaffolds.

This Standard incorporates the following major changes from the 1995 edition:

- (a) The referenced Standards have been updated.
- (b) Section 2 has been deleted as the content now appears in AS/NZS 1576.1.
- (c) The formulae in Paragraphs A4, Appendix A, and B4, Appendix B, have been changed significantly and Figures A1, Appendix A, and B1, Appendix B, have been changed accordingly, and a new Figure B2, Appendix B, inserted.
- (d) A new test for prefabricated stair units has been included (Appendix G).
- (e) The test for prefabricated platforms has now been removed and included in AS/NZS 1577, *Scaffold decking components* Standard.
- (f) The duty loading and stability requirements for minor scaffolds are referenced in this Standard.
- (g) A new Appendix J, which summarizes all the test loads and outcomes for scaffold components and systems, has been included.

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.

This Standard incorporates a Commentary on some Clauses. The Commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a panel. The Commentary is intended to help readers understand the background to the clause but does not form part of the clause.

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Scaffolding

Part 3: Prefabricated and tube-and-coupler scaffolding

SECTION 1 SCOPE AND GENERAL**1.1 SCOPE**

This Standard specifies product information and test and performance requirements for prefabricated and tube-and-coupler scaffolding.

This Standard does not apply to the following:

- (a) The performance of prefabricated platforms.
- (b) Materials and components for scaffolding.

NOTE: Requirements for prefabricated platforms, as specified in AS/NZS 1577, and material and components for scaffolding are specified in AS/NZS 1576.1.

1.2 APPLICATION

This Standard shall be read in conjunction with AS/NZS 1576.1.

1.3 NORMATIVE REFERENCES

The following are the normative documents referenced to in this Standard:

AS/NZS

1576	Scaffolding
1576.1	Part 1: General requirements
1576.2	Part 2: Couplers and accessories
1577	Scaffold decking components
1892	Portable ladders
1892.1	Part 1: Metal

1.4 NEW MATERIALS AND METHODS

This Standard does not preclude the use of new techniques or new materials other than those specified in this Standard, equivalent European or other equivalent Standard, provided that such techniques or materials can be proved, by appropriate performance testing, to be equal or better than those specified herein.

1.5 DEFINITIONS

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

1.5.1 Adjustable castor

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

1.5.2 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.

1.5.3 Counterweight

A weight or series of weights used to counterbalance a scaffold against overturning.

1.5.4 Diagonal brace

A member in a scaffold placed diagonally in the vertical plane and attached to the vertical or horizontal members to stiffen the scaffold in that plane.

1.5.5 Frame

A prefabricated component, of defined width and height, that consists of vertical members separated by horizontal and/or diagonal members.

1.5.6 Frame scaffold

A scaffold assembled from prefabricated frames, braces and accessories.

NOTE: For an example, see Figure 1.1.

1.5.7 Freestanding tower

A tower that is not attached to any other structure and that is stable against overturning on its own account or, if necessary, assisted by stabilizers, outriggers, counterweights or backup towers.

NOTE: For an example, see Figure 1.2.

1.5.8 Height

The vertical distance from the supporting surface to the topmost working platform.

1.5.9 Mobile scaffold

A scaffold fitted with castors.

1.5.10 Plan brace

A member in a scaffold placed diagonally in the horizontal plane and attached to the vertical or horizontal members to stiffen the scaffold in that plane.

1.5.11 Prefabricated scaffold

A scaffold assembled from prefabricated components manufactured in such a way that the geometry of the scaffolding is predetermined.

NOTE: For an example, see Figure 1.3.

1.6 TYPES OF SCAFFOLD

Types of scaffolds are the following, the most typical being independent scaffolds, tower scaffolds, mobile scaffolds and birdcage scaffolds, which may be constructed from prefabricated components, frames, tubes and couplers, or timber components with bolted connections:

- (a) *Independent scaffold* A scaffold that consists of two or more longitudinal rows of standards connected longitudinally and transversely.
- (b) *Tower scaffold* A scaffold that consists of four standards, connected longitudinally and transversely, or two frames in plan connected transversely, to create a scaffold of one bay.
- (c) *Mobile scaffold* A freestanding scaffold that is mounted on castors.

- (d) *Perimeter scaffold* An independent scaffold that follows an internal or external facade of a structure.

NOTE: A perimeter scaffold is also known as a facade scaffold.

- (e) *Birdcage scaffold* An independent scaffold with a single working platform placed on the top lift of each bay.

- (f) *Minor scaffold* A scaffold that is of light and portable nature, and is restricted to having no working platforms at a height that is greater than 2 m above the supporting surface and of no greater than light duty rating, and includes the following:

- (i) *Mobile scaffold* A scaffold that is able to support the live loads for which it was designed while being supported on wheels that have the capability of being locked against rotation.

- (ii) *Modular scaffold* A scaffold that, prior to its use and by following the manufacturer's instructions, is constructed or assembled from two or more previously unattached components parts.

- (iii) *Rigid scaffold* A scaffold where the complete in-service shape is fixed or parts of the scaffold fold out or slide out to form the complete in-service shape.

NOTE: A rigid minor scaffold, apart from the folding or sliding of captive components into place, is not required to be assembled prior to use.

- (iv) *Work platform* A rigid scaffold where the platform area is not greater than 0.5 m², has a maximum length not greater than 1 m and has a working load limit of 150 kg.

1.7 PRODUCT INFORMATION

1.7.1 Documented information

Appropriate documented information, in plain English and SI units, shall be provided on the scaffolding system or scaffolding equipment. The information shall identify the supplier and the means of product identification. Except where specified otherwise by this Standard, the information shall include, as a minimum, the following:

- (a) A list of all components with descriptions from which each can be identified.
- (b) Instructions for erection, dismantling, movement of mobile scaffolds, use, transportation and storage.
- (c) Guidance for the servicing and inspection of the equipment and the rejection of damaged components.
- (d) The nominal weight of each component, in kilograms.
- (e) Details giving sufficient information to determine—
 - (i) duty loadings;
 - (ii) maximum heights; and
 - (iii) maximum number of working platforms.
- (f) Guidance on the type of scaffolding coupler to use when connecting ties and other accessories.
- (g) Relevant limitations.

1.7.2 Labelled information

For freestanding, single bay tower scaffolds, where the top working platform is not more than 6 m above the supporting surface, and minor scaffolds, the requirements of Clause 1.7.1 may be considered to be met, provided the following information is displayed in a prominent position on the scaffold or on an essential component of the scaffold:

- (a) Instructions for erection, dismantling, use, transportation and storage, including—
 - (i) advice on safe means of access (e.g., warning against descending in a forward direction) from minor scaffolds provided with rung or step access; and
 - (ii) where the scaffold is not of an insulated type, the words ‘DO NOT USE WHERE ELECTRICAL HAZARD EXISTS’ in the largest lettering practicable.
 - (iii) advice for the correct type of couplers to be used with the scaffold system.
- (b) The working load limit, in kilograms and, where applicable—
 - (i) maximum height of working platform;
 - (ii) maximum number of working platforms; and
 - (iii) any other relevant limitations.

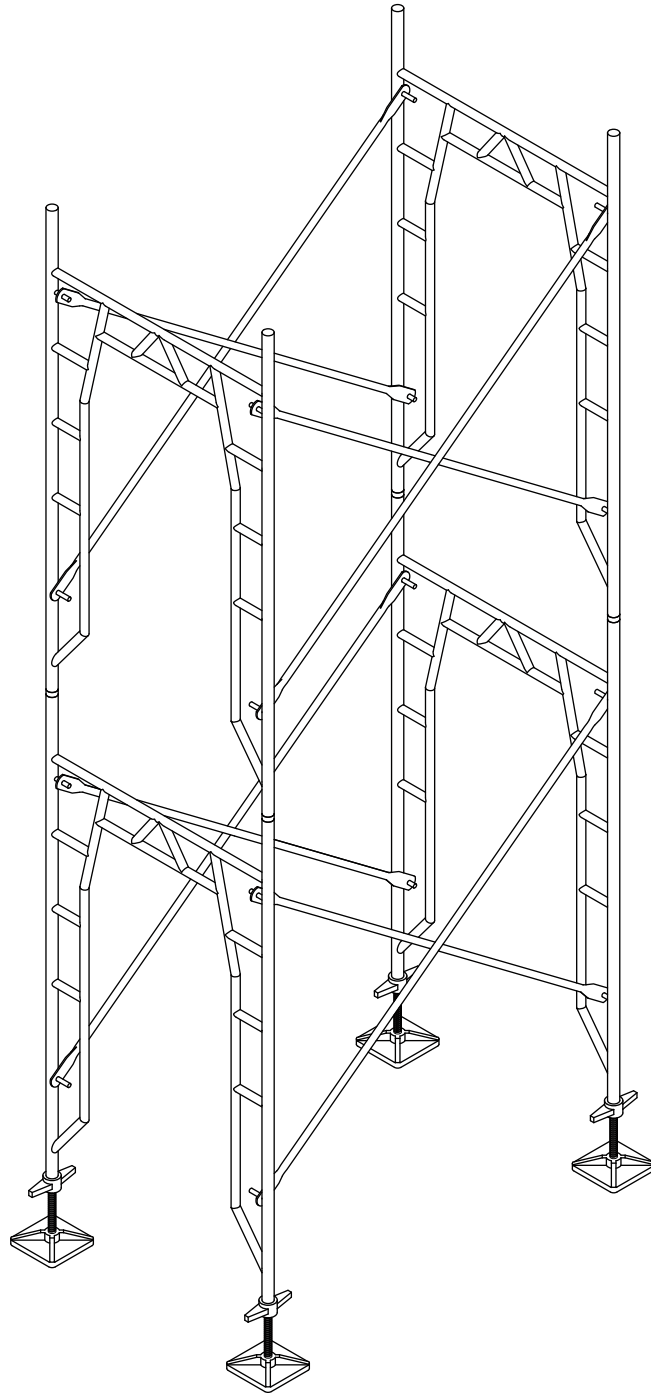
1.7.3 Labels

Where documented information complying with Clause 1.7.1 is not supplied with the scaffold, the information required by Clause 1.7.2 shall be in the form of labels that—

- (a) comply with the test requirements for specified labels in AS/NZS 1892.1; and
- (b) are appropriately located or protected, or both, to guard against wear, abrasion and disfiguring; and
- (c) are attached by a method that does not adversely affect the strength of the label, or the component to which it is attached.

1.8 MATERIALS

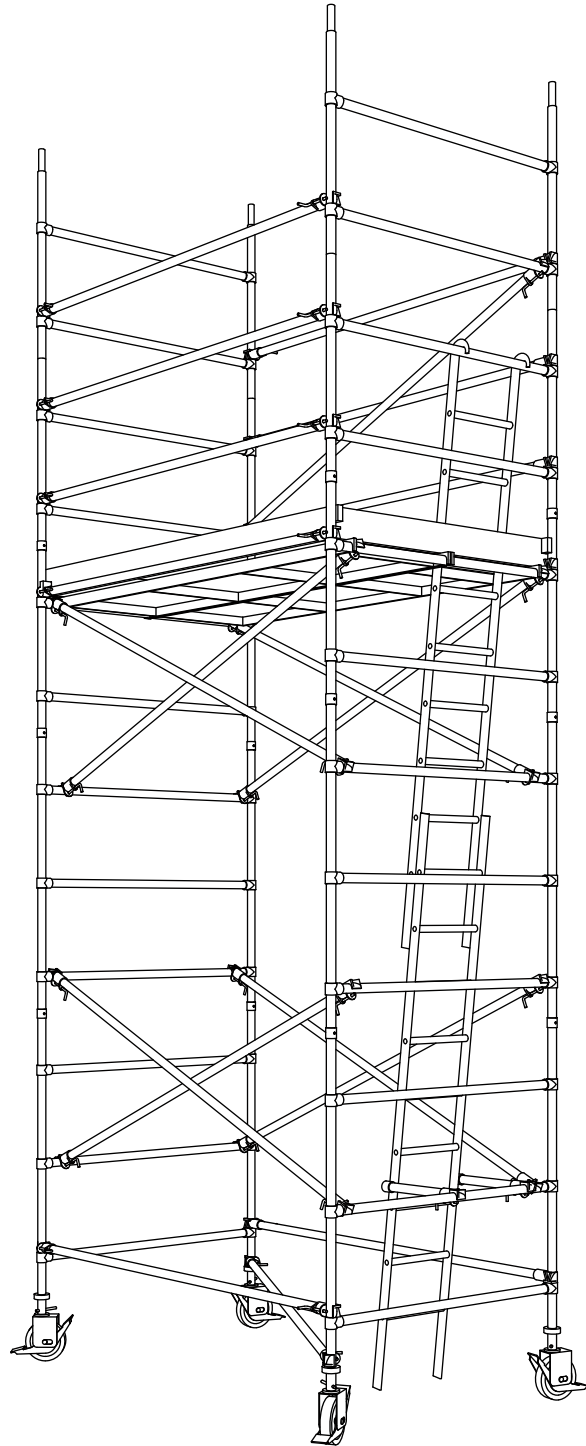
Materials for general scaffolds and minor scaffolds shall be in accordance with AS/NZS 1576.1.



NOTES:

- 1 Decking and edge protection components omitted for clarity.
- 2 Single bay shown only.

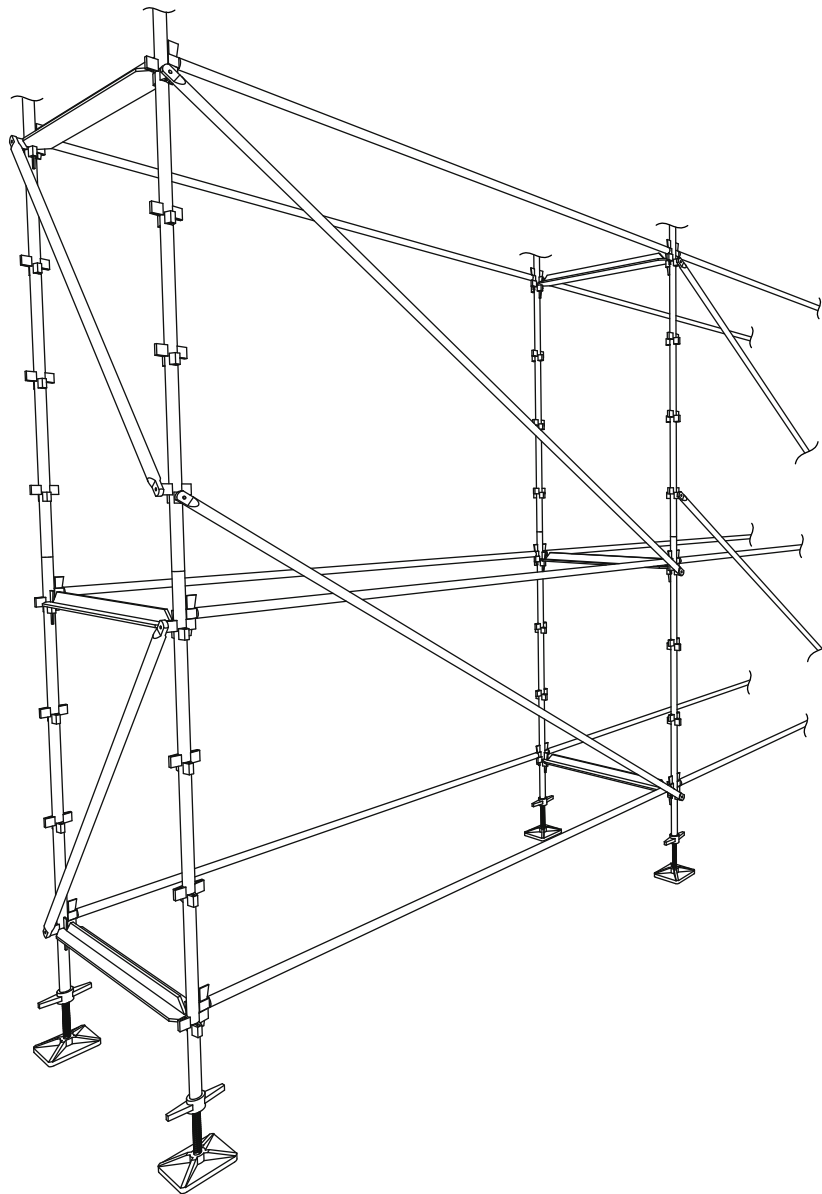
FIGURE 1.1 EXAMPLE OF WALKTHROUGH FRAME SCAFFOLDING



NOTES:

- 1 Scaffold may be on baseplates or castors.
- 2 Scaffold illustrated is a tower erected from frame scaffolding.
- 3 Tower scaffolds may be erected using prefabricated modular or tube-and-coupler scaffolding.
- 4 Ladder to be clear of supporting surface if scaffold is on castors.

FIGURE 1.2 EXAMPLE OF MOBILE TOWER FRAME SCAFFOLD



NOTES:

- 1 Decking and edge protection components omitted for clarity.
- 2 Single bay shown only.
- 3 Other systems may use different connections.

FIGURE 1.3 EXAMPLE OF A PREFABRICATED MODULAR SCAFFOLDING SYSTEM

SECTION 2 SPECIFIC REQUIREMENTS

2.1 MODULAR SCAFFOLDING

2.1.1 Base lift

Modular scaffolding shall be capable of incorporating a lift of ledgers and transoms not higher than 500 mm above the base of the standards.

2.1.2 Lift height

Modular scaffolding shall be capable of incorporating lift heights not exceeding 2.1 m, to facilitate erection.

2.2 FRAME SCAFFOLDING

Frame scaffolding shall be designed in such a way that full-length working platforms can be constructed with access along such platforms.

2.3 STABILITY OF FREESTANDING SCAFFOLD

Freestanding scaffolds shall comply with the stability requirements of AS/NZS 1576.1.

Stability may be achieved by increasing the least base dimension. Where such means are used, stabilizers or outriggers shall be capable of transferring the load from the scaffold without slip, rotation or other movement. Counterweights may also be used to increase the stability of a freestanding scaffold.

2.4 MOBILE SCAFFOLDS

The base of a mobile scaffold, including minor mobile scaffolds, shall be stiff enough in the horizontal plane to allow relocation of the scaffold.

NOTES:

- 1 A plan brace can be an effective means of providing stiffness to the base of a mobile scaffold.
- 2 Where counterweights are used to increase stability in a mobile scaffold, the capacity of the castors to take the extra load should be checked.

SECTION 3 PERFORMANCE REQUIREMENTS

3.1 GENERAL

The load capacity of a prefabricated or tube-and-coupler scaffold system shall be verified by either structural analysis in accordance with AS/NZS 1576.1 or testing in accordance with this Section.

Where a previously tested scaffold system is subsequently varied, its load capacity shall be verified by either structural analysis or testing.

Where a component of a previously tested scaffold system is subsequently varied, its load capacity shall be verified by either structural analysis or testing.

Where a specific application of a previously tested scaffold system requires dimensional or loading variations, the load capacity of the scaffold shall be verified by either structural analysis or testing.

The system shall comply with the stability requirements of AS/NZS 1576.1. The stability of minor scaffolds shall be verified by analysis or by testing.

Any structural member or component of a scaffold system that has been subjected to any test required by this Standard shall not subsequently be used as scaffolding.

3.2 TESTING

3.2.1 General

The scaffold shall be assembled in a manner to represent and simulate (as close as possible) the use of components in the assembly in their intended application.

Test loads shall be calculated in accordance with AS/NZS 1576.1 and adjusted by the test load factors as specified in the relevant appendices of this Standard.

Interpretation of the test results achieved from the appendices shall take into account possible variations in the material properties and the section properties of the tested components or test configuration.

3.2.2 Testing requirements

3.2.2.1 *Tower scaffolds*

Tower scaffolds shall be tested in accordance with Appendix A.

3.2.2.2 *Perimeter scaffold*

A perimeter scaffold of one bay width shall be tested in accordance with Appendix B.

3.2.2.3 *Loadbearing components*

Loadbearing components shall be tested in accordance with Appendix C.

Ledgers that carry loads shall be tested in accordance with Appendix C.

3.2.2.4 *Edge protection*

Edge protection components shall be tested in accordance with the following:

- (a) Guardrails, toeboards and panels, Appendix D.
- (b) Guardrail posts, Appendix E.

3.2.2.5 *Maximum working platform height of a tower scaffold on baseplates or castors*

The maximum height of a working platform in a tower or mobile scaffold limited by stiffness shall be determined in accordance with Appendix F.

3.2.2.6 Decking component

Decking components shall comply with the requirements of AS/NZS 1577.

3.2.2.7 Stairs

Stair systems shall be tested in accordance with Appendix G.

C3.2.2.7 *For stair towers sharing standards with perimeter scaffold, AS/NZS 1576.1 specifies that the supporting structure for a stair system be designed for an imposed action of 2.5 kPa uniformly distributed on all treads and landings up to a height of 10 m. This loading will need to be taken into consideration when the scaffold structure and the stair tower share common standards, as it may result in the common standards being overloaded when the above stair loading is added to the duty loads on the working platforms of the adjoining bays.*

3.2.2.8 Minor scaffolds

Testing of components for use in a minor scaffold does not constitute appropriate testing for use of a similar component in a standard scaffold.

NOTE: Minor scaffolds should be tested in accordance with Appendix H.

APPENDIX A

LOAD TEST ON ASSEMBLED SINGLE BAY TOWER SCAFFOLD

(Normative)

A1 SCOPE

This Appendix sets out the method for verifying the vertical load-carrying capacity of an assembled single bay tower scaffold.

NOTE: For a summary of test loads and outcomes, see Table J1, Appendix J.

A2 PRINCIPLE

A vertical settling load is applied to each standard of the assembled single bay tower to settle its loadbearing components. Three load cases are tested with the test loads being applied in the sequence listed below. Vertical test loads are applied to the standards of the assembled tower, which are then inspected, at each stage of the test, as follows:

- (a) *Working load* The maximum expected duty live load that the assembled tower scaffold has to support.
- (b) *Design load* The minimum load that the assembled tower scaffold has to support without permanent deformation of the loaded standards or failure of individual components.
- (c) *Minimum strength load* The minimum load that the assembled tower scaffold or its components has to support. Permanent deformation is permitted.

A3 APPARATUS

The following apparatus is required:

- (a) Weight or device for applying the specified axial test load to the standards of the assembled scaffold with a maximum deviation of 50 N or 1% of the minimum strength load, whichever is greater.
- (b) A means of timing an interval of not less than 300 ± 1 s (e.g., a stopwatch).
- (c) Deflection-measuring device capable of reading the deflection within an accuracy of ± 1 mm (e.g., a calibrated steel rule or tape measure).

A4 TEST LOAD DESCRIPTIONS

The following descriptions apply to the loads for this test:

- G_d = for one bay, the weight of the assembled tower scaffold at its maximum design height, which includes the accessories normally used with the scaffold system
- Q = for one bay, the duty live load on a working platform, as specified in AS/NZS 1576.1, multiplied by the number of working platforms to be loaded at the same time applicable to the design under test
- G_t = for one bay, the weight of the assembled scaffold tower as erected to the required height for the test

A5 TEST SET-UP AND PROCEDURE

A5.1 Set-up

The tower scaffold shall be assembled on a firm horizontal foundation such that the height from the foundation to the working platform is three times the least base dimension or the design height, whichever is the lesser. The scaffold shall be assembled in accordance with the manufacturer's instructions.

NOTES:

- 1 For a typical assembly, see Figure A1.
- 2 It is not necessary to incorporate toeboards and guardrails where these interfere with the test loading.

Where the scaffold is designed to be used with adjustable legs, they shall be fitted to the tower under test in the fully extended position. Where castors are provided as one of the standard features of a scaffold, they shall be fitted in place of adjustable legs and the brakes applied. Where the castors are eccentric, they shall be turned towards the diagonally opposite corner. Adjustable castors shall be extended to their maximum extension.

A5.2 Procedure

The procedure shall be as follows:

- (a) Simultaneously, apply to each standard an axial concentric settling load of 20% of the duty live load, $(0.2Q)$ for 300 s. Reduce the settling load to a preload equal to 10% of the duty live load $(0.1Q)$ per standard and check that all relevant joints are fully bedded down. On each standard, measure and record the horizontal distance from the standard to a datum independent of the test assembly at each of the following location:

- (i) At the load application level.
- (ii) At mid-height.
- (iii) At any other location that may result in a greater deflection.

Measurements shall be made in both the transverse and longitudinal directions of the scaffold.

NOTE: This establishes zero points for deflection measurements. The change in the measured horizontal distance during each load case represents the horizontal deflection at each location.

- (b) *Working load test:*

- (i) Progressively increase the preload to an axial load of $P_w = [Q + (G_d - G_t)]/4$ to each standard. Apply these loads simultaneously to all four standards. Maintain the loads for a minimum 300 s.
- (ii) After 300 s, measure and record the horizontal distances as specified in Step (a) above.
- (iii) Reduce the test load to the preload, and measure and record the horizontal distances as specified in Step (a) above.
- (iv) Inspect the tower for failure or any permanent deformation.

- (c) *Design load test:*

- (i) Progressively increase the preload to an axial load of $P_D = [1.5Q + (1.5G_d - G_t)]/4$ to each standard. Apply these loads simultaneously to all four standards. Maintain the loads for a minimum 300 s.
- (ii) After 300 s, measure and record the horizontal distances as specified in Step (a) above.

- (iii) Reduce the test load to the preload, and measure and record the horizontal distances as specified in Step (a) above.
- (iv) Inspect the tower for failure or any permanent deformation. Inspect the loaded standards and connecting components for cracks in the material or welds of individual components.
- (d) *Minimum strength load test:*
 - (i) Progressively increase the preload to an axial load of $P_M = [2.25Q + (2.25G_d - G_t)]/4$ to each standard. Apply these loads simultaneously to all four standards. Maintain the loads for a minimum 300 s.
 - (ii) Remove the test load, and inspect the loaded standards and connected components for cracks in the material or welds of individual components.

NOTE: For the test loading on a typical assembled tower, see Figure A1.

A6 ACCEPTANCE CRITERIA

The following criteria shall apply:

- (a) The load on the scaffold assembly shall reach the specified test loads for the three load cases.
- (b) The scaffold assembly shall support the test loads for the specified time.
- (c) Following removal of the loads specified in Steps (b) and (c) of Paragraph A5.2, there shall not be any measured permanent deformation of the loaded standards.
- (d) Following removal of the loads specified in Steps (b) and (c) of Paragraph A5.2, any measured permanent deformation of the loaded standards shall not exceed 0.1% of the height of the nominal working platform of the test assembly to the foundation (see Paragraph A5.1).
- (e) Following removal of the loads specified in Step (d) of Paragraph A5.2, there shall not be a failure of any connection between components.

A7 REPORT

In addition to the requirements of Appendix I, the report shall include the following information:

- (a) Identification of the tower scaffold system, and whether it was supported on baseplates or castors.
- (b) The maximum possible extension for the adjustable legs or castors fitted to the loaded standards.
- (c) The calculation of the component weights, the duty live loads and the total test loads on each standard for the three load cases.
- (d) The actual loads applied or achieved when testing each of the three load cases and the length of time they were applied.
- (e) Location and details of structural failure or any permanent deformation.
- (f) Whether the tower scaffold passed or failed the acceptance criteria for each load case.

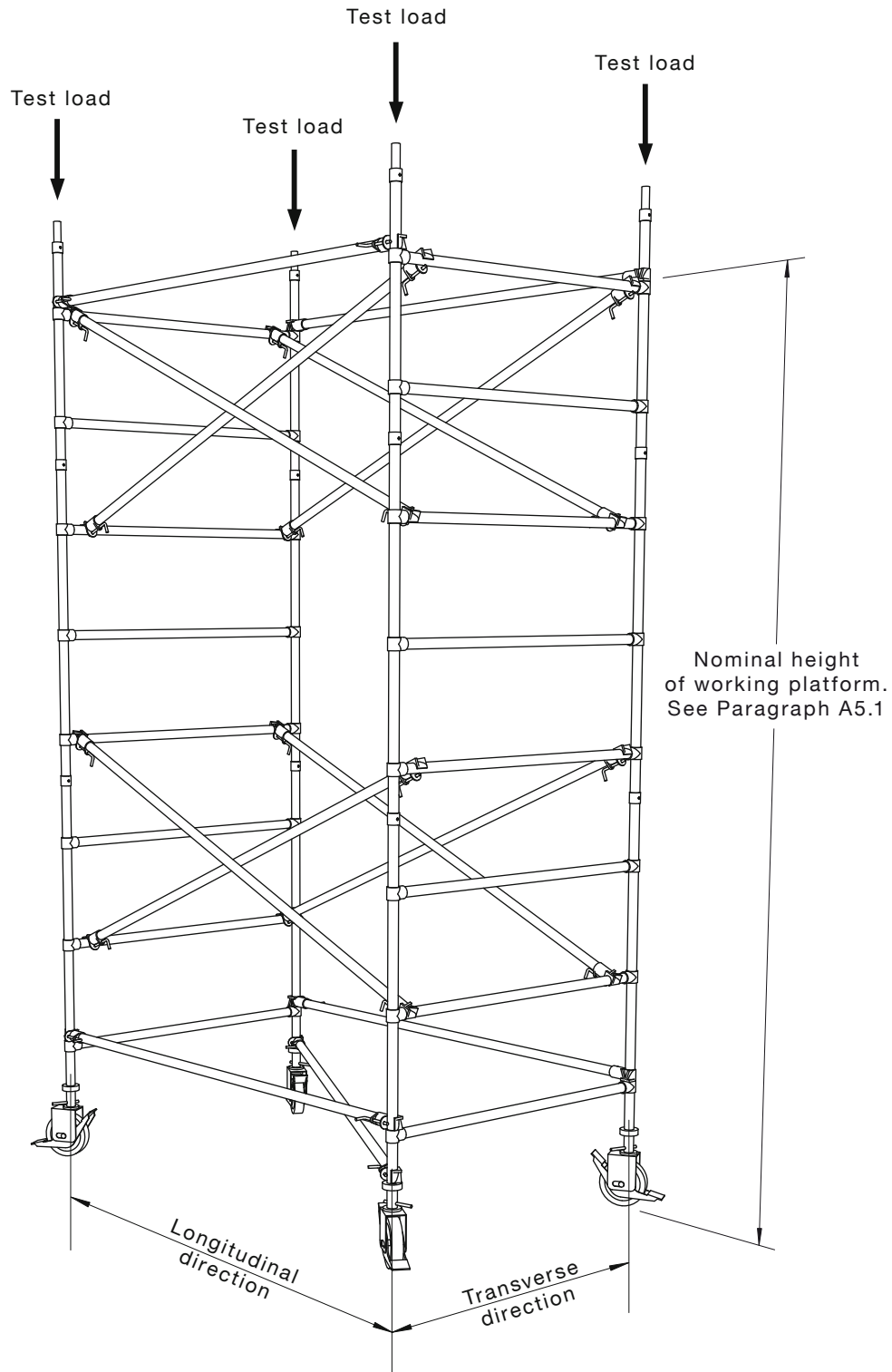


FIGURE A1 TEST LOADING OF TYPICAL ASSEMBLED TOWER SCAFFOLD
(EXAMPLE SHOWING CASTORS FITTED)

APPENDIX B

LOAD TEST ON ASSEMBLED FRAME, PREFABRICATED MODULAR OR TUBE-AND-COUPLER SCAFFOLD

(Normative)

B1 SCOPE

This Appendix sets out the method for verifying the vertical load-carrying capacity of an assembled frame, prefabricated modular or tube-and-coupler scaffold.

NOTE: For a summary of test loads and outcomes, see Table J2, Appendix J.

B2 PRINCIPLE

A vertical settling load is applied to two standards of the assembled scaffold to settle its loadbearing components. Three load cases are tested with the test loads being applied in the following sequence:

- (a) *Working load* The maximum expected duty live load that the assembled scaffold has to support.
- (b) *Design load* The minimum load that the assembled scaffold has to support without permanent deformation of the loaded standards or failure of individual components.
- (c) *Minimum strength load* The minimum load that the assembled scaffold or its components has to support. Permanent deformation is permitted.

Vertical test loads are applied to the loaded standards of the assembly, which are then inspected for failure, at each stage of the test.

B3 APPARATUS

The following apparatus is required:

- (a) Weight or device for applying the specified axial test load to the standards of the assembled scaffold with a maximum deviation of 1% of the minimum strength load.
- (b) A means of timing an interval of not less than 300 ± 1 s (e.g., a stopwatch).
- (c) Deflection-measuring device capable of reading the deflection within an accuracy of ± 1 mm (e.g., a calibrated steel rule or tape measure).

B4 TEST LOAD DESCRIPTIONS

The following descriptions apply to the loads for this test:

- G_d = for one bay, the weight of the assembled scaffold at its maximum design height. This includes accessories normally used with the scaffold system
- Q = for one bay, the duty live load on a working platform as specified in AS/NZS 1576.1, multiplied by the number of working platforms to be loaded at the same time applicable to the design under test
- G_t = for one bay, the weight of the assembled scaffold as erected to the height for the test

B5 TEST SET-UP AND PROCEDURE

B5.1 Set-up

Three bays of the frame, modular or tube-and-coupler scaffold shall be assembled, as shown in Figures B1 and B2, on a firm horizontal foundation. The height to the topmost lift shall be at a minimum of three lifts or 6 m, whichever is the greater. The scaffold shall be assembled in accordance with the appropriate documentation. It is not necessary to fit toeboards and guardrails where these interfere with the test loading. Where the scaffold is designed to be used with adjustable legs, they shall be fitted in the fully extended position. Where the scaffold is designed to be used with castors, they shall be oriented with maximum eccentricity to result in a minimum base dimension and have brakes applied.

For the purposes of this test, the term 'standard' also refers to the primary vertical loadbearing members of a frame.

At the second lift or other height as specified by the appropriate documented information, at each end, the test structure shall be rigidly tied to a supporting structure. Except where diagonal members form an integral part of each bay in each lift, diagonal bracing shall not be fixed to the members under test load.

B5.2 Procedure

The procedure shall be as follows:

- (a) Apply to a pair of standards in the transverse direction one bay in from the end frame or pair of standards, as shown in Figure B1, a concentric axial settling load of 50% of the duty live load ($0.5Q$) on each standard for 300 s. Reduce the settling load to a preload of 20% of the duty live load ($0.2Q$), and check that all relevant joints are fully bedded down.

On the loaded standards, measure and record the horizontal distance from the standard to a datum independent of the test assembly at each of the following locations:

- (i) At the load application level.
- (ii) At each lift height.
- (iii) At mid-height between lifts.
- (iv) At the top of the adjusting nut of the adjustable base.

Measurements shall be made in the transverse direction of the scaffold. Except where standards are transversely connected, deflection measurements shall be taken at both loaded standards.

NOTE: This establishes zero points for deflection measurements. The change in the measured horizontal distance during each load case represents the horizontal deflection at each location.

- (b) *Working load test:*
 - (i) Simultaneously increase the preload to the following test loads to the pair of standards specified in Step (a) above for 300 s:
At each of two standards—an axial load of $P_W = (G_d - G_t)/2 + (0.5Q)$.
 - (ii) After 300 s, measure and record the distance specified in Step (a) above representing the deflection of each node under load.
 - (iii) Reduce the test load to the preload of $0.2Q$ and again measure and record the distance as specified in Step (a) above.