A.4.4 Repeated batch failures

In the event of five consecutive routine testing batch non-conformances, production shall cease, corrective action is instigated, and the relevant type testing is repeated before the resumption of routine testing.

A.5 Factory production control

A.5.1 General

A factory production control system (FPC) shall be established and documented to ensure that the components placed on the market conform to the performance requirements of the Standard. The FPC system shall provide for the control of raw materials, production equipment and processes and the manufacture of access and maintenance chamber components. Control systems shall also provide for the use of documented production process and manufacturing procedures, production input and output inspections and minimum product sampling and testing plans.

NOTE A factory production control system (FPC) and associated product inspection and test plan (ITP) that is embodied in a duly accredited production quality management system (e.g. ISO 9001) is likely to meet and demonstrate conformity to the performance requirements of this Standard.

A.5.2 Equipment

A.5.2.1 Testing

All weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

A.5.2.2 Manufacturing

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures.

A.5.3 Raw materials

Characteristic property requirements for all raw materials shall be documented as shall the processes for assuring their conformity with the requirements of this Standard.

A.5.4 Manufacturing control

The manufacturer shall establish documented procedures and processes that ensure continued conformance of all manufacturing processes and manufactured output with the performance requirements of this Standard.

A.5.5 Minimum sampling and testing frequency

The minimum frequency of sampling and testing for each of the quality parameters specified shall be as set out in Table A.1.

Table A.1 — Routine Sampling and Testing Frequency

Item	Test	Normal frequency (see Note 1)	Increased frequency trigger	Increased frequency	Trigger to return to normal frequency
1a	Ultimate vertical load (unreinforced components)	1 in 200 but not less than one per three consecutive months of production	A failed result requires the batch to be quarantined. Retesting should then be conducted as per Clause A.4.2.	1 in 50 or 1 weeks production	5 consecutive passing tests
1b	Ultimate vertical load (reinforced components)	1 in 200 but not less than one per three consecutive months of production (where specified), or a minimum of 1 every 3 years			
2	Proof vertical load (reinforced components)	1 in 200 but not less than one per three consecutive months of production			
3	Cover to reinforcement (only reinforced components)	1 in 200 but not less than one per each month's production			
4	Water absorption	One per six months of production per concrete mix design, per machine/ manufacturing method and routine curing process			
5	Hydrostatic test of components	1 in 200 but not less than one per each month of production			
6	Hydrostatic testing of components joint	1 in 200 but not less than one per three consecutive months of production			
7	Vacuum testing of the shaft section	1 in 200 but not less than one per each month of production			
8	Vacuum testing of shaft joint	1 in 200 but not less than one per three consecutive months of production			
9	Dimensional accuracy	1 in 200 but not less than one per each month of production			
10	Hydrostatic testing of the base to pipe joint	Annually	Should a test fail then, after corrective action, the type testing shall be repeated. If successful, then annual testing shall resume.	N/A	N/A
11	Load testing of installed step irons				

Table A.1 *(continued)*

Item	Test	Normal frequency (see Note 1)	Increased frequency trigger	Increased frequency	Trigger to return to normal frequency
12a	Ultimate horizontal load (unreinforced components)	1 in 200 but not less than one per three consecutive months of production	A failed result requires the batch to be quarantined. Retesting should then be conducted as per Clause A.4.2.	1 in 50 or 1 weeks production	5 consecutive passing tests
12b	Ultimate horizontal load (reinforced components)	1 in 200 but not less than one per three consecutive months of production (where specified), or a minimum of 1 every 3 years			
13	Proof horizontal load (reinforced components)	1 in 200 but not less than one per three consecutive months of production			
14	Concrete Compressive Strength	As per Clause 2.6	N/A	N/A	N/A
NOTE 1 The listed normal frequencies are per individual component design/type.					
NOTE 2 Refer to Table 6.1 for the testing requirements for different components.					

Appendix B
(informative)

Information exchange between manufacturer and purchaser

B.1 General

It is essential that manufacturer and purchaser exchange all relevant product application, performance and site-related information clearly and unambiguously, by timely mutual consultation.

B.2 Information to be supplied by the purchaser

The purchaser should supply the following information when calling for quotes or tenders:

(a) Nominal internal diameter of access and maintenance chamber system and size of access cover clear openings.

(b) Access and maintenance chamber depths and connected pipe configuration requirements or schedule of required components.

(c) Access cover type(s), materials and load classification requirements.

(d) All user-determined loading, installation environment or usage application pre-conditions or requirements.

(e) Step iron or ladder requirements, including the type of step or ladder.

(f) Type and material requirements for access cover lifting keyholes, see Figure 5.1.

(g) Sizes and locations of pre-drilled holes and details of benching required in precast concrete bases.

(h) Any test required by the purchaser which appears as “only if specified” in Table 6.1.

(i) Places, rates and dates of delivery.

(j) Place(s) of acceptance if other than the place of manufacture.

(k) Type of cement or cementitious material if other than required by this standard, see Clause 2.3.1.

(l) Any other special treatments or requirements.

(m) Purchaser’s requirements or acceptance/rejection with respect to alternative concrete mixes, see Clause 2.3.10.

B.3 Information to be supplied by the manufacturer

The manufacturer should be prepared to supply any or all of the following information if requested by the purchaser:

(a) Drawings showing the general arrangement of access and maintenance chamber system components.

(b) The mass of each component.

(c) The places of manufacture.

(d) The methods of manufacture.

(e) The types of inserts or lifting devices including their material of manufacture (excluding access cover lifting keyholes).

(f) Recommended component handling and installation procedures.

(g) Copies of test records relevant to components supplied.

Appendix C
(normative)

Methods for load testing of access and maintenance chamber components

C.1 Scope

This Appendix sets out methods for determining the load-carrying capacity of precast concrete access and maintenance chamber components under the action of externally applied vertical loads.

NOTE The diagrams shown in this Appendix are schematic to demonstrate how loads should be applied and components supported during testing. Specific safety measures which will be required for personnel carrying out the testing and in the particular measurement of crack widths have not been included and will need to be developed by the party carrying out the testing.

C.2 Application

The methods described apply to precast concrete access and maintenance chamber components to determine conformity to either the specified proof load capacity or the specified ultimate load capacity of a component.

C.3 Apparatus

C.3.1 Timber bearing blocks

Hardwood timber blocks 100 mm deep × 200 mm wide × 400 mm long.

Each block shall be sufficiently rigid to ensure that the load on the test specimen is evenly distributed and shall be faced along its entire length and width with 12 mm thick rubber sheeting with a Shore A hardness of 55° ± 5°.

C.3.2 Standard feeler gauges

Gauges used for determining crack widths shall be of the form and shape given in Figure C.1, and with a thickness in accordance with Table C.7.1, within a tolerance of ± 0.02 mm.

C.3.3 Load testing equipment

A typical load testing arrangement is detailed in Figure C.2. The force measuring equipment shall be calibrated in accordance with AS 2193 and have a repeatability of 3.0 % and a maximum permissible mean error plus or minus 3.0 % in the operating range required.

C.4 Condition of test specimens

Test specimens shall be surface dry and free from —

(a) dust or any matter that might obscure a crack; and

(b) any defect described in Clause 3.5.5 excluding Type 1 defects.

C.5 Positioning of test specimens

C.5.1 General

Test specimens shall be positioned in accordance with Clauses C.5.2 to C.5.4, as appropriate. For illustrations of the various loading arrangement configurations, see Figures C.2 to C.10.

C.5.2 Concrete access covers and concrete surrounds

Access covers and surrounds shall be prepared for testing as follows:

(a) *Concrete access covers* — Concrete access covers shall be installed into a compatible concrete surround in accordance with the manufacturer's instructions, see Figures C.9 and C.10.

(b) *Concrete surrounds* — Concrete surrounds shall be seated upon a suitable constructed steel support frame or a compatible component, see Figures C.7.1 and C.7.2.

C.5.3 Makeup rings

Makeup rings/spacer rings shall be installed onto a compatible supporting component in accordance with the manufacturer's instructions, see Figures C.6.

C.5.4 Squat cones, straight-back tapers and conversion slabs

Squat cones, straight-back tapers and conversion slabs shall be prepared for testing as follows:

(a) Squat cones and straight-back tapers shall be installed onto a suitable constructed steel support frame or a compatible component (e.g. shaft). A Type D cover and surround shall be installed on top of the squat cone/straight-back taper in accordance with the manufacturer's instructions. See Figure C.8.

(b) Conversion slabs shall be installed onto a suitable constructed steel support frame or a compatible component (e.g. shaft). The component and supporting arrangements shall be configured to enable ready inspection, photographing or measurement of test conformance outcomes including e.g. Crack widths etc. For nominal shaft diameters less than or equal to 1200 mm, see Figure C.7.1. For nominal shaft diameters between 1200 mm and 1800 mm, an additional test is required to cater for the AS 5100.2 M1600 load case, see Figure C.7.1 and Figure C.7.2.

C.5.5 Shaft sections and precast bases

C.5.5.1 Vertical load tests

Shaft sections and precast bases shall be prepared for testing as follows:

(a) Shaft sections shall be installed onto a suitable constructed support frame or a compatible component (e.g. shaft). For nominal shaft diameters less than or equal to 1 200 mm, see Figure C.4.1. For nominal shaft diameters between 1 200 mm and 1 800 mm, an additional test is required to cater for the AS 5100.2 M1600 load case, see Figures C.4.1 and C.4.2.

(b) Precast base units which have benching installed after the initial casting of the base unit shall be tested before the installation of the benching.

(c) To confirm the adequacy of the shaft portion of a precast base unit, precast base units shall be manufactured including a penetration in the wall of the shaft. The penetration shall be the largest expected diameter for the shaft diameter and height combination. The penetration shall be positioned as close as possible to the top of the unit. The minimum distance shown in Figure C.3.1 shall be determined by the designer of the component.

The precast base unit shall be evenly supported on an unyielding foundation with a rubber (or similar) mat between the foundation and the underside of the base. A suitable conversion shall be placed on top of the base unit in accordance with the manufacturer's instructions. The load shall be applied above the penetration. For all shaft nominal diameters (i.e. between 600 mm and 1 800 mm), see Figure C.3.1.

(d) For the purpose of confirming the adequacy of the base slab portion of a precast base, precast base units shall be evenly supported on an unyielding foundation with a sand bed, nominally 75 mm thick between the foundation and the underside of the base. The shaft component of the base unit shall have a suitable penetration to enable ready inspection, photographing or measurement of test conformity outcomes, including e.g. crack widths (in the top face of the base slab) etc. A suitable conversion slab shall be placed on top of the base unit in accordance with the manufacturer's instructions. The load shall be as follows:

(i) For nominal shaft diameters between 600 mm and 1 200 mm, the load is based on the AS 5100.2 W80 load case. The test load shall be applied in the centre of the conversion slab, see Figure C.3.2.

(ii) For nominal shaft diameters between 1 500 mm and 1 800 mm, the load is based on the AS 5100.2 M1600 load case. The test load shall be applied in accordance with the arrangement in Figure C.3.2.

C.5.5.2 Horizontal load test for shaft components

In addition to the vertical load tests as detailed in Clause C.5.5.1, an additional load test is required for shaft components only to ensure that shaft components are capable of withstanding the horizontal loads which result from lateral earth pressure due to a wheel load applied adjacent to the access chamber or maintenance chamber at the road surface.

Shaft components shall be tested in accordance with the relevant sections of AS/NZS 4058 except that the test loads shall be in accordance with Table 3.2.3.

For unreinforced shaft components, only the ultimate load test needs to be performed. For reinforced shaft components, both the proof and ultimate load tests need to be performed.

C.5.6 Positioning of bearer blocks

The positioning of timber bearing blocks shall be as depicted in Figures C.3.1. C.3.2, C.3.3, C.4.1, C.4.2, C.5, C.6, C.7.2, C.8, C.9 and C.10 as appropriate to the type of component.

C.6 Procedure

C.6.1 Application of test loads

The test loads specified in Tables 3.2.2 and 3.2.3 shall be applied without shock, at a minimum rate of 10 kN per minute to the test specimens in accordance with Clauses C.5.2 to C.5.4. The load shall be held for a sufficient time to visually inspect and measure the test specimen but, in any case, for not less than 60 s and be released without shock to the test specimen.

C.6.2 Proof load test

The proof load test shall only be performed on concrete components which are reinforced. For all unreinforced components, the proof load test shall not be performed. The procedure for the proof load test shall be as follows:

(a) Position the test specimen and bearer block in accordance with Clause C.5.

(b) Apply the test proof load specified in Table 3.2.2 in accordance with Clause C.6.1.

(c) While the test load is being maintained inspect the component for any cracks on any face and measure the maximum crack width in accordance with Clause C.7.

(d) After the load has been removed measure the maximum crack width of any residual cracks in accordance with Clause C.7.

NOTE All unreinforced components are omitted from the proof load test because unreinforced components are likely to have little difference between proof load and failure load. The ultimate load test is still to be carried out on all unreinforced components to confirm design adequacy.

C.6.3 Ultimate load test

The ultimate load test shall be performed on all concrete components. The procedure for the ultimate load test shall be as follows:

(a) Position the test specimen and bearer block in accordance with Clause C.5.

(b) Apply the test ultimate load specified in Table 3.2.2 in accordance with Clause C.6.1.

(c) Record whether the test ultimate load was able to be achieved without loss of load.

C.7 Selection and measurement of crack width

The maximum crack width shall be selected visually by normal or corrected vision. The crack shall be measured by inserting the tip of the appropriate feeler gauge along the crack at consecutive points spaced at 50 mm centres over a crack length of not less than 300 mm until resistance is encountered. If the gauge mark on the feeler gauge (selected from Figure C.1) —

(a) is always visible at or above the component surface, then the crack shall be taken as being of less width than the thickness of the feeler gauge and the component shall be recorded as conforming; and

(b) is below the surface of the component at any measuring point, then the crack shall be taken as being greater in width than a test crack and the component shall be recorded as non-conforming.

The thickness of the feeler gauge for crack width determination shall be in accordance with Table C.7.1.

Table C.7.1 — Thickness of feeler gauge for crack width determination

Specified cover (mm)	Thickness of feeler gauge for proof load test (mm)	
	Component loaded	Component after load removed
10	0.15	0.10
20	0.20	0.15
25	0.25	0.20
35	0.30	0.20
45	0.30	0.20
60	0.35	0.20

C.8 Test record

The following shall be recorded:

(a) Description of the component under test.

(b) Date of testing.

(c) The presence or absence of cracks classified as defects, resulting from the application of the test proof load.

(d) Whether the test ultimate load was able to be sustained without loss of load. If not, state the load at which failure occurred.

(e) Reference to this test method, i.e. AS 4198, Appendix C.

Dimensions in millimetres

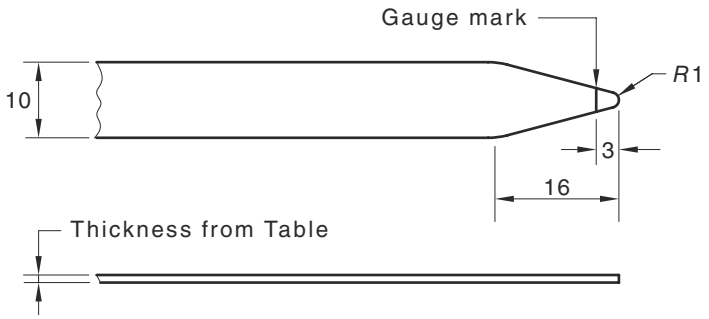

Figure C.1 — Form and shape of standard feeler gauge

Dimensions in millimetres

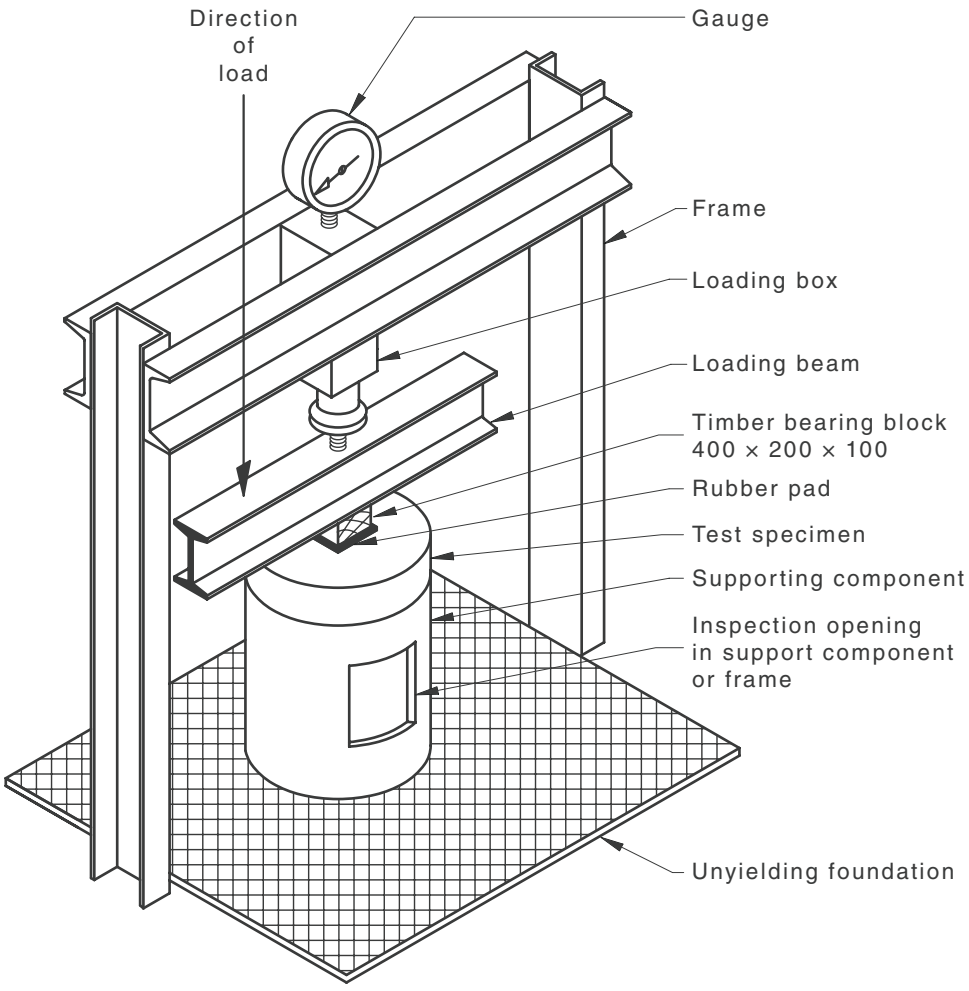

Figure C.2 — Typical load testing apparatus