BS 5834-4:2011

BSI Standards Publication

# Surface boxes, guards and underground chambers for the purposes of utilities

## Part 4: Specification for utility chambers

bsi.

...making excellence a habit.™

**Publishing and copyright information**
The BSI copyright notice displayed in this document indicates when the document was last issued.



ISBN 978 0 580 56123 8

ICS 91.140.40; 91.140.60

The following BSI references relate to the work on this standard:
Committee reference B/504
Draft for comment 08/30142165 DC

**Publication history**
First published September 1989
Second (present) edition May 2011

**Amendments issued since publication**

| Date | Text affected |
|---|---|

# Contents



**Summary of pages**
This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 26, an inside back cover and a back cover.

# Foreword

## Publishing information

This part of BS 5834 was published by BSI and came into effect on 31 May 2011. It was prepared by Technical Committee B/504, *Water supply*. A list of organizations represented on this committee can be obtained on request to its secretary.

## Supersession

This part of BS 5834 supersedes BS 5834-4:1989, which is withdrawn.

## Relationship with other publications

BS 5834, *Surface boxes, guards and underground chambers for the purposes of utilities*, is published in three parts:

- Part 1: *Specification for guards and plinths;*
- Part 2: *Specification for surface boxes;*
- Part 4: *Specification for utility chambers.*

## Information about this document

This is a full revision of the standard and incorporates the following principal changes:

a) the exclusion of glass fibre reinforced polyester (GRP) units made by either hand lay-up or spray-up manufacture;

*NOTE These are no longer manufactured in the United Kingdom.*

b) the incorporation of chamber units made from recycled polymers;

c) the update of requirements for cementitious content and concrete mix;

d) the extension of product evaluation requirements.

**Product certification.** Users of this part of BS 5834 are advised to consider the desirability of third party certification of product conformity with this British Standard. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

## Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

## Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

# 1 Scope

This part of BS 5834 specifies requirements and test methods for precast reinforced concrete and recycled polymer units for utility chambers of rectangular shape (including utility chambers of square shape), for use with surface boxes conforming to BS 5834-2 or covers and frames with a maximum designated clear opening of 900 mm × 600 mm and conforming to BS EN 124.

*NOTE In BS 5834-4:1989 "utility chambers" were termed "preformed chambers".*

# 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 4027, *Specification for sulfate-resisting Portland cement*

BS 4035, *Specification for linear measuring instruments for use on building and civil engineering constructional works – Steel measuring tapes, steel bands and retractable steel pocket rules*

BS 4449, *Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification*

BS 4482, *Steel wire for the reinforcement of concrete products – Specification*

BS 4483, *Steel fabric for the reinforcement of concrete – Specification*

BS 4484-1, *Specification for measuring instruments for constructional works – Part 1: Metric graduation and figuring of instruments for linear measurement*

BS EN 197-1, *Cement – Part 1: Composition, specifications and conformity criteria for common cements*

BS EN 197-4, *Cement – Composition, specifications and conformity criteria for low early strength blastfurnace elements*

BS EN 450-1, *Fly ash for concrete – Part 1: Definition, specifications and conformity criteria*

BS EN 934-2, *Admixtures for concrete, mortar and grout – Part 2: Concrete admixtures – Definitions, requirements, conformity, marking and labelling*

BS EN 1008, *Mixing water for concrete – Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete* [1)]

BS EN 12390-2, *Testing hardened concrete – Part 2: Making and curing specimens for strength tests*

BS EN 12390-3, *Testing hardened concrete – Part 3: Compressive strength of test specimens*

BS EN 12390-4:2000, *Testing hardened concrete – Part 4: Compressive strength – Specification for testing machines*

1) This standard also gives an informative reference to BS EN 1008:2002.

BS EN 12620, *Aggregates for concrete* [2)]

BS EN 15167-1, *Ground granulated blastfurnace slag for use in concrete, mortar and grout – Part 1: Definitions, specifications and conformity criteria*

BS EN 15167-2, *Ground granulated blastfurnace slag for use in concrete, mortar and grout – Part 2: Conformity evaluation*

# 3 Terms, definitions and symbols

## 3.1 Terms and definitions

For the purposes of this part of BS 5834, the following terms and definitions apply.

**3.1.1 adaptor slab**
reinforced concrete or recycled polymer component incorporating an access opening, used at the top of a utility chamber to provide support for a surface box

**3.1.2 base wall unit**
lowest placed wall unit, incorporating slots for entry and exit of utility apparatus

**3.1.3 bearing slab**
reinforced concrete or recycled polymer component, with or without an aperture for the entry and exit of utility apparatus, used at the base of a utility chamber to provide support for the structure

**3.1.4 cementitious content**
quantity of cement plus any pozzolanic or latent hydraulic addition in the concrete mix

*NOTE This is measured in kg/m$^3$.*

**3.1.5 clear opening**
access opening in an adaptor slab through which a horizontal plate of the specified chamber dimensions passes unimpeded without deviation

*NOTE The corners of the horizontal plate are removed.*

**3.1.6 concrete cover**
thickness of concrete over any reinforcement

**3.1.7 intermediate wall unit**
wall unit for extending the structure upwards from the base wall unit

**3.1.8 nominal size**
numerical designation of the size of a utility chamber, which is an integer approximately equal to the internal length/width (LN/WN)

*NOTE This is measured in millimetres.*

**3.1.9 recycled polymer**
polymer made up predominantly of recycled thermoplastics materials

[2)] This standard also gives an informative reference to BS EN 12620:2002.

**3.1.10 routine inspection**
inspection by sampling at prescribed intervals

*NOTE This is used to indicate the number of units of the same nominal size and type, manufactured from a specific process that can be evaluated to have attained, and continue to be in, a state of control, and adhere to the relevant acceptance criteria.*

**3.1.11 sample**
one or more units selected at random

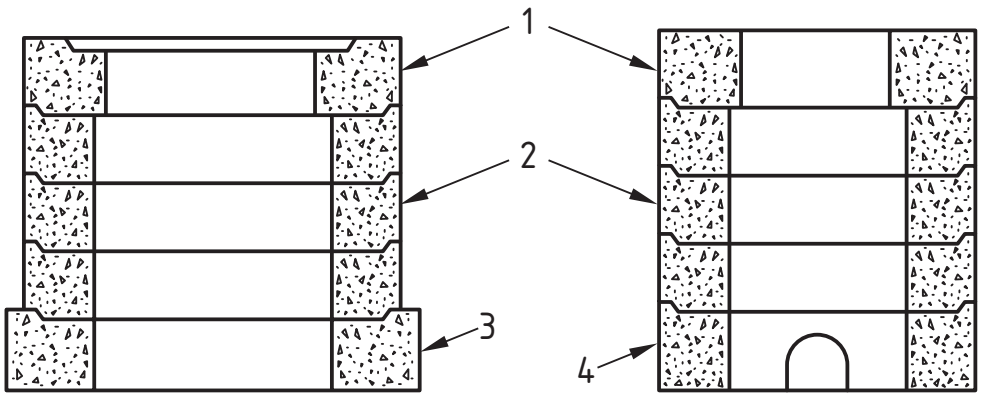
**3.1.12 switching rules**
rules that govern the decision to increase or decrease the inspection requirements

*NOTE See **H.2** for more information regarding switching rules.*

**3.1.13 unit**
component of an utility chamber

*NOTE This can be made from precast reinforced concrete or recycled polymer. See Figure 1.A for typical components of a utility chamber.*

Figure 1.A **Typical components of an utility chamber: sectional elevation**




a) Using bearing slab

b) Using base wall unit

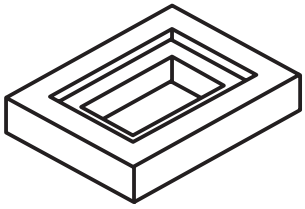
**Key**

1 Adaptor slab
2 Intermediate wall section
3 Bearing slab
4 Base wall section

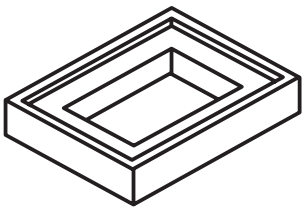
**3.1.14 utility chamber**
vertical structure used to house utility apparatus and to permit access for personnel and/or equipment for inspection and maintenance

*NOTE See Figure 1.A and Figure 1.B.*

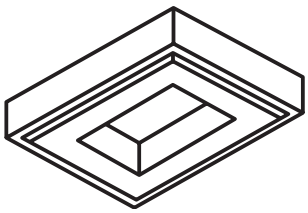
Figure 1.B **Typical components of a utility chamber: isometric views**



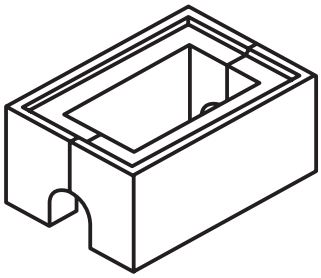
a) Adaptor slab



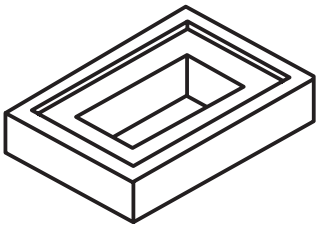
b) Intermediate wall section (view from above)



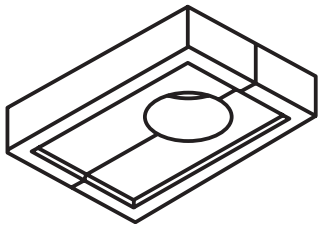
c) Intermediate wall section (view from below)



d) Base wall section



e) Bearing slab (view from above, shown with optional aperture)



f) Bearing slab (view from below)

**Key**

Intermediate wall section
Depths: 25 mm (polymer only)
50 mm (polymer only)
75 mm
100 mm
150 mm
200 mm
300 mm

Base wall section
Depths: 150 mm
200 mm
280 mm

Bearing slabs
Thickness (min.): 75 mm

**3.1.15 wall unit**
vertical hollow reinforced concrete or recycled polymer component of uniform rectangular cross-section, except at the joint profile

## 3.2 Symbols

For the purposes of this British Standard the symbols in Table 1 apply.

Table 1 **Symbols**

| Symbol | Meaning | Unit | Reference |
|---|---|---|---|
| *A* | maximum length/width of female joint in adaptor slab | mm | **5.6** |
| *B* | minimum length/width of female joint in adaptor slab | mm | **5.6** |
| *C* | maximum length/width of male joint in adaptor slab | mm | **5.6** |
| *D* | minimum length/width of male joint in adaptor slab | mm | **5.6** |
| *d* | loaded depth of intermediate wall unit | m | **F.2.2** |
| *L* | internal length of intermediate wall unit | m | **F.2.2** |
| N | test per nominal size | — | Annex G |
| *P* | calculated test load | kN | **F.2.2** |
| R | routine inspection test | — | Clause **6** |
| S | test per type, nominal size and grade | — | Annex G |
| T | initial type test | — | Clause **6** |
| *t* | wall thickness of intermediate wall unit | m | **F.2.2** |
| Y | test per type, nominal size and grade produced per 1 000, with a minimum of one per type and year | — | Annex G |

# 4 Grading

Units shall be graded as one of the following.

a) *Grade A (heavy)*. Utility chambers for use with surface boxes suitable for use in carriageways capable of supporting fast-moving commercial vehicles with wheel loads[3)] of up to 5 t.

b) *Grade B (medium).* Utility chambers for use with surface boxes capable of supporting wheel loads[3)] of up to 5 t, for use in areas to which vehicles would only have occasional access.

c) *Grade C (light).* Utility chambers for use with surface boxes for use in areas not intended for use by vehicles.

*NOTE Installation techniques (e.g. surrounding in concrete) can significantly contribute to the load-bearing qualities of the installed unit. Reference should be made to the appropriate manufacturer's instructions.*

[3)] The magnitude of the stated wheel load is as exerted by a stationary vehicle.

# 5 General requirements

## 5.1 Materials

### 5.1.1 Cements

Cements shall conform to **5.2.4**.

### 5.1.2 Aggregates

Aggregates shall conform to BS EN 12620.

*NOTE BS EN 12620:2002, **4.3.7**, permits special aggregate gradings where these are needed to suit the manufacturing process, provided the special grading envelopes are defined using the R20 series of sieves specified in ISO 565:1990 and incorporating the appropriate sieves from a specified range of sizes.*

### 5.1.3 Admixtures

Admixtures shall conform to BS EN 934-2.

### 5.1.4 Additions

Additions shall be in the form of ground granulated blastfurnace slag (ggbs) or pulverized-fuel ash (pfa), conforming to BS EN 15167-1, BS EN 15167-2 and BS EN 450-1, Category A or B, respectively.

### 5.1.5 Mixing water

Mixing water for concrete shall conform to BS EN 1008.

*NOTE BS EN 1008:2002, **3.1**, specifies that potable water does not need testing.*

### 5.1.6 Reinforcing steel

Reinforcing steel shall conform to BS 4449, BS 4482 or BS 4483.

## 5.2 Concrete

### 5.2.1 Concrete materials

Only materials specified in **5.1** shall be used.

### 5.2.2 Concrete strength

With the exception of:

a) adaptor slabs with 150 mm × 150 mm and 600 mm × 450 mm clear openings;

b) LN 430/WN 280 and LN 915/WN 610 utility chambers; and

c) intermediate wall units for utility chambers with a nominal length exceeding LN 400 (see **5.7.2**);

units without structural requirements specified in this part of BS 5834, shall have a characteristic compressive strength of not less than 30 MPa ($N/mm^2$).

The characteristic compressive strength shall be verified by making and curing cubes or cylinders either:

1) in a manner that reflects the manufacturing process; or

2) in accordance with BS EN 12390-2.

Where method 2) is adopted, a conversion factor shall be applied to the results of the tests to take into account differences between the manufacturing process and that used to produce the test specimens in accordance with the relevant part of BS EN 12390-2 and BS EN 12390-3. This conversion factor shall be determined by correlation tests, the results of which shall be made available for inspection. Correlation tests shall be repeated at least once annually and whenever a change is made in the materials or manufacturing process.

The cubes or cylinders shall be tested in accordance with the relevant part of BS EN 12390-3.

The minimum rate of sampling concrete shall be in accordance with Table 2.

Table 2 **Minimum rate of sampling concrete**

| **Production** | **Minimum rate of sampling** | | |
|---|---|---|---|
| | **First 50 $m^3$ of production** | **After first 50 $m^3$ of production** [A)] | |
| | | **Concrete with production control certification** | **Concrete without production control certification** |
| Initial (until at least 35 test results are obtained) | 3 samples | 1/200 $m^3$ or 2/production week | 1/150 $m^3$ or 1/production day |
| Continuous (when at least 35 test results are obtained) | | 1/400 $m^3$ or 1/production week | |

[A)] Sampling shall be distributed throughout the production and not more than one sample within each 25 $m^3$ shall be taken.

*NOTE This table is consistent with the provisions of BS EN 206-1.*

### 5.2.3 Concrete quality

The concrete in any unit shall be compacted, homogenous and conform to **5.2.4** and **5.2.5**.

### 5.2.4 Types of cement

The cement type used shall either:

a) be factory-produced by the cement manufacturer and conform to one of the following standards:

1) CEM I – BS EN 197-1;

2) CEM II/B-V – BS EN 197-1;

3) BIII/B – BS EN 197-4; or

4) sulphate-resisting Portland – BS 4027.

or,

b) consist of a combination cement conforming to CEM I, as specified in BS EN 197-1, and additional ggbs or pfa in

accordance with Table 3. The additional material shall be included as part of the concrete mix by simultaneously combining it with the other concrete materials at the concrete mixer.

Table 3 **Additional ggbs or pfa for CEM I cement**

| Additional material to cement | Standard | % (mm/m) of total |
|---|---|---|
| Ground granulated blastfurnace slag (ggbs) | BS EN 15167-1; BS EN 15167-2 | 0 to 65 |
| Pulverized fuel ash (pfa) | BS EN 450-1 | 15 to 35 |

Where combinations of cement conforming to CEM I (as specified in BS EN 197-1) and ggbs or pfa are used, the relevant proportion of ggbs or pfa shall be fully documented in the production records (see **7.3**).

### 5.2.5 Cementitious content

The fully compacted concrete shall have a minimum cementitious content of 340 kg/m$^3$.

*NOTE Units conforming to this part of BS 5834 are suitable for use in wet, rarely dry conditions and a slightly aggressive chemical environment (i.e. generally the most adverse conditions for natural soils and groundwaters in the top metre or so of undisturbed ground). Where more severe conditions are expected, special attention needs to be given to the cement and any permitted addition to the concrete (see Annex A). A "wet, rarely dry" condition for concrete surfaces subject to long-term water contact and a "slightly aggressive chemical environment", together with more severe environments, are defined in BS EN 206-1.*

### 5.2.6 Chloride content

The amount of chloride ion in the concrete shall be evaluated by calculation and shall not exceed 0.4% by mass of the cementitious content.

### 5.2.7 Concrete cover

The minimum concrete cover shall be 20 mm, or the relevant nominal maximum size of aggregate stated in the factory documents, whichever is the larger.

*NOTE This requirement is consistent with the normal exposure conditions described in the note in **5.2.5**.*

## 5.3 Recycled polymers

### 5.3.1 Traceability

The origins of recycled polymers used shall be fully traceable.

*NOTE Ideally recycled polymers should be sourced from a food packaging source. This includes recycled material from domestic or industrial food packaging.*

**WARNING.** Recycled materials from agricultural, chemical or automotive industries should not be used unless the recycling process removes or repairs contaminants or material damage to such an extent that they do not render the recycled material unfit for the intended application (see BS EN 15343:2007). Where contamination or damage cannot be removed or repaired during recycling, the purchase and/or control of the incoming materials should guarantee that contaminated or damaged material does not enter the process in quantities that affect the properties of the recycled material.

#### 5.3.2 Material constitution

The material used shall contain a minimum of 90% by mass of recycled polymer.

*NOTE The recycled polymer can include a bonding agent.*

#### 5.3.3 Density

When measured in accordance with Annex B, the material shall have a minimum density of 800 kg/m$^3$.

#### 5.3.4 Porosity

After moulding there shall be no localized porosity and no pores exceeding 0.5 mm in diameter. When measured in accordance with Annex C, the increase in mass shall be not greater than 4%.

### 5.4 Units

After any final treatment is applied:

a) concrete units shall not exhibit any surface void greater than 12 mm deep; and

b) all units shall be free from burrs.

*NOTE A final treatment is the final process applied to a unit so that it is in a saleable condition.*

### 5.5 Geometrical characteristics

#### 5.5.1 General

When measured in accordance with Annex D, the dimensions of a unit shall conform to **5.5.2** to **5.5.7** inclusive, as appropriate.

#### 5.5.2 Utility chamber sizes

Nominal sizes of utility chambers shall be as given in Table 4. When measured in accordance with **D.1**, the chamber dimensions shall conform to Table 4 within the following tolerances.

a) ±6 mm up to and including LN/WN 610; and

b) ±10 mm for LN 915.

Table 4 **Nominal sizes of utility chambers**
Dimensions in millimetres

| Nominal size [A] | |
|---|---|
| **LN** | **WN** |
| 230 | 230 |
| 305 | 305 |
| 380 | 230 |
| 430 | 280 |
| 610 | 455 |
| 610 | 610 |
| 915 | 610 |

[A] Any chamfered or rounded corners shall not reduce the chamber area in the horizontal plane by more than 1600 $mm^2$ at each corner for utility chambers up to and including LN 430/WN 280 and by more than 3800 $mm^2$ for larger sizes.

### 5.5.3 Bearing slabs

#### 5.5.3.1 Thickness

When measured in accordance with **D.2**, bearing slabs shall have a minimum thickness of 75 mm.

#### 5.5.3.2 Apertures

Where apertures are provided in bearing slabs, their sizes shall be as specified in Table 5 when measured in accordance with **D.1**.

Table 5 **Bearing slab aperture sizes**
Dimensions in millimetres

| Nominal size of utility chamber | Aperture size [A] |
|---|---|
| LN/WN | |
| 230/230 | 100 × 100 |
| 305/305 | 295 × 295 |
| 430/280 | 380 × 230 or 230 diameter |
| 610/455 | 600 × 445 |

[A] The tolerance on an aperture size shall be $^{+10}_{0}$ mm.

Rectangular apertures shall be positioned centrally in the bearing slab.

Bearing slabs with a 230 mm diameter aperture shall be supplied in two halves (see Figure 1.A and Figure 1.B), the aperture being positioned centrally across the minor axis and anywhere along the major one.

### 5.5.4 Base wall units

When measured in accordance with **D.3**, base wall units shall have a depth of 150 mm ±5 mm, 200 mm ±5 mm or 280 mm ±5 mm and be supplied in either one or two pieces (see Figure 1.A and Figure 1.B).

### 5.5.5 Intermediate wall units

When measured in accordance with **D.3**, intermediate wall units shall have a depth of 75 mm ±5 mm, 100 mm ±5 mm, 150 mm ±5 mm, 200 mm ±5 mm or 300 mm ±5 mm.

*NOTE Units made from recycled polymer may also have a depth of 25 mm ±5 mm and 50 mm ±5 mm.*

### 5.5.6 Wall thickness

The wall thickness of wall units shall be 65 $^{+6}_{-2}$ mm, 75 $^{+6}_{-2}$ mm or 100 $^{+6}_{-2}$ mm.

### 5.5.7 Adaptor slabs

When measured in accordance with **D.2**:

a) concrete adaptor slabs shall have a minimum depth of 100 mm;

b) recycled polymer adaptor slabs shall have a minimum depth of 75 mm.

Adaptor slabs shall have either a continuous flat upper surface or be recessed to accept the flange of the surface box.

For adaptor slabs, the depth of the recess shall be a minimum of 12 $^{+2}_{0}$ mm.

*NOTE See Annex A regarding the choice of mating surfaces.*

Each adaptor slab shall have a centrally positioned clear opening conforming to Table 6 when measured in accordance with **D.1**.

Table 6 **Clear opening sizes and test loads for adaptor slabs**

| **Nominal size of utility chamber** LN/WN in mm | **Clear opening** mm | **Test load** kN | | **Test plate size** mm | **Test block size** mm |
|---|---|---|---|---|---|
| | | **Grade A or B** | **Grade C** | | |
| 230/230 | 225 × 225 | — | — | — | — |
| 305/305 | 300 × 300 | — | — | — | — |
| 380/230 | 380 × 230 | — | — | — | — |
| 430/280 | 150 × 150 | 262 [A)] | 26.0 [B)] | 230 × 230 | 230 × 230 |
| | 380 × 230 | — | — | — | — |
| | 430 × 280 | — | — | — | — |
| 610/455 | 600 × 450 | — | — | — | — |
| 610/610 | 600 × 600 | — | — | — | — |
| 915/610 | 600 × 450 | 350 | 35 | 680 × 530 | 300 dia. |
| | 900 × 600 | — | — | — | — |

[A)] Calculated from: $350 \times \frac{(230 \times 230)}{70\,686}$ See BS 5834-2.

[B)] Calculated from: $35 \times \frac{(230 \times 230)}{70\,686}$ See BS 5834-2.

### 5.5.8 Slots for utility apparatus

The sizes of slots for utility apparatus in base wall units shall, for utility chambers up to and including LN 610/DN 455, be as specified in Table 7. The tolerance on slot breadth and height shall be $^{+6}_{0}$ mm.

Table 7 **Slot sizes in base wall units**
Dimensions in millimetres

| Depth of unit | Breadth | Height [A)] |
|---|---|---|
| 150 | 65 | 55 |
| 200 | 70 | 70 |
| 280 | 120 | 120 |

A) The top of the slots shall be either semi-circular or semi-hexagonal in side elevation.

*NOTE For slots in larger units, see Annex A.*

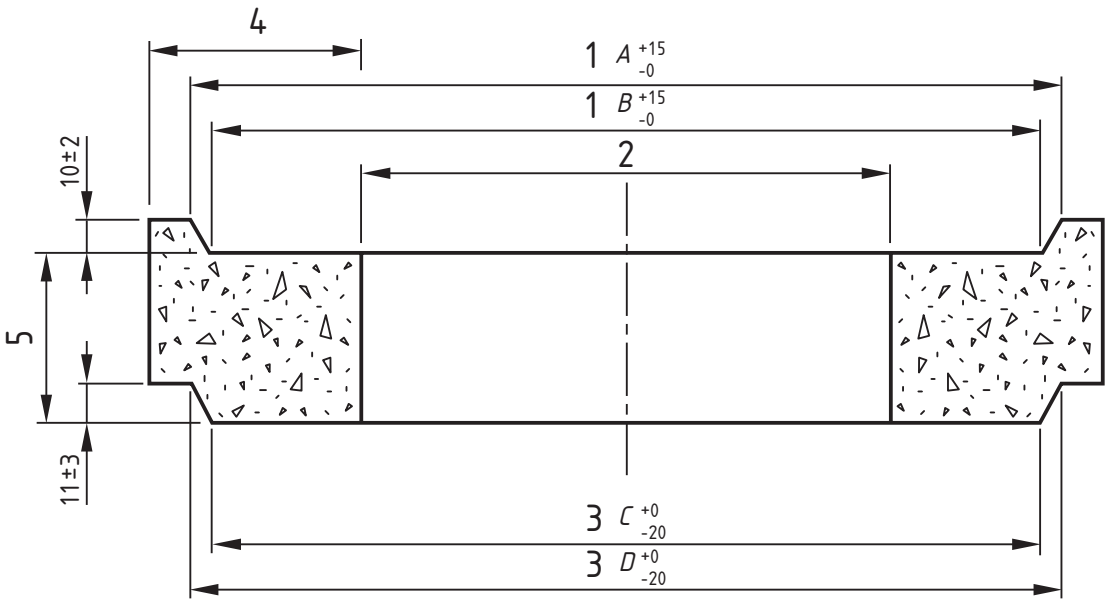
Slots shall be arranged on the vertical centre lines of the two shorter sides and, in the case of square chambers, on any two opposite sides.

## 5.6 Joints

Except where a flat upper mating surface is required for adaptor slabs (see **5.5.7**), joints shall be rebated in accordance with Figure 2 and Table 8.

Figure 2 **Rebated joints**

Dimensions in millimetres




**Key**

1 Female joint
2 Length or width
3 Male joint
4 Wall thickness
5 Depth

Table 8 **Rebated joint dimensions**

| LN or WN | Wall thickness | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimum dimensions in millimetres | | | | | | | | | | | |
| | Female | | | | | | Male | | | | | |
| | 65 mm | | 75 mm | | 100 mm | | 65 mm | | 75 mm | | 100 mm | |
| | *A* | *B* | *A* | *B* | *A* | *B* | *C* | *D* | *C* | *D* | *C* | *D* |
| 230 | 315 | 310 | 335 | 330 | 385 | 380 | 314 | 309 | 334 | 329 | 384 | 379 |
| 280 | 365 | 360 | 390 | 385 | 435 | 430 | 364 | 359 | 389 | 384 | 434 | 429 |
| 305 | 390 | 385 | 410 | 405 | 465 | 460 | 389 | 384 | 409 | 404 | 464 | 459 |
| 380 | 465 | 460 | 485 | 480 | 535 | 530 | 464 | 459 | 484 | 479 | 534 | 529 |
| 430 | 515 | 510 | 545 | 540 | 585 | 580 | 514 | 509 | 544 | 539 | 584 | 579 |
| 455 | 555 | 550 | 555 | 550 | 610 | 605 | 554 | 549 | 554 | 549 | 609 | 604 |
| 610 | 705 | 700 | 710 | 705 | 770 | 765 | 704 | 699 | 709 | 704 | 769 | 764 |
| 915 | 1 000 | 995 | 1 020 | 1 015 | 1 070 | 1 065 | 999 | 994 | 1 019 | 1 014 | 1 069 | 1 064 |

## 5.7 Strength

### 5.7.1 Vertical load strength of adaptor slabs

Tests shall be carried out on adaptor slabs for which test loads are specified in Table 6.

When tested in accordance with Annex E, the surface width of any residual crack in the undersurface shall not exceed 0.15 mm over a continuous length of 300 mm or more, or the full width of a concrete surface, whichever is the smaller.

When tested in accordance with Annex E, recycled polymer units shall not show any signs of stress or failure, and vertical or lateral movements shall not exceed 0.1 mm.

### 5.7.2 Horizontal load strength of intermediate wall units

When tested in accordance with Annex F, an intermediate wall unit for utility chambers with a nominal length exceeding LN 400 shall withstand a pressure of 85 kN/m$^2$.

# 6 Requirements and testing for finished products

Finished products shall be tested in accordance with Table 9.

Table 9 **Summary of requirements supported by testing**

| Clause | Requirement | Bearing slab | Base wall unit | Intermediate wall unit | Adaptor slab |
|---|---|---|---|---|---|
| **5.2.7** | Concrete cover | T/R | T/R | T/R | T/R |
| **5.4** | Visual inspection of finish | T/R | T/R | T/R | T/R |
| **5.5** | Dimensions | T/R | T/R | T/R | T/R |
| **5.7.1** | Vertical load strength [A)] | — | — | — | T/R |
| **5.7.2** | Horizontal load strength [B)] | — | — | T/R | — |

[A)] Only applicable to adaptor slabs for LN 430/WN 280 utility chambers, with a 150 mm × 150 mm clear opening, and those for LN 915/WN 610 chambers, with a 600 mm × 450 mm opening.

[B)] Only applicable to intermediate wall units for utility chambers with a nominal length exceeding LN 400.

# 7 Product evaluation

## 7.1 Product evaluation procedures

Products shall be evaluated through:

a) initial type testing of units;

b) factory production control; and

c) further testing of samples in accordance with **7.4**.

## 7.2 Initial type testing

Initial type testing shall be undertaken to demonstrate conformity to this part of BS 5834.

Initial type testing shall also be undertaken:

a) at the start of production of a new type;

b) whenever there is a change in structural design or method of manufacture.

The initial type test shall consist of taking samples in accordance with Annex G from the production line and subjecting them to the relevant test(s). Where routine inspection is required, the results from initial type tests shall not be used.

Initial type testing shall only be carried out with the manufacturer's officially calibrated test equipment.

## 7.3 Factory production control

The manufacturer shall establish, document and maintain a factory production control system. The factory production control system shall consist of procedures, regular inspections and tests and/or assessments

and the use of results to control raw and other incoming materials or components, the production process and the product.

*NOTE This requirement would be satisfied by a quality control system conforming to BS EN ISO 9001 or equivalent.*

### 7.4 Further testing of samples taken at the factory

Samples shall be taken during initial type testing and at further routine inspection. Routine inspections shall be carried out on samples at intervals specified by the manufacturer.

For load tests, each type and nominal size of unit shall be subjected to routine inspection in accordance with Annex H.

## 8 Marking

Each slab and a minimum of 20% of each delivery batch of wall units shall be marked indelibly and in a clearly visible manner. Identification of the unit(s) shall be made in such a way that they cannot be misidentified.

*NOTE This requirement does not preclude the use of adhesive labels.*

Marking shall include the following minimum information:

a) the manufacturer's name, trade mark or identification mark, and site of production;

b) the number and date of this British Standard, i.e. "BS 5834-4:2011" [4)];

c) the grade, i.e. "A", "B" or "C";

d) the date of manufacture; and

e) identification of exposure conditions excluding sewer condensates, water, salt and motor vehicle oils.

[4)] Marking BS 5834-4:2010 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

## Annex A (informative) Information to be supplied in an enquiry or order

The following particulars cover details required by the manufacturer so that an enquiry or order can be fully understood:

a) quantity, nominal size(s) and grade of utility chambers (see Table 4 and Clause **4**);

b) size of clear openings in adaptor slabs (see Table 6);

c) details of any exposure conditions of greater severity than those considered normal (see note to **5.2.5**);

d) details of any slots in intermediate wall units for utility chambers having a nominal size greater than LN 610/DN 455 (see **5.5.8**); and

e) whether a flat or rebated upper mating surface is required for adaptor slabs.

## Annex B (normative) Method for measuring density

To measure the density of recycled polymers, the following method shall be used.

a) Take a 100 mm cube of extruded or compressed, moulded material.

*NOTE The properties of the material should be representative of the materials in finished products.*

b) Weigh the sample.

c) Calculate and record the density of the material in kilogrammes per cubic metre.

## Annex C (normative) Method for measuring porosity

To measure the porosity of recycled polymers, the following method shall be used.

a) Take a 100 mm cube of extruded or compressed, moulded material.

*NOTE The properties of the material should be representative of the materials in finished products.*

b) Weigh the sample.

c) Completely submerge the sample in water for seven days.

d) Weigh the sample immediately after removal from the water.

e) Calculate and record the increase in mass as a percentage of the original mass.

# Annex D (normative) Dimensional measurements

*NOTE At the manufacturer's discretion it is permissible to use purpose-made "go/no-go" steel gauges for dimensional measurements in lieu of the apparatus specified for the tests in this annex.*

## D.1 Internal dimensions

### D.1.1 Apparatus

**D.1.1.1** *Steel measuring tape or retractable pocket rule*, conforming to BS 4035 with metric graduation and figuring conforming to BS 4484-1.

### D.1.2 Procedure

Measure each internal dimension twice, approximately 50 mm from each end, and record the results in millimetres.

## D.2 Thickness of slab test

### D.2.1 Apparatus

**D.2.1.1** *Steel measuring tape or retractable pocket rule*, conforming to BS 4035 with metric graduation and figuring conforming to BS 4484-1.

### D.2.2 Procedure

Measure the thickness at the outer edge at each corner of the slab and record the results in millimetres.

## D.3 Internal depth of wall unit

### D.3.1 Apparatus

**D.3.1.1** *Steel measuring tape or retractable pocket rule*, conforming to BS 4035 with metric graduation and figuring conforming to BS 4484-1.

### D.3.2 Procedure

Measure and record the internal depth at each corner of the unit in millimetres.

# Annex E (normative) Method of test for vertical load strength of adaptor slabs

## E.1 Apparatus

**E.1.1** *Device for applying the load*, preferably a hydraulic testing machine conforming to the accuracy requirements for BS EN 12390-4:2000, Class 3, capable of applying a load at least 25% greater than the appropriate load specified in Table 6. If any other loading device is used it shall be accurate to within 3% of the indicated load.

**E.1.2** *Rigid test plate*, with dimensions in accordance with Table 6 and faced on the underside with a 25 mm thick rubber layer of hardness between 50 IRHD and 60 IRHD.

## E.2 Procedure

**E.2.1** Uniformly support the adaptor slab on a rigid perimeter support having internal dimensions of the appropriate utility chamber size and with a top surface equal to or greater than the thickness of the wall unit with which the slab is designed for use.

*NOTE It is permissible for the adaptor slab to be provided with such further support as would result in use, following installation in accordance with the manufacturer's instructions. If those instructions specify the provision of a concrete collar to provide peripheral support to the top of the utility chamber, this may be simulated by placing a rigid steel collar of the same depth as that specified for the concrete around the slab, provided that there is an all-round clearance of at least 1 mm between collar and slab.*

**E.2.2** Apply the test load specified in Table 6 to the upper surface of the adaptor slab through a rigid test plate positioned as shown in Figure E.1 a) or b), as appropriate, progressively and without shock, within a total period of 1 min. Sustain the load for a minimum of 30 s.

**E.2.3** After removal of the load, measure the width of any residual crack in the undersurface of the adaptor slab.

**E.2.4** In the case of recycled polymer units, examine the unit for any visible signs of stress or failure and measure any vertical or lateral movement exceeding 0.1 mm.

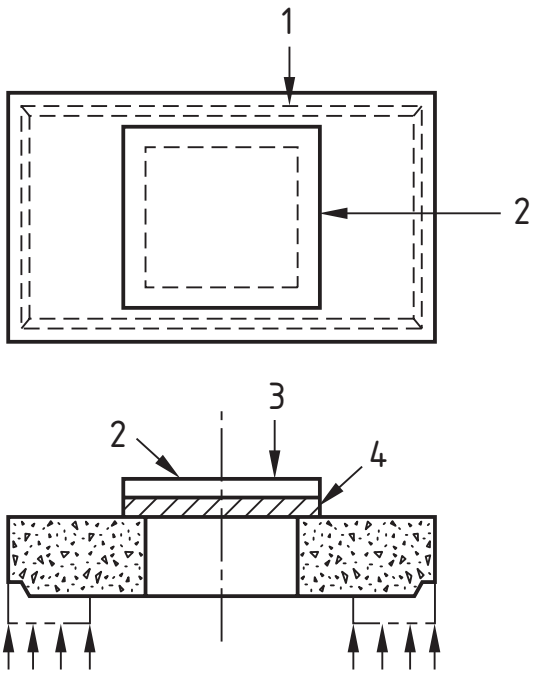
## E.3 Expression of results

**E.3.1** Measure the surface width of any residual crack and record conformity or non-conformity to **5.7.1**.

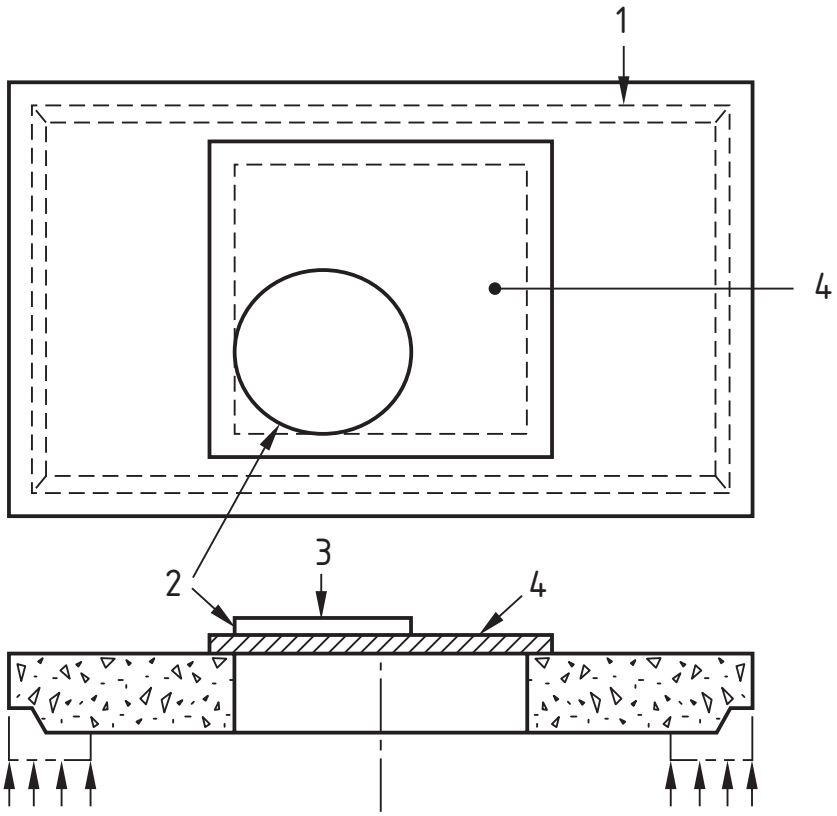
**E.3.2** In the case of recycled polymer units, record any signs of stress or failure and any vertical or lateral movements exceeding 0.1 mm.

Figure E.1 **Loading positions for vertical load strength test**

Dimensions in millimetres




a) Adaptor slab for LN 430/WN 280 utility chamber, with 150 mm × 150 mm clear opening and no recess




b) Adaptor slab for LN 915/WN 610 utility chamber, with 600 mm × 450 mm clear opening and no recess

**Key**

1 Hidden detail of male joint
2 Test block
3 Load
4 Test plate

# Annex F (normative) Method of test for horizontal load strength of intermediate wall units

## F.1 Apparatus

**F.1.1** *Testing machine*, capable of applying the full test load, equipped with a load-recording facility and conforming to the accuracy requirements for Class 3 in BS EN 12390-4:2000. The structure shall ensure that the distribution of the load is not affected appreciably by the deformation or yielding of any part.

**F.1.2** *Bearers*, consisting of an upper beam and a lower beam or base, on which steel rollers are symmetrically positioned as shown in Figure F.1. The bearers shall be located on the machine so as to receive and uniformly transmit the test load without lost motion, vibration or sudden shock.

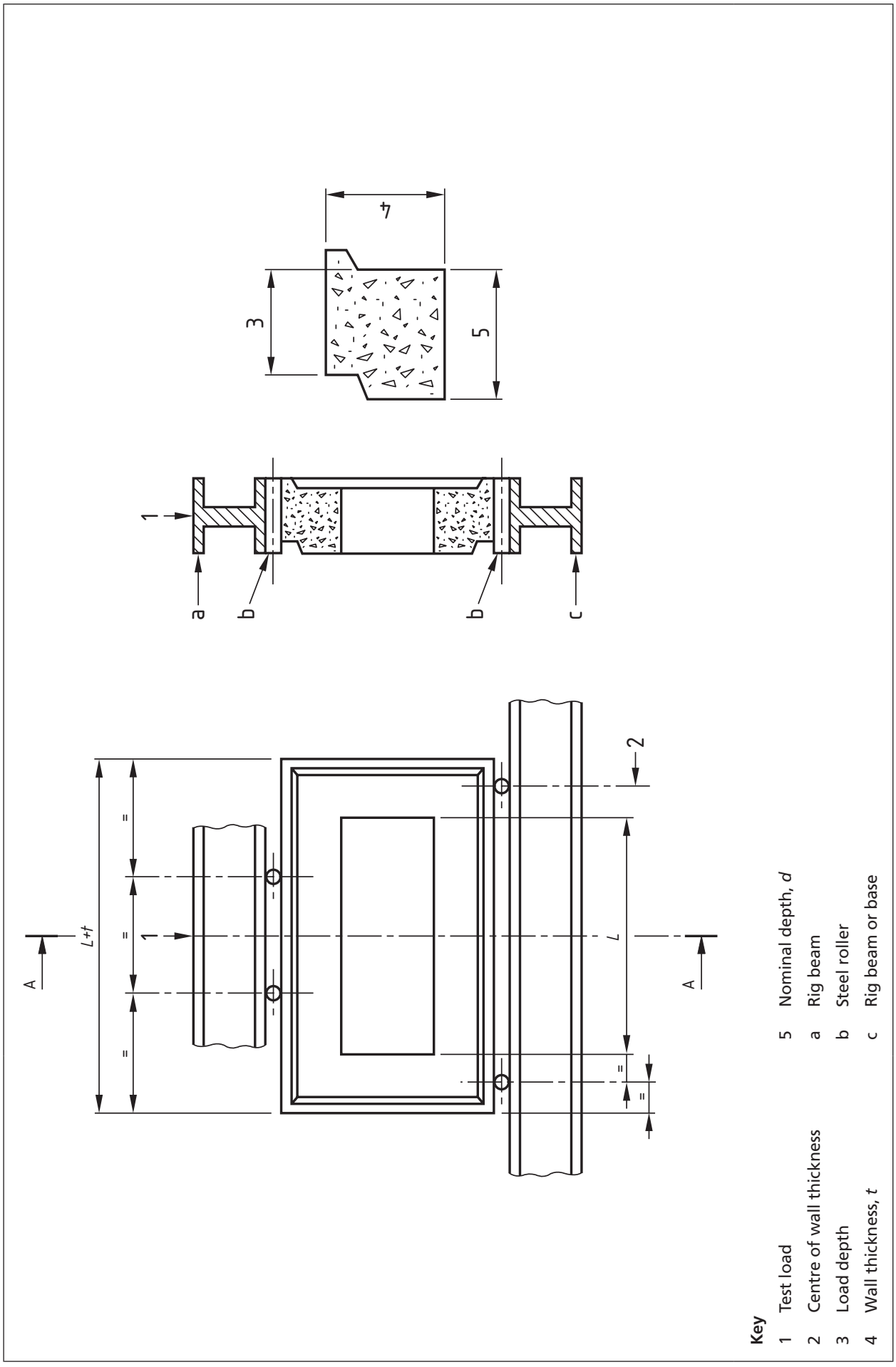
## F.2 Procedure

**F.2.1** Place the unit to be tested with its longest side positioned on the two lower rollers as shown in Figure F.1. Position the upper beam and rollers above the unit, as shown in Figure F.1.

**F.2.2** Calculate test load, $P$, from the following formula:

$$P = \frac{(L + 2t) \times d \times 85}{1.33}$$

**F.2.3** Apply the test load centrally to the upper bearer, increasing it at a rate between 20 kN/m and 25 kN/m per minute. Continuously increase the load until it reaches the required test load mass.




Key

1 Test load
2 Centre of wall thickness
3 Load depth
4 Wall thickness, *t*
5 Nominal depth, *d*
a Rig beam
b Steel roller
c Rig beam or base

Figure F.1 **Arrangements for load strength test**

# Annex G (normative) Sampling procedures for inspection of finished products

Sampling for the inspection of finished products shall be in accordance with Table G.1.

Table G.1 **Sampling procedures**

| Clause | Test where specified | Initial type test | Routine inspection |
|---|---|---|---|
| **5.2.7** | Concrete cover | 1 N | 2 N/day using cover meter |
| **5.4** | Visual inspection of finish | Every tested unit | Every tested unit |
| **5.5** | Dimensions | 3 N | 3 Y |
| **5.7.1** | Vertical load strength [A)] | 1 S | See **H.3.2** |
| **5.7.2** | Horizontal load strength [B)] | 1 S | See **H.3.2** |

A) Only applicable to adaptor slabs for LN 430 mm/WN 280 mm utility chambers, with a 150 mm × 150 mm clear opening, and those for LN 915/WN 610 chambers, with a 600 mm × 450 mm opening.

B) Only applicable to intermediate wall units for utility chambers with a nominal length exceeding LN 400 mm.

*NOTE Symbols are referred to in **3.2**.*

# Annex H (normative) Sampling procedures for routine inspection of strength

## H.1 Levels of inspection and the interpretation of results

### H.1.1 Inspection levels

Inspections shall be carried out at one of the following three levels, as follows.

a) *Tightened inspection*. This shall be applied when a new production or a change in process occurs.

b) *Normal inspection*. This shall be applied according to the relevant rate when the specific process is under a state of control.

c) *Reduced inspection*. A lower rate of sampling may be applied when so permitted by the switching rules in **H.2**.

*NOTE The inspection level in use may be switched to one of the other two levels, in accordance with the switching rules in **H.2**. See **H.3** for an explanation of the different levels of inspection.*

### H.1.2 Interpretation of results

The acceptability of results of routine tests and inspection shall be determined in accordance with the provisions of **H.4**.

## H.2 Switching inspection levels

### H.2.1 Tightened to normal inspection

Tightened inspection shall continue until five consecutive samples show conformity to the requirement, at which time normal inspection may be instituted or reinstated.

### H.2.2 Discontinuation of inspection

If ten consecutive samples remain on tightened inspection, the provisions of these sampling procedures shall be discontinued pending action to improve the quality of the submitted products.

### H.2.3 Normal to reduced inspection

At the manufacturer's discretion reduced inspection may be introduced when normal inspection is in effect, provided that the following conditions are met:

a) the last ten samples have shown conformity with the requirement;

b) the production is in a state of control.

### H.2.4 Reduced to normal inspection

When reduced inspection is in effect, normal inspection shall be reinstated if any of the following occur on original inspection (i.e. before any non-acceptance):

a) a sample has shown nonconformity to the requirement;

b) the production becomes irregular or is delayed;

c) other conditions warrant the reinstatement of normal inspection.

### H.2.5 Normal to tightened inspection

When normal inspection is in effect, tightened inspection shall be reinstated if two or more samples have shown nonconformity with the requirement in any five consecutive tests of normal inspection.

## H.3 Tightened, normal and reduced inspection

### H.3.1 Tightened inspection

Tightened inspection corresponds to twice the sampling rate of normal inspection.

### H.3.2 Normal inspection

The maximum production on consecutive working days before a sampling under normal inspection of each type and nominal size shall be 750 units. If a particular nominal size has not been produced for a period of 60 consecutive working days, a sampling shall be carried out when production recommences, subject to at least one sampling per year.

### H.3.3 Reduced inspection

Reduced inspection corresponds to half the sampling rate of normal inspection.

## H.4 Acceptability determination: inspection on the basis of individual assessments

### H.4.1 Application

Inspection on the basis of individual assessments shall be applied to test results for all samples.

### H.4.2 Procedure

Compare every test result to the appropriate requirement in **5.7**.

### H.4.3 Acceptance criteria

If the result conforms to the appropriate requirement in **5.7**, the corresponding production shall be accepted.

If a result does not conform to the appropriate requirement, a sample of two more units from the same production shall be tested. If both results of this second sample conform to the appropriate requirement, the corresponding production shall be accepted, with the exception of any defectives. If one or both results from this second sample do not conform to the appropriate requirement, it shall be determined which part of the corresponding production is concerned and that part shall be rejected.

# Bibliography

## Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 5834-2, *Surface boxes, guards and underground chambers for the purposes of utilities – Part 2: Specification for surface boxes* [5)]

BS EN 206-1:2000, *Concrete – Part 1: Specification, performance, production and conformity*

BS EN 15343:2007, *Plastics – Recycled plastics – Plastics recycling traceability and assessment of conformity and recycled content*

BS EN ISO 9001:2008, *Quality management systems – Requirements*

ISO 565:1990, *Test sieves – Metal wire cloth, perforated metal plate and electroformed sheet – Nominal sizes of openings*

5) In preparation.

*This page deliberately left blank*

*This page deliberately left blank*

# British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

## About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

## Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

## Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

## Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

**PLUS** is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

**BSI Group Headquarters**

389 Chiswick High Road London W4 4AL UK

## Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

## Copyright



## Useful Contacts:

**Customer Services**
**Tel:** +44 845 086 9001
**Email (orders):** orders@bsigroup.com
**Email (enquiries):** cservices@bsigroup.com

**Subscriptions**
**Tel:** +44 845 086 9001
**Email:** subscriptions@bsigroup.com

**Knowledge Centre**
**Tel:** +44 20 8996 7004
**Email:** knowledgecentre@bsigroup.com

**Copyright & Licensing**
**Tel:** +44 20 8996 7070
**Email:** copyright@bsigroup.com

bsi.

...making excellence a habit.™