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ICS 91.100.30

Draft

Jamaican Standard

Specification

for

Standard hollow concrete blocks

BUREAU OF STANDARDS JAMAICA

Comment period: 25 April 2021 to 25 June 2021

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Jamaican Standards establish requirements in relation to commodities, processes and practices, but do not purport to include all the necessary provisions of a contract.

The attention of those using this standard specification is called to the necessity of complying with any relevant legislation.

Amendments

No.	Date of Issue	Remarks	Entered by and date

Contents

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Foreword

This standard is a revision of and supersedes JS 35: 2011. It is presented in metric unit only. This revision includes removal of the classification of blocks and the gauge and no gauge test method, change to the external dimensions of blocks, sample size of blocks and change to the compressive strength requirements for blocks.

This standard is compulsory.

Committee representation

Related Documents

This standard makes reference to the following:

a) AS 2193 Calibration and classification of force-measuring systems

b) ASTM C125 Standard Terminology Relating to Concrete and Concrete Aggregates

c) ASTM C140/C140M Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

d) ASTM 1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

e) ASTM C1552 Standard Practice for capping masonry units, related units and masonry prisms for compression testing

f) BS EN 771-3 Specification for masonry units. Aggregate concrete masonry units (Dense and lightweight aggregates)

g) IS 2185 Concrete Masonry Units – Specification Part 1 Hollow and solid concrete blocks

h) JS 32 Portland cement (ordinary and rapid-hardening)

i) JS 301 Jamaican Standard Specification for Blended hydraulic cement

j) JS 303 Physical test methods for hydraulic cements

k) JS 320 Jamaican Standard Specification (Performance-based) for General purposed hydraulic cement

l) *JS 124 Aggregates for concrete*

Draft Jamaican Standard Specification for Standard hollow concrete blocks

1 Scope

This standard applies to hollow pre-cast concrete blocks made from a mixture of Portland cement, water and suitable aggregates and intended for the use in loadbearing masonry walls of buildings and other structures.

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.

ASTM E4, *Standard Practices for Force Verification of Testing Machines*

BS 4551, *Mortar. Methods of test for mortar and screed. Chemical analysis and physical testing*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

JS 32, *Portland cement (ordinary and rapid-hardening)*

JS 303, *Physical Test Methods for Hydraulic Cement*

JS 320, *General purpose hydraulic cement (performance based)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
block
a concrete masonry unit, consists of, external dimensions that is greater than the corresponding dimensions specified for a brick. The height of the block shall not exceed either its length or six times its thickness to avoid confusion with slabs or panels.

3.2
block density
the value is calculated by dividing the weight of a block by the overall volume including holes and cavities.

3.3
curing
the maintenance of a satisfactory moisture content in concrete for a period of time immediately following the manufacturing of the blocks.

3.4
drying shrinkage
the differences between the length of a specimen, which has been immersed in water, and the length when subsequently dried, all under specified conditions, expressed as a percentage of the length of the specimen.

3.5
gross area
the area occupied by a block on its bedding face.

3.6
height
the exposed vertical face dimensions of a block, that is, excluding any tongue or any other device designed to produce mechanical keying.

3.7
hollow block
a block which has one or more large holes or cavities passing through the block and the solid material is between 50 % and 75% of the total volume of the block calculated from the overall dimensions.

3.8
length
the exposed horizontal face dimension of a block that is, excluding any tongue or other device designed to provide mechanical keying.

3.9
manufacturer
a block constructor who is registered by the appropriate authority in Jamaica.

3.10
net area
the area of a block in contact with a plane surface on its bedding face.

3.11
width
the external dimension of a block at the bedding plane, measured at right angles to the length and height of the block.

4 Materials

4.1 Cement

Cement shall comply with the requirements of JS 32 and JS 303 and JS 320.

4.2 Aggregates

The aggregates used in the manufacturing of blocks shall be clean and free from deleterious matter. The aggregates used shall be one or more of the following types:

a) natural aggregates (sand, natural gravel, crushed stone) complying with the requirements of JS 124;

b) other materials including expanded clay, expanded shale and vermiculite, providing that such aggregates are not harmful to the concrete and do not contain undesirable ingredients in sufficient

quantity to adversely affect the strength and durability of the blocks or to attack any reinforcement or metal tie, which may be used in conjunction with the blocks, provided that the resulting blocks comply in all other respects with the requirements of this standard.

4.3 Water

Water shall be free of matter that is harmful to concrete and its reinforcement, and also from substances likely to cause efflorescence in the blocks.

4.4 Admixtures.

Admixtures that do not have deleterious effects and do not adversely affect the durability and the properties of the blocks with the passage of time may be used.

5 Form

Subject to the tolerances specified in Clause 10; the face of the blocks shall be flat and rectangular. Opposite faces shall be parallel to and all arises shall be square.

6 Cavities

The total width of a cavity in any block, measured at right angles to the face of the block as laid in the wall, when determined in accordance with Appendix B.1.2, shall not exceed 65%* of the thickness of the block. The volume of the cavity in the block when determined in accordance with Appendix B.1.3, shall not exceed 50% of the gross volume of the block.

7 Joints

The bedding surfaces shall be at right angles to the faces of the blocks. The ends of the blocks which form the vertical joints may be tongued and grooved, or double grooved, or plain butt as illustrated in Figure 1.

Figure 1 — Joints

NOTE: A maximum of 70% is allowed for width of cavity of 200 mm blocks if the compressive strength meets the requirement of 7MPa and the sample is accepted as having met the requirements of this standard if all other requirements are met.

8 Surface

When intended for use with rendering or plastering, the surface characteristics of the blocks shall be capable in providing a satisfactory bond.

9 Blocks with special faces

Blocks in the following categories:

a) blocks having profiled faces;

b) blocks having a special facing backed with dense or lightweight concrete as an integral part of the manufacturing;

c) blocks having a special face applied to the block subsequent to moulding;

shall all be deemed to comply with this standard, provided that in categories (a) and (c), such blocks comply with the test requirements appropriate to the backing. The profile and/or facing, including the thickness of any integral or applied facing and its suitability for its intended purpose, shall have an existing agreement between the consumer and the supplier.

10 Density

The block density shall not be less than those given in **Table 1**.

Table 1 — Density of hollow concrete blocks

Normal size of block (Thickness - mm)	Density Kg/m^3
200	880
150	1040
100	1200

11 Dimensions, tolerances and shell thickness

11.1 Dimensions

The external dimensions of the blocks shall be in one of the following size specifications listed in **Table 2.**

Table 2 — External dimensions of hollow concrete blocks

	Nominal Size (mm)			Actual Size[A] (mm)		
	Length	Breadth	Height	Length	Breadth	Height
Size A (8″)	400	200	200	397	194	194
Size B (6″)	400	150	200	397	143	194
Size C (4″)	400	100	200	397	92	194
A **Actual Size variance** is +3, -5						

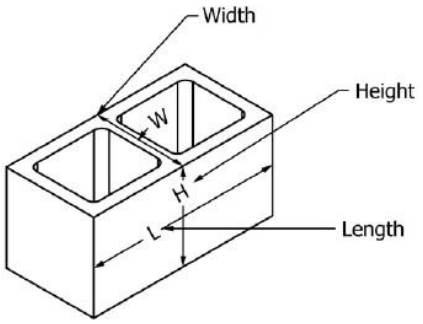


Figure 2 — Diagram Showing the location of dimensions for measurement of hollow concrete blocks

11.1.1 Sizes other than those specified in 11.1 may also be used by mutual agreement between the purchaser and the supplier.

11.2 Tolerances

In following with the measurements described in Appendix A, no determination of length or height of the sample blocks shall fall outside the limits specified in Table 2. No individual measurement of breadth of the sample of blocks shall fall outside the breadth specified by ± 2 mm.

11.3 Shell thickness of hollow concrete blocks

The thickness of each shell and web of any hollow concrete block in a loadbearing wall shall not be less than the details given in Table 3 specifically for the particular width, and in addition, the sum of the thickness of web occurring in any meter of wall length shall not be less than the details given in Table 3. Webs shall be extended to the full height of the block in which they occur, except that in the case of blocks designed to be used with longitudinal reinforcement, the web height may be reduced by no more than 25 mm. This requirement shall not apply to web-less blocks used to form lintels or bond beams.

Table 3 — Minimum face-shell and web thickness for hollow concrete blocks

Nominal width of block	Face-shell thickness (minimum)	Web thickness (minimum)	Sum of web thickness (minimum per meter of wall length)
mm	mm	mm	mm
100	25	25	125
150	25	25	185
200	25	25	185

12 Mixing

Mixing shall be maintained until there is a uniform distribution of the cementitious materials, aggregates and water.

13 Manufacture

13.1 After demoulding, the blocks shall be protected until it is sufficiently hardened to permit handling without damage. It shall be stored on suitable pallets or a platform which will prevent distortion or breakage of the block.

13.2 Blocks shall be stored until they reach the required strength before being dispatched by the manufacturer.

NOTE Curing determines the rate and magnitude of hydration of Portland cement.

14 Sale and Usage

No blocks shall be sold or used in a building unless it meets the requirement of this standard.

15 Physical requirements

15.1 Compressive strength

The average compressive strength of the sample and the corresponding lowest compressive strength of any individual block thereof shall, when determined in the manner described in Appendix C, not be less than the value given in Table 4. When loadbearing of other strengths are required they shall comply with the requirements of this standard.

Table 4 — Compressive strength of hollow concrete blocks

Compressive strength – N/mm^2 (MPa) based on gross area	
Average of 10 units	Individual unit
7.0	5.6

15.2 Absorption and moisture content

When determined by the method described in Appendix E, the moisture content of blocks at the time of delivery to the consumer or his/her representative, shall not exceed 40% of the total absorption of the blocks.

NOTE: This moisture content of 40% of the total absorption is an absolute maximum and users are warned that care should be taken to ensure that the maximum is not exceeded.

15.3 Maximum potential drying shrinkage

In following with the method described in Appendix D, the average value of drying shrinkage of blocks shall not exceed 0.05%.

16 Branding of units

The marking identified from the manufacturer, may be specified by the purchaser in his/her order and the cost of such marking shall be borne by the purchaser.

17 Sampling, identification and storage

17.1 Sampling

For the purposes of testing, full-sized units shall be selected by the purchaser or authorized representative. The selected specimens shall be of similar configuration and dimensions. Specimens shall be a representative of the whole lot of units from which they are selected. Blocks being sampled should meet the requirements of Clause 12.

17.2 Identification

Each block selected for testing shall be marked to ensure that it is identifiable at any time with the consignment it represents. Marking shall not cover more than 5 % of the superficial area of the block.

17.3 Storage

Specimens that is taken shall be stored in a dry place not in contact with the ground, until the tests are carried out. Specimens required for moisture content tests shall be stored in the manner described in Appendix E.

18 Manufacturer's certificates

18.1 As an alternative, the assessment of an individual; consignments as provided in Clause 15, the consumer or his/her representative may elect to accept a certificate from the manufacturer to the effect that all blocks comply with the requirements of this standard. The acceptance of such a certificate by the consumer shall not prejudice his/her rights to demand independent tests on specimens selected in accordance with Clause 15.

18.2 If the consumer or his/her representative requires independent tests, the specimens shall be taken at the time of delivery and the tests shall be carried out in accordance with this standard by a

mutually acceptable testing authority on the written instructions of the consumer or his/her representative.

18.3 The entire consignment represented by the specimens under “fails” test to comply with the requirements of this standard shall be promptly separated from any batch that have been deemed compliant by the manufacturer at his/her sole cost, whether for transport, handling, or any other action. Such blocks shall be clearly marked with a symbol of rejection in an indelible ink or oil-paint on at least one side. The rejection symbol shall be an 'X'.

Annex A
(Informative)

Methods for the measurement of dimension

A.1 Test specimens

For the checking of dimensions, take at random, ten whole blocks from those sampled in accordance with Clause 17. For the purpose of the determination both densities described in Appendix B and of compressive strength described in Appendix C, may be necessary, to check the dimensions of three further whole blocks taken at random from those sampled in accordance with Clause 17.

NOTE: It is permissible to remove any fins before checking a block for compliance with the dimensional requirement.

A.2 Apparatus

A.2.1 Callipers that contains such, size and shape that can be used to measure the thickness of the blocks at the seven positions are shown in Figure A.1(c).

A.2.2 A steel ruler, for use with the callipers, graduated to 1 mm.

A.3 Procedure for measuring length and thickness of cut specimens

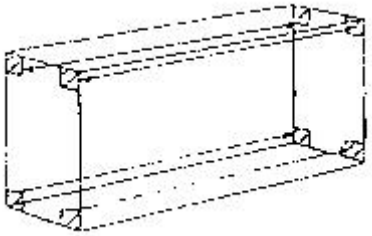
Measure to the nearest 1 mm, with the callipers and steel ruler, the thickness of each block as the maximum dimension across a square of side 25 mm to 26 mm at the six edge positions and at the maximum thickness near the middle of the length and height of the block, both shown in Figure A.1(c). Record for each block the seven individual measurements. Similarly, measure the length of specimens cut for compressive strength tests at the four positions shown in Figure A.1(a).

A.4 Calculations

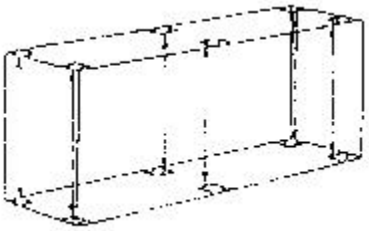
A.4.1 When checking the compliance with the dimensional tolerance, calculate to the nearest 1 mm the average of the seven measurements of thickness of each block.

A.4.2 When determining the block density, calculate the gross volume of the block to the nearest (50,000 mm^2) from the average thickness, calculated as in A.4 (a), and the specified length and height of the block.

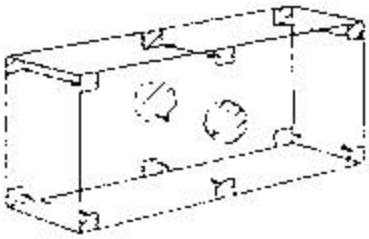
A.4.3 When determining the compressive strength of a whole block, calculate to the nearest 1 mm the average thickness at the top and bottom bed faces and calculate to the nearest 500 mm^2 the gross area of the specimen as the smaller of the two average thickness multiplied by the specified length of the block. When determining the compressive strength of a cut block, calculate to the nearest 250 mm^2 the gross area of each bed face from the average length and the average thickness of the specimen at that face and take the smaller of the two bed face areas as the gross area of the specimen.



a. Four positions for checking length of whole blocks and for measuring length of cut specimen



b. Six positions for checking height of whole blocks



c. Seven measurements of width

Figure A.1 — Checking and measuring dimensions of blocks

Annex B
(Informative)

Methods for the determination of block density, and width and volume of cavity

B.1 Test specimens

For the determination of block density, and width and volume of cavity, take at random three whole blocks from those sampled in accordance with Clause 16 and test in the following manner:

B.1.1 Block density

B.1.1.1 Calculate the gross volume of each of the three blocks as described in A.4.2.

B.1.1.2 Dry the blocks for at least 16 hrs in a ventilated oven having the temperature controlled at 105 ± 5°C.

B.1.1.3 Cool the blocks for 6 hrs to 8 hrs and weigh.

B.1.1.4 Repeat B.2 (b) and B.2 (c) until the weight lost in one cycle does not exceed 0.05 kg.

B.1.1.5 Calculate the oven-dry block density by using the formula:

$$\text{Oven-dry block density (kg/m}^3\text{)} = \frac{\text{oven - dry weight (kg)}}{\text{gross volume m}^3}$$

B.1.1.6 Report the mean block density of the three blocks to the nearest 10 kg/m^3, as the oven-dry block density.

B.1.2 Width of cavity

B.1.2.1 Select, by inspection (in all three blocks) the line perpendicular to the block face, where the total width of cavity is maximum.

B.1.2.2 Measure, at these positions, the total width of cavity by using a suitable calliper. The calliper should not be allowed to bend into surface irregularities and should 'feel' the wall surfaces smoothly for a stroke of 10 mm to 15 mm.

B.1.2.3 Record, to the nearest 1 mm, the total width of cavity at each position in each block.

B.1.2.4 Measure the block thickness by the method given in A.3, at all the positions where the width of cavity was measured.

B.1.2.5 Express the total width of cavity at each position as a percentage of the block thickness at the same position.

B.1.2.6 Report to the nearest 5% the greatest width of cavity detected.

B.1.3 Volume of cavity

B.1.3.1 Place each of the three blocks on a thin sheet of foam rubber or other resilient material with the open ends of the cavity uppermost.

B.1.3.2 Close any cavities at the ends of the block by clamping flat sheets of 12.7 mm insulating board to the ends of the block without distortion. Ignore the effects of tongues or grooves shown in Figure 1.

B.1.3.3 Fill a 1-L glass measuring cylinder accurately with dry sand which has been graded between a No. 25 BS test sieve and No. 52 test sieve (both complying with ISO 3310-2 and ISO 3310-1).

B.1.3.4 Fill the cavities with the sand, by pouring from the cylinder, refilling if required, keeping the cylinder lip within 25 mm of the top of the cavity and pouring steadily and striking off the level.

B.1.3.5 Return to the cylinder any sand struck off and note in mL, the total volume of sand used to the nearest 50 mL and record this volume as the volume of the cavities.

B.1.3.6 Express the volume of cavities in each block as a percentage of the gross volume of each block as determined in accordance with A.4.2.

B.1.3.7 Report to the nearest 5% the greatest volume of cavity detected.

Annex C
(Informative)

Method for determination of compressive strength

C.1 Test specimens

For the determination of compressive strength take six (6) whole blocks previously measured in accordance with Appendix A. Normally the specimens consist of whole blocks. Where the blocks are claimed to have high compressive strength, such that the capacity of the machine is likely to be exceeded or there is likely to be excessive deflection of the platens cut each block in two (2) as follows:

1) Saw from the longest dimension a portion 200 mm to 250 mm long, for testing, so that as far as possible, the cut specimen is symmetrical about an axis perpendicular to the original length. Discard the remainder of the block.

2) The two surfaces of each specimen which would normally be placed horizontally in the wall are, for the purposes of this standard, termed the bed faces. Calculate the gross area of the specimen as described in A.4.3.

C.2 Apparatus

C.2.1 Capping plates

C.2.1.1 When following the procedure described in C.3.3.1, use a steel capping plate at least 25 mm longer and wider than the block to be capped, and not less than 19 mm thick. The plate is a smooth and planed machine which are to be within approximately 0.1 mm on one side.

C.2.1.2 Alternately, use a sheet of plate glass at least 9 mm thick and complying with the requirements for size and planeness given in C.2.1.1.

C.2.1.3 Alternately, if the procedure described in C.3.3.2 is followed, use either a steel plate and sheet of plate glass or two sheets of plate glasses, all complying with the requirements for size and planeness given in C.2.1.1. and C.2.1.2.

NOTE: The steel plate described in C.2.1.1 and C.2.1.3 or the single sheet of plate glass described in C.2.1.2 or the lower of the two sheets of plate glass described in C.2.1.3 should be adequately supported over most of its area (e.g. in a bed of mortar) to prevent excessive deflection.

C.2.2 A square or vertical level

C.2.3 Testing machine

It shall be reliable, that sufficient capacity for the test and equipment with a means provide the rate of loading specified in C.5. The capacity of the machine is such that the expected ultimate load on a specimen is greater than one-fifth of the machine scale range. The machine shall comply, with regards to accuracy, with the requirements of Class A or B of ASTM E4, at the ultimate load expected. The testing machine is equipped with two steel bearing platens which should preferably be at least, as large as the bedding faces of the specimen being tested. The upper platen (assuming that the load is applied in a

vertical direction) is fitted with a ball seating in the form of a portion of a sphere, the centre of which lies within 2 mm of the axis of the loading system and within 7 mm of the bearing face of the upper platen. The moveable portion is held onto the spherical seat but the design is developed for the bearing face that can be rotated freely and tilted through small angles in any direction. The spherical surfaces of the ball seating may be coated thinly with a preservative to prevent corrosion but should not be lubricated in such a way as to enable movement to occur under load (refer to **NOTE** below).

The lower compression platen is a plain, non-tilting bearing block. If the permanent platens of the testing machine are not as large as the specimen to be tested, auxiliary platens of the required size are used. They are not fixed to the permanent platen but are brought to bear in close contact with care being taken to exclude dirt from the interfaces. The auxiliary platen that will bear on the upper surface of the specimen should be attached loosely to the testing machine by flexible wire or chain to prevent it falling if the specimen collapses suddenly under load. The bearing surfaces of the permanent platens and both bearing surfaces of each auxiliary platen are smooth and when new, do not depart from a plane to more than 0.02 mm at any point. The planeness is regularly checked and maintained within a permissible variation limit of 0.05 mm. The bearing surfaces have a diamond pyramid hardness number of at least 600.

The thickness of the platens and of the auxiliary platens is such that, they will not deflect unduly under the maximum load applied during the test. The thickness required depends upon the strength of the blocks to be tested and the amount by which any part of the platens over hangs its supporting structure. In general, platens should be solid and not less than 50 mm thick. Where blocks with an average compressive strength of 7.0 MPa or more are to be tested, platens should be solid and not less than 75 mm thick. The use of the thinner platens may give low results.

NOTE: Lubricant designed to maintain a continuous film under high bearing pressures should not be used in ball seating of testing machines. The intention is that the seating should enable the platen ten (10) to accommodate itself initially of a 10 shape for the test specimen but should thereafter be restrained from moving as a result of metal-to-metal contact between the surfaces.

C.3 Preparation of specimens

C.3.1 Immerse each specimen in water at a temperature of 27 ± 2° C for at least 16 hrs and allow it to drain for about 30 minutes under damp sacking or similar material, before capping with mortar.

C.3.2 Prepare mortar for capping each block from one part by weight of ordinary or rapid hardening Portland cement complying with the requirements of JS 32 and JS 303 to one part by weight of sand complying with the requirements of Grading Zones 2 or 3 of JS 124 but from which has been rejected material on a No. 7 fine mesh normal or special test sieve as specified in ISO 3310-1.

Use a measured quantity of water sufficient to produce a mortar having a consistent value of not less than 6 mm and not more than 9 mm when measured by the test for the determination of consistence by the dropping ball method specified in BS 4551. Make prisms or cubes from the mortar and test for compressive strength in accordance with the procedures given in BS 4551 except that, when using prism(s) the specimens are hydraulically cured, using plain tap-water instead of either lime-saturated or distilled water, the flexural strength test is omitted and the compressive strength test is performed near the ends of the broken prisms. Make sufficient specimens to determine the age at which the mortar attains an average compressive strength of at least 28 MPa. This will normally occur over a two to four days period.

C.3.3 Bed each face with the mortar by the method described in C.3.3.1 or by the method described in C.3.3.2.

C.3.3.1 Cover the machined face of the steel plate described in C.2.1.1 of the working face of the single sheet of plate glass described in C.2.1.2 with an appropriate release material (e.g. a film of oil or a sheet of absorbent paper) to prevent any mortar adhering to it. Support the plate with the working surface uppermost so that the surface is level.

Place a uniform layer of the mortar, about 5 mm thick, on the plate. Press one bed face of the specimen firmly into the layer of mortar so that the vertical axis of the specimen is perpendicular to the plane of the plate. Check this condition by using the square or vertical level held against each of the four vertical faces of the specimen in turn, making allowance for any taper of the block sides.

Ensure that the thickness of the mortar bed is at least 3 mm over the whole area and that any cavity in the bed face, which is normally filled when the blocks are laid in the wall, is completely filled with mortar. Cavities which are formed in the block to produce a lightweight block are not filled. Trim off any surplus mortar flush with the sides of the block. Cover the specimen and mortar with a damp cloth which should be kept damp.

Allow the specimen to remain undisturbed for at least 16 hrs and then carefully remove the bedded specimen from the plate without damaging the mortar. Examine the mortar bed for defects such as lack of compaction, cracking and lack of adhesion of the block. If the bed is free from defects, embed the second bed face in the same way as the first, using mortar made with materials drawn from the same samples and with the same proportions of cement, sand and water as for the first bedding operation, and make prisms or cubes as before. After removing the specimen from the plate, check that the mortar is free from defects.

C.3.3.2 Alternatively to C.3.3.1, cap each block by using either the steel plate and the sheet of plate glass or the two sheets of plate glass described in C.2. Support the steel plate, or one of the two sheet glass, so that the working face is horizontal and uppermost. Cover it with an appropriate release material, as described in C.3.3.1. Place a layer of mortar on the face and press a bed face of the block into the mortar so that the vertical axis of the block is straight.

Coat the working face of the remaining sheet of glass described in C.2 with a transparent release agent, then place a uniform layer of the mortar, about 5 rum thick, on the upper bed face of the specimen, and place the sheet of glass, working face downwards on to the bed of mortar. Work the plate, observing the condition of the mortar bed, until the mortar forms a horizontal bedding face and the bed is at least 3 mm thick over the whole area. Check the horizontal bedding face and the bed is at least 3 mm thick over the whole area. Check the horizontal and vertical settings of the plates and blocks by using a spirit level and trim off any surplus mortar flush using the sides of the block. Cover and allow to remain undisturbed and check as described in C.3.3.1.

C.3.4 After checking, immerse the block in water at a temperature 27 ± 2° C until the mortar used for both bed faces has been attained with the required minimum strength.

C.4 Preparation of specimens (alternative method)

Alternatively, the method below may be used to prepare blocks for testing. A quantity of capping mortar shall be made from one part (by volume) of Portland cement and one part of calcined gypsum mixed with sufficient water to produce a stiff paste which will spread evenly.

The mortar shall be placed on a plate surface which has been levelled with a spirit level in two directions at right angles and coated with oil. The surface to be capped shall be bedded in this mortar, and the specimen, so held that its axis is at right angles to the capping surface, shall be firmly pressed down with a single motion. The average thickness of the cap after the extruded capping mortar has been removed and the edges trued shall not be more than 3.2 rum. This procedure shall be repeated for

each of the bed faces. The two bearing surfaces so formed shall be made parallel to each other by levelling the specimen in two directions at right angles on the second capping surface. All shells, including webs, which lie in the bedding planes are to be capped for the purposes of the compressive strength test.

Patching of caps after setting shall not be permitted. Imperfect caps shall be removed and replaced with new ones. The caps shall be aged for at least 6 hrs in the air before the specimens are tested.

C.5 Procedure

The specimen bearing the surfaces of the platens on the testing machine, and any steel plate to be placed between the specimen and a platen, shall be wiped clean. Place the specimen in the machine and carefully align its axis with the centre of thrust of the spherically-seated platen. As the upper platen is brought to bear on the specimen, rotate the movable portion of the spherically-seated platen gently by hand so that uniform seating is obtained. Apply the load without shock and increase it continuously until the specimen fails. In testing machines of the screw type, the moving head shall travel at a rate of about 1.25 mm/min when the machine is running idle. In hydraulically-operated machines, apply the load at a constant rate within the range 0.141 MPa/s to 0.352 MPa/s. During the application of the first half of the maximum load, a higher rate of loading shall be permitted. No adjustment shall be made in the controls of the testing machine while a specimen is yielding rapidly before failure.

Record the maximum load carried out by the specimen during the test.

C.6 Calculation of results

The compressive strength, based on gross area of a concrete block shall be taken as the maximum load in N to the nearest 100 N (0.1 kN) supported by the block before failure occurs, divided by the gross area of the block mm^2 to the nearest 500 mm^2. Calculate each compressive strength to the nearest 0.05 N/mm^2 (MPa).

C.7 Report

The compressive strength results shall be reported separately for each block, together with the average of the compressive strengths of the ten blocks tested. This average, subject to the specified requirement for minimum strength of individual units shall be taken as the compressive strength of the batch under test. The report shall be expressed in (MPa) to the nearest 0.1 MPa.

Annex D
(Informative)

Method for the determination of maximum potential drying shrinkage of concrete blocks

D.1 Test specimens

Three blocks shall be selected for testing from the sample selected in accordance with Clause 18. The test specimen shall be prisms cut from full-size blocks in such a manner that each will have a cross-sectional area of 12.5 cm^2 and a length of approximately 200 mm. Blocks which have been subjected to any other tests with temperatures exceeding 65°C (e.g. those used in the test for moisture content and total absorption) shall not be used in the drying shrinkage test.

D.2 Apparatus

D.2.1 Measuring apparatus

A measuring apparatus shall be used which incorporates a micrometre gauge or a suitable dial gauge, reading accurately to 0.0025 mm.

This gauge shall be rigidly mounted in a measuring frame and have a recessed end which can be located upon a 6.35 mm diameter ball or other reference point cemented in the end of the specimen as described in D.3. The other end of the frame shall have a similar recessed seating which can be located upon the other ball or reference point in the specimen. An invar steel rod of a suitable length (approximately 216 mm for a 200 mm specimen) with 6.35 mm diameter hemispherical ends, or with 6.35 mm diameter steel balls mounted in the ends, shall be used as a standard length against the readings of the gauge that can be tested, thus enabling corrections to be made for any changes in the dimensions of the apparatus between successive measurements of a test specimen.

D.2.2 Drying oven

The drying oven shall comply with the following requirements:

a) it shall have an internal volume equivalent to not less than 0.0085 m^3 per specimen, and a minimum total volume of 0.051 m^3.

b) it shall be reasonably airtight and shall be provided with the fan to keep air circulating effectively during the drying of the specimens.

c) it shall be maintained at a temperature of 50 ± 10 °C.

d) the humidity of the air in the oven shall be controlled at approximately 17 % of relative humidity by the means of saturated calcium chloride solution or by other suitable means. When a saturated calcium chloride solution is used, suitable dishes or trays containing this solution shall be provided to give an exposed area of solution no less than 0.028 m^2 for each cubic (m^3) of the volume of the oven. The dishes or trays shall contain sufficient solid calcium chloride to show the above surface of the solution throughout the test.

D.3 Preparation of specimens

Two reference points shall be provided consisting of 6.35 mm diameter steel balls or other suitable reference points providing a hemispherical face. The reference point shall be cemented with neat rapid-hardening Portland cement or other suitable cementing agent into shallow recesses drilled or cut in the centre of each specimen. After the balls has been fixed, their surfaces shall be wiped clean of cement, dried, and coated with lubricating grease to prevent corrosion. The specimens shall then be completely immersed in water for 4 days at a temperature of 22.5 ± 1.4°C.

D.4 Procedure

Immediately after removal of the specimens from the water, wipe the grease from the steel balls and measure the length of each specimen to an accuracy of 0.0025 mm using the apparatus described in D.2.1. This shall be taken as the 'wet measurement' (Mw). The instrument reading required is not the absolute length of the specimen but the difference in length between the specimen and the Invar reference rod.

Dry the specimens for at least 44 hrs in an oven complying with the requirement of D.2.2. Remove the specimens from the oven and cool for at least 4 hrs in a desiccator containing solid calcium chloride or a saturated solution of calcium chloride. Measure each specimen as described above, at a temperature of 22.5 ± 1.4°C. If the measurements are made to a temperature other than 22.5°C, they should be reduced by 0.002% of the dry length for each 200 C above 22.5°C.

Repeat the cycle of drying, cooling and measuring until practically constant length is attained, i.e. when the difference between two consecutive readings are separated by a period of drying of at least 44 hrs, following the cooling process for at least 4 hrs, is less than 0.075 mm for a 200 mm specimen and pro rata for other lengths. The final reading shall be taken as the dry measurements (M_d).

During the above drying process continue with the wet specimens that shall not be placed into the same oven and it shall be free access of air to all surfaces of the specimens. After the dry measurement has been taken, the length of the specimen shall be measured, adjacent to the steel balls, to the nearest 1 mm and this shall be taken as the dry length (L_a).

D.5 Calculation of results

The drying shrinking expressed as a percentage of the dry length shall be calculated from the following formula:

$$\text{Drying shrinkage, (\%)} = \frac{M_w - M_d \times 100}{L_a}$$

where:

M_w measurement over reference points – specimen wet

M_d measurement over reference points - specimen dry

L_a length of specimen dry

D.6 Reporting results and rejections

Should the value for drying shrinkage obtained with any one of the three specimens tested exceed that permitted by the requirements of 15.3, the test shall be repeated on a further three blocks. Should the value obtained with any one of the specimens from the second test exceed the value specified, the consigned shall be deemed not to comply with this standard.

Annex E
(Informative)

Method for the determination of moisture content and total absorption of concrete blocks

E.1 Test Specimens

Six blocks shall be selected for testing from the sample selected in accordance with Clause 17 and shall be immediately stored in airtight containers until weighed and specified in E.3.

E.2 Accuracy of weighing

The balance used shall be sensitive within 0.1 % of the weight of the specimens being tested.

E.3 Weight as sampled (W_s)

For determination of the weight as sampled, weigh each specimen immediately after removal from the airtight container.

E.4 Weight dry (W_1) and after 24-hours immersion (W_2)

Each test specimen shall be dried in a ventilated oven at 100°C to 115°C and weighed at 24 hrs intervals until the loss in weight does not exceed 1% in a 24 hrs period. The weight shall be recorded as the 'dry weigh' (W_1). The dry specimens shall then be completely immersed in clean water at room temperature from 15.5°C to 30°C for 24 hrs. The specimens shall then be removed from the water, allowed to drain for one minute before placed on a 9.5 mm or coarser wire mesh, visible water surface wiped off with a damp cloth, and immediately weighed. This shall be recorded as the wet weight (W_2).

E.5 Calculation of results

E.5.1 Moisture content

The moisture content of each test specimen at the time of sampling expressed as a percentage of the total absorption shall be calculated from the following formula:

$$\text{Moisture content, (\%)} = \frac{Ws - W_1 \times 100}{W_2 - W_1}$$

where:

W_s weight of the specimen as sampled

W_1 weight of dry specimen

W_2 saturated weight of the specimen after 24 hrs immersion in water at a temperature in accordance with E.4.

E.5.2 Total absorption

The total absorption of each specimen, expressed as a percentage of its dry weight, shall be calculated from the following formula:

$$\text{Total absorption, (\%)} = \frac{W_2 - W_1 \times 100}{W_1}$$

E.6 Reporting results and rejection

The moisture content and total absorption results shall be reported separately for each of the six specimens tested. The calculated average values for the six specimens shall be taken as the moisture content or total absorption of the batch under test. If the average moisture content is greater than that permitted by the requirements of 15.2 the whole consignment of which the specimens tested are representative, shall be deemed to have failed.

END OF DOCUMENT

Standards Council

The Standards Council is the controlling body of the Bureau of Standards Jamaica and is responsible for the policy and general administration of the Bureau.

The Council is appointed by the Minister in the manner provided for in the Standards Act, 1969. Using its powers in the Standards Act, the Council appoints committees for specified purposes.

The Standards Act, 1969 sets out the duties of the Council and the steps to be followed for the formulation of a standard.

Preparation of standards documents

The following is an outline of the procedure which must be followed in the preparation of documents:

1. The preparation of standards documents is undertaken upon the Standard Council's authorisation. This may arise out of representation from national organisations or existing Bureau of Standards' Committees of Bureau staff. If the project is approved it is referred to the appropriate sectional committee or if none exists a new committee is formed, or the project is allotted to the Bureau's staff.

2. If necessary, when the final draft of a standard is ready, the Council authorises an approach to the Minister in order to obtain the formal concurrence of any other Minister who may be responsible for any area which the standard may affect.

3. The draft document is made available to the general public for comments. All interested parties, by means of a notice in the Press, are invited to comment. In addition, copies are forwarded to those known, interested in the subject.

4. The Committee considers all the comments received and recommends a final document to the Standards Council.

5. The Standards Council recommends the document to the Minister for publication.

6. The Minister approves the recommendation of the Standards Council.

7. The declaration of the standard is gazetted and copies placed on sale.

8. On the recommendation of the Standards Council the Minister may declare a standard compulsory.

9. Amendments to and revisions of standards normally require the same procedure as is applied to the preparation of the original standard.

Overseas standards documents

The Bureau of Standards Jamaica maintains a reference library which includes the standards of many overseas standards organisations. These standards can be inspected upon request.

The Bureau can supply on demand copies of standards produced by some national standards bodies and is the agency for the sale of standards produced by the International Organization for Standardization (ISO) members.

Application to use the reference library and to purchase Jamaican and other standards documents should be addressed to:

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P.O. Box 113,
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