
Draft
Jamaican Standard
Specification
for
Portland cement (ordinary and rapid-hardening)



BUREAU OF STANDARDS JAMAICA

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Draft Jamaican Standard

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DJS 32: 2021

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Certification of Agricultural Produce
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for

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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

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Foreword

This standard is a revision of and supersedes JS 32: 2014. It provides requirements for the chemical and physical properties, sampling, labeling and packaging of ordinary and rapid-hardening Portland cements.

This standard is compulsory.

Committee representation

Acknowledgement

Acknowledgement is to ASTM International for permission to reproduce material from the standards listed below.

Related Documents

This standard makes reference to the following:

- a) ASTM C 150, Standard Specification for Portland cement
- b) ASTM C 109M, Standard Test method for compressive strength of hydraulic cement mortars (using 50mm cube specimens)
- c) ASTM C 778, Standard Specification for Standard sand
- d) BS 812, Methods for the sampling and testing of mineral aggregate sands and fillers
- e) BS EN 197 – 1, Cement – Part 1: Composition, specifications and conformity criteria for common cements. CAN 3-A5-M Portland Cements
- f) JS 124, Standard Specification for Aggregates for concrete
- g) JS 301, Standard Specification for Blended hydraulic cements
- h) JS 302, Chemical test methods for hydraulic cements
- i) JS 303, Physical test methods for hydraulic cements

DJS 32: 2021 Draft Jamaican Standard Specification for Portland cement (ordinary and rapid-hardening)

1 Scope

This standard applies to ordinary and rapid-hardening Portland cements and specifies the requirements for chemical and physical properties, sampling, labelling and packaging.

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 EN 196-2, Method of testing cement Chemical analysis of cement

JS 1 Part 1, Jamaican Standard Specification for The labelling of commodities Part 1: General Principles

JS 1 Part 20, Jamaican Standard Specification for The labelling of commodities Part 20: Labelling of pre-packaged goods

JS 302, Chemical test methods for hydraulic cements

JS 303, Physical test methods for hydraulic cements

3 Terms and definitions

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

3.1 addition

a material that is inter-ground or blended in limited amounts into a hydraulic cement during manufacture either as a 'processing addition' to aid in manufacturing and handling of the cement or as a 'functional addition' to modify the properties of the cement.

3.2 hydration

the chemical reaction between hydraulic cement and water, forming new chemical compounds, most of which have strength producing properties.

3.3 pozzolan

siliceous or siliceous and aluminous material which in itself possesses little or no cementitious property but which, in a finely divided form, will react chemically with calcium hydroxide in the presence of moisture at ordinary temperatures to produce compounds possessing cementitious properties.

3.4

reactive calcium oxide/lime (CaO)

that fraction of the calcium oxide content which under normal hardening conditions can form calcium silicate hydrates or calcium aluminate hydrates.

3.5

reactive silica (SiO₂)

the fraction of the silica (silicon dioxide) which is soluble after treatment with hydrochloric acid (HCl aq.) and with boiling potassium hydroxide (KOH aq.) solution.

3.6

vendor

the seller of cement whether or not he is a manufacturer of the cement.

4 Composition and manufacture of Portland cement

4.1 The cement, whether ordinary or rapid-hardening, shall consist of an intimate mixture of a lime bearing (calcareous) material and a silica, alumina or iron oxide bearing (argillaceous) material, which has been fired at a clinkering temperature and ground with the addition of a small proportion of calcium sulphate.

4.2 The quantity of calcium sulphate shall not exceed 5.0% by mass of the final cement. Other additions may be incorporated to aid in the processing or functioning of the cement. The powder so produced shall comply with the requirements of this standard.

4.3 The total quantity of additions shall not exceed 5.0 % by mass of cement. If any addition except, calcium sulphate, limestone or pozzolan exceeds 1.0% shall be stated on the packaging and/or delivery note. The total amount of organic addition(s) shall not exceed 1.0 % by mass of the cement.

4.3 Cement is a hydraulic binder, i.e. a finely ground inorganic material which, when mixed with water, forms a paste which sets and hardens by means of hydration reactions and processes and which after hardening, retains its strength and stability even under water. Cement shall conform, when appropriately batched and mixed with aggregate and water, be capable of producing concrete or mortar which retains its workability for a sufficient time and shall after defined periods attain specified strengths and possess long term volume stability.

4.4 Hydraulic hardening of cement shall conform to the hydration of calcium silicates but the presence of other chemical compounds (e.g. aluminates) may also participate in the hardening process. The sum of the proportions of reactive calcium oxide and reactive silica in such cement is usually at least 50% by mass when the proportions are determined in accordance with BS EN 196-2.

5 Tests

The cement shall be sampled in accordance with JS 303 and the following chemical and physical tests performed in accordance with the methods described in JS 302 and JS 303 respectively:

a) Chemical tests

- 1) Chemical composition
- 2) Loss on ignition
- 3) Insoluble residue

b) Physical tests

- 1) Fineness
- 2) Compressive strength
- 3) Consistence
- 4) Setting times
- 5) Expansion

5.1 Chemical properties

5.1.1 The chemical properties of the cement shall comply with the requirements listed in Table 1:

Table 1 — Standard requirements for the chemical properties of Portland cement

Property	Reference standard	Standard requirements
Magnesium oxide content	JS 302	5.0 % maximum
Chloride content		0.10 % maximum
Alkali (Na ₂ O + 0.658 K ₂ O)		----- *
Alumina/Iron ratio		0.66 minimum
SO ₃ content		3.0 % maximum if [C ₃ A] < 8.0%
		3.5 % maximum if [C ₃ A] > 8.0%
Loss on ignition		4.0 % maximum
Insoluble residue		1.5 % maximum
Lime saturation factor (LSF)		0.66 - 1.02

Key: * In the case of alkali reactive aggregate, the use of cement with alkali content below 0.6% is recommended.

5.1.2 Lime saturation factor shall be calculated by the formula:

$$LSF = \frac{(CaO) - 0.7(SO_3)}{2.8(SiO_2) + 1.2(Al_2O_3) + 0.65(Fe_2O_3)}$$

NOTE In the formula above, each symbol in brackets refers to the percentage (by weight of total cement) of the oxide, excluding any contained in the insoluble residue.

Chemical formulae	Chemical name
CaO	calcium oxide
SO ₃	sulfite
SiO ₂	silicon dioxide
Al ₂ O ₃	aluminium oxide
Fe ₂ O ₃	iron (III) oxide
C ₃ A	Tri-calcium aluminate
Na ₂ O	sodium oxide
K ₂ O	potassium oxide

5.2 Physical properties

The physical properties when determined in accordance with the methods described in the appropriate reference shall be as listed in Table 2.

Table 2 — Standard requirements for the physical properties of Portland cement

JS 303 Alternate Method ^A	Method 3 (100 mm concrete cube method)	2	----	11.9
		3	10.4	----
		7	17.3	----
		28	27.6	30.3
Fineness (m ² /kg)	JS 303	Ordinary		Rapid hardening
		280 minimum		-----
Setting times	JS 303	Initial	45 minutes minimum	
		Final	420 minutes maximum	
Expansion (Autoclave) ^B	JS 303	0.80% maximum		
Expansion (Le Chatelier) ^C	JS 303	10 mm maximum		
^A This is an alternative method and the results are acceptable upon agreement between purchaser and manufacturer or their representatives.				
^B The standard reference method is the Autoclave method.				
^C This is an alternative method and the results are acceptable upon agreement between purchaser and manufacturer or their representatives. In the event that the result fails to meet the specification, the retest as outlined in JS 303 shall yield a maximum result of 5 mm.				

5.3 Strength

5.3.1 The cement shall be tested for compressive strength by one of the following three methods as agreed by the vendor and purchaser at the time of placing the order:

- a) **Method 1** - The average compressive strength of three 50 mm mortar cubes, prepared, stored and tested in the manner described in JS 303 shall be taken.
- b) **Method 2** -The average compressive strength when measured on three 40 x 40 x 160 mm mortar prisms, prepared, stored and tested in accordance with JS 303 shall be taken.
- c) **Method 3** - The average compressive strength of three 100 mm concrete cubes prepared, stored and tested in the manner described in JS 303, shall be taken.

5.3.2 In the event of a dispute, a re-test shall be carried out employing either reference method 1 or 2 and in the presence of representatives of the two parties concerned.

6 Sampling

Sampling shall be done in accordance with the methods described in JS 303.

7 Tests and manufacturers' certificates

7.1 The manufacturer shall be satisfied that the cement at the time of its delivery conforms to the requirements of this standard and, if requested, shall provide a certificate to this effect to the purchaser or his representative. Any consignment or part of a consignment, when sampled and tested according to JS 302 and JS 303, does not satisfy all of the requirements specified above, shall be deemed not to comply with this standard.

7.2 If the purchaser or his representative requires independent test, the samples shall, at the option of the purchaser or his representative, be taken before or immediately after delivery and the tests shall be carried out in accordance with this standard on the written instructions of the purchaser or his representative. If the vendor so desires, he or his representative shall be permitted to be present at the sampling site.

7.3 The manufacturer shall supply, free of charge, the cement required for testing.

8 Labelling, packaging and marking

8.1 Labelling

The label shall comply with the relevant labelling standards and/or regulations. Ordinary or rapid-hardening Portland cement shall be marked with the following particulars:

- a) The common name of the product, including type and or grade if applicable;
- b) Brand name or trade name/mark;
- c) Name and identifiable street address of manufacturer/packer/distributor;
- d) Net quantity, stated as 'Net weight' in kg. The letter-size shall not be less than 40 mm;
- e) Country of origin, stated as 'Product of __', blank being filled in accordingly;
- f) Date of manufacture/batch code;
- g) Expiry date, if applicable.

NOTE P.O. Box is not acceptable

9 Packaging

All packages shall be sealed and represented in good condition at the time of inspection.

10 Marking

10.1 When the cement contains a functional addition, the type shall be plainly marked on each package or supplied in documentation for bulk cement.

10.2 The packages of cement shall be marked to comply with all other requirements of the Jamaican Standards JS 1 Part 1 and JS 1 Part 20.

10.3 Information which satisfies the general principles outlined in JS 1 Part 1 shall be provided in the documentation for all cement delivered in bulk.

10.4 All packages shall be of sound integrity and legibly labelled at the time of inspection.

11 Rejection

11.1 At the option of the purchaser, cements which fail to meet the requirements of this standard may be rejected. Where cement is rejected a purchaser or his/her agent shall promptly dispatch to the manufacturer or supplier a written report outlining the reason for the rejection of the cement.

11.2 At the option of the purchaser, bulk cement kept in storage for more than six months or packaged cement kept in storage for more than three months, after testing shall be re-sampled and shall be rejected if it fails to meet any of the requirements of this standard applicable to that type of cement.

11.3 At the option of the purchaser, any package with a mass of cement more than 1.5% below the marked mass shall be rejected.

Draft Jamaican Standard

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

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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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