UDC 622.363.5

Ref. No. : ISO/R 1587-1972 (E)

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 1587

GYPSUM ROCK

FOR THE MANUFACTURE OF BINDERS

CLASSIFICATION, CHARACTERISTICS AND TEST METHODS

1st EDITION

March 1972

Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 1587, *Gypsum rock for the manufacture of binders – Classification, characteristics and test methods*, was drawn up by Technical Committee ISO/TC 74, *Hydraulic binders*, the Secretariat of which is held by the Institut Belge de Normalisation (IBN).

Work on this question led to the adoption of Draft ISO Recommendation No. 1587, which was circulated to all the ISO Member Bodies for enquiry in June 1968.

The Draft was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Ireland	South Africa, Rep. of
Austria	Israel	Spain
Brazil	Italy	Sweden
Czechoslovakia	Netherlands	Thailand
France	Norway	Turkey
Greece	Peru	U.A.R.
Hungary	Poland	United Kingdom
India	Portugal	
Iran	Romania	

The following Member Body opposed the approval of the Draft :

Germany

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

ISO Recommendation R 1587 March 1972

GYPSUM ROCK

FOR THE MANUFACTURE OF BINDERS

CLASSIFICATION, CHARACTERISTICS AND TEST METHODS

1. SCOPE

This ISO Recommendation defines the classification and characteristics of gypsum rock used as raw material for the manufacture of calcium sulphate binders, or as an admixture in the manufacture of other kinds of binders.

It also specifies the relevant test methods.

2. DEFINITION

Gypsum rock. Sedimentary rock formation of crystalline structure with calcium sulphate dihydrate ($CaSO_4.2H_2O$) as the main component.

3. CLASSIFICATION

3.1 According to the calcium sulphate content

Four classes of gypsum rock are distinguished, according to the calcium sulphate dihydrate content, Tg :

Class I	$Tg \geqslant 90\ \%$
Class II	$80\ \% \leqslant Tg < 90\ \%$
Class III	$70\ \% \leqslant Tg < 80\ \%$
Class IV	$55\ \% \leqslant Tg < 70\ \%$

3.2 According to the particle sizes

Five groups of gypsum rock are distinguished, according to the size of the particles :

Group 1	0 to 20 mm
Group 2	20 to 50 mm
Group 3	50 to 150 mm
Group 4	0 to 150 mm
Group 5	0 to 300 mm

Other groups of particle sizes may be adopted, as required by the user.

4. TECHNICAL SPECIFICATIONS

4.1 Foreign bodies

The content of foreign bodies, accidentally mixed with the gypsum rock, not originating from the mined deposit, should not exceed 0.1 %.

4.2 Moisture

The moisture content of gypsum rock should not exceed 4 %.

4.3 Tolerances on particle sizes

The content of particles of size larger than the upper limits given for the particular groups should not exceed 5 % of the mass of the batch for groups 1, 2, 3 and 4; the content of particles of size smaller than the limits given for groups 2 and 3 should not exceed 20 % of the mass of the batch.

4.4 Chemical and mineralogical composition

The chemical and mineralogical composition of the gypsum rock should comply with the specifications of Table 1 :

TABLE 1

Class	Mineralogical composition	Chemical composition
	Calcium sulphate content, Tg % ($CaSO_4.2H_2O$)	Water of crystallisation, Tc %
I	$Tg \geqslant 90$	$Tc \geqslant 18.83$
II	$80 \leqslant Tg < 90$	$16.74 \leqslant Tc < 18.83$
III	$70 \leqslant Tg < 80$	$14.65 \leqslant Tc < 16.74$
IV	$55 \leqslant Tg < 70$	$11.51 \leqslant Tc < 14.65$

NOTE. – The content of different impurities may be limited, by agreement between both parties.

5. ACCEPTANCE AND DELIVERY

5.1 Acceptance

The order should specify whether the consignment is to be delivered with or without acceptance tests.

If acceptance tests are specified, they should be carried out at the place of supply.

5.2 Delivery

Gypsum rock is usually delivered in bulk, i.e. without packing. If requested by the user, it may be packed in sacks, barrels, casks, containers, etc.

5.3 Transport documents

Deliveries of gypsum rock should be accompanied by transport documents currently used in the various countries. If the order is made with acceptance tests, these documents will also include the report of these tests.

6. SAMPLING

6.1 Mass of a batch

The consignment should be divided into batches, each having a maximum mass of 100 t. Each delivery or fraction of a batch having a mass of less than 100 t is considered as a single batch.

6.2 Mass of a gross sample

From each batch take increments to make up a gross sample, the mass of which is determined as a function of the maximum particle size of the gypsum rock, as shown in Table 2 :

TABLE 2

Maximum size of particles	Minimum mass of the gross sample
mm	kg
50	50
150	100
300	300

6.3 Increments

6.3.1 *Number and size of increments.* The number and size of increments depend on the way the delivery is carried out.

6.3.1.1 DELIVERY IN BULK. The gross sample is obtained by taking 10 increments, about equal in mass, from each batch.

6.3.1.2 DELIVERY IN CONTAINERS. The gross sample is obtained by taking 20 increments, about equal in mass, from each batch.

6.3.2 *Procedure*

6.3.2.1 DELIVERY IN BULK. Sampling should take place during the loading of the transport vehicles (lorries, railway trucks, barges or ships), before leaving the producer's works.

The time of sampling should be fixed in advance by agreement between both parties, according to the nature and capacity of the vehicles. When the consignment is already loaded, it should be divided into 10 approximately equal parts and the respective increments in the same lot should be taken at different depths.

6.3.2.2 DELIVERY IN CONTAINERS. Increments should be taken at different depths from 20 packed units chosen at random.

6.4 Reduced sample

6.4.1 *Procedure.* The gross sample made up of increments taken as described in clause 6.3 should be mixed carefully, reduced by quartering, which is to be performed once only, and finally divided into two equal parts, one of which will be used for the tests and the other hermetically packed and preserved for at least 3 months to be used for independent tests, if these are required.

6.4.2 *Reduced sample for the determination of foreign bodies and of particle size group.* The mass of the reduced sample used for these determinations should be equal to that shown in Table 3.

6.4.3 *Reduced sample for determination of moisture content and of water of crystallisation.* The reduced sample intended for these determinations should have a mass of about 5 kg for all classes of particle sizes.

For particle sizes up to 150 mm, take the reduced sample by the method of quartering.

For particle sizes up to 300 mm, crush lumps exceeding 150 mm with a hammer, mix the whole sample and reduce twice by quartering.

7. TEST METHODS

7.1 Determination of the foreign body content

7.1.1 *Test sample.* From the reduced sample (see clause 6.4) weigh a test sample, the mass of which should be as given in Table 3 :

TABLE 3

Maximum size of particles	Minimum mass of the test sample
mm	kg
50	5
150	20
300	100

7.1.2 *Procedure.* Spread the test sample carefully on a clean, hard slab. Remove and weigh foreign bodies. Express the content of foreign bodies as a percentage of the total mass of the test sample.

7.2 Determination of the particle size group

7.2.1 *Test sample.* Use the test sample which has served for the determination of foreign body content, after having removed the latter.

7.2.2 *Procedure.* The determination of the particle size group should be carried out by means of a test sieve for particles smaller than or equal to 50 mm, and with a gauge having circular holes for particles smaller than or equal to 150 mm.

Weigh the residue for all particle size groups and the sieve material for groups 2 and 3 and express the value as a percentage of the total mass of the test sample.

7.3 Determination of moisture content

7.3.1 *Crushing of the reduced sample.* Having prepared the reduced sample according to clause 6.4.2, and after the elimination of foreign bodies, crush it into lumps about 10 mm in size.

7.3.2 *Test sample.* From the prepared sample (see clause 7.3.1) weigh a test sample of about 100 g. Let m_0 be the mass obtained.

7.3.3 *Procedure.* Dry the test sample in an oven at a temperature of 40 ± 4 °C to constant mass, m_1.

7.3.4 *Expression of results.* The moisture content of the sample, H, expressed as a percentage of the initial mass of the test sample, is given by the formula :

$$H\ \% = \frac{m_0 - m_1}{m_0} \times 100$$

7.4 Determination of water of crystallisation

7.4.1 *Preparation of the sample.* Grind the sample which served for the determination of moisture content in a porcelain mortar so that it is capable of passing through a sieve with 0.2 mm square meshes.

Grinding and sieving of the sample should be carried out without interruption.

Preserve the ground sample in a glass vessel provided with a tight stopper.

7.4.2 *Principle.* Dehydration, at a temperature of 230 °C, to constant mass, of the previously dried test sample.

7.4.3 *Apparatus*

7.4.3.1 CRUCIBLES made of material resistant to thermal shock.

7.4.3.2 CONTAINER provided with a tight cover and capable of containing a crucible (7.4.3.1).

7.4.3.3 FURNACE controlled at a temperature of 230 ± 5 °C.

7.4.4 *Procedure.* Dry and weigh the container together with its cover and a crucible. Quickly enclose in the container the crucible containing about 2 g of the ground sample, prepared according to clause 7.4.1. Weigh the whole. Let m_2 be the precise mass of the test sample.

Place the crucible in the furnace; remove it after 30 minutes; allow it to cool in the hermetically sealed container. Weigh. Let m_3 be the final mass of the test sample.

7.4.5 *Expression of results.* The water of crystallisation of the sample, expressed as a percentage of the initial mass of the test sample, is given by the formula :

$$Tc\ \% = \frac{m_2 - m_3}{m_2} \times 100$$

NOTE. – Carry out duplicate determinations. Take as the result the arithmetical average of the results obtained, provided that the difference between them is not greater than 0.15.

7.4.6 *Calculation of calcium sulphate dihydrate content.* The content of calcium sulphate dihydrate ($CaSO_4.2H_2O$) is obtained by multiplying the water of crystallisation by the coefficient 4.7785 :

$$Tg\ \%\ (CaSO_4.2H_2O) = 4.7785 \times Tc\ \%$$

7.5 Determination of other constituents

The chemical analysis of gypsum rock will be the subject of a separate ISO Recommendation.