

MIL-G-20098C  
31 January 1969  
SUPERSEDING  
See Section 6

## MILITARY SPECIFICATION

### GYSUM, CALCINED

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 This specification covers calcined gypsum (calcium sulfate hemihydrate).

1.2 Classification. The calcined gypsum shall be of the following types, as specified:

Type I - Fast setting  
Type II - Slow setting

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

#### SPECIFICATIONS

##### FEDERAL

RR-S-366 - Sieves, Standard for Testing Purposes  
UU-S-48 - Sack, Shipping, Paper  
PPP-C-96 - Cans, Metal, 28 Gauge and Lighter

#### STANDARDS

##### MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes  
MIL-STD-129 - Marking for Shipment and Storage

FSC 5610

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(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

Method C266 - Test for Time of Setting of Hydraulic Cement by  
Gillmore Needles

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa., 19103.)

3. REQUIREMENTS

3.1 Material. The material shall be a high-quality calcined gypsum meeting the requirements hereinafter specified.

3.2 Fineness. All the material shall pass a No. 20 U. S. standard test sieve, while not less than 95 percent shall pass a No. 100 sieve, when tested as specified in 4.5.1.

3.3. Setting time.

3.3.1 Type I. The calcined gypsum shall set in not less than 20 minutes nor more than 25 minutes from the initial time of addition of water to the material. The setting time shall be determined as specified in 4.5.2.

3.3.2 Type II. The calcined gypsum shall set in not less than 20 minutes nor more than two hours.

3.4 Shrinkage and expansion. The calcined gypsum shall not shrink more than 0.10 percent when tested as specified in 4.5.3. The gypsum shall not expand when so tested.

3.5 Compression strength.

3.5.1 Type I. The average compression strength of the dry set calcined gypsum shall be not less than 3,400 psi when tested as specified in 4.5.4. The compression strength of any one of the individual test specimens shall be not less than 2,900 psi.

3.5.2 Type II. The compression strength of type II calcined gypsum shall not be less than 4,000 pounds psi.

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3.6 Workmanship. The calcined gypsum shall be a dry, powdered material, smooth in texture, and free of lumps and extraneous matter. The material shall be processed in accordance with high-grade commercial practice.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Lot. A lot of calcined gypsum shall be of uniform composition, produced under like conditions in one unchanged process by one manufacturer and presented for acceptance at one time.

#### 4.3 Sampling.

4.3.1 Sampling for examination. A random sample of shipping containers shall be selected for examination of the gypsum and for the preparation for delivery in accordance with level 1 of MIL-STD-105.

4.3.2 Sampling for tests. Five containers shall be taken at random from the lot. A composite 2-pound sample shall be prepared by removing equal portions of material from each selected container, and mixing them thoroughly. The composite sample shall be placed in a tightly sealed metal container, labeled to show the name of the material, lot number, lot size, contract or order number, and name of the contractor. All acceptance tests shall be performed on material drawn from the composite sample.

#### 4.4 Examination.

4.4.1 Visual. Sample units selected in accordance with 4.3.1 shall be examined for visual defects in the calcined gypsum and at the acceptable quality level shown in table I.

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Table I. Examination of gypsum, calcined

<u>Material</u>	<u>AQL percent</u>	<u>Classification of defects</u>	<u>Defects</u>	<u>Method of examination</u>
Calcined gypsum (See 3.6 and 4.4.1)	2.5	Major 101	Not dry	Visual and tactile
		Major 102	Not powdered	Visual and tactile
		Major 103	Not smooth in texture	Visual and tactile
		Major 104	Not free from lumps	Visual
		Major 105	Contains ex- traneous matter	Visual

4.4.2 Packaging, packing and marking. Sample units selected in accordance with 4.3.1 shall be examined for the defects and at the acceptable quality level shown in table II.

Table II. Examination of packaging and packing

Item	AQL percent	Classification of defects	Defect	Method of Inspection
<b>Level A</b>				
<b>Critical</b>				
Unit container (See 4.4.2 and section 5)	4.0	Major 106	None defined	Visual
		Major 107	Improper types	Visual
		Major 108	Improper sizes	Approved scale <sup>2</sup>
		Major 109	Improper fill Improper closure	Visual
Box open (See 4.4.2 and section 5)	4.0	Major 110	Improper type of box	Visual
		Major 111	Lack of or improper strapping	
Box closed (See 4.4.2 and section 5)	4.0	Major 112	Gross weight, max.	Approved scale <sup>2</sup>
		Major 113	Improper marking	Visual
		Major 114	Improperly closed	Visual
<b>Level C</b>				
<b>Critical</b>				
Filled sacks (See 4.4.2 and section 5)	4.0	Major 115	Improper weight	Approved scale <sup>2</sup>
		Major 116	Marking, misleading or unidentifiable	Visual
		Major 117	Improperly closed	Visual

<sup>1</sup>The actual weight of a container filled with the minimum required quantity of gypsum shall be the basis for determining the acceptable weight of subsequent containers.

<sup>2</sup>Approved by procuring activity

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4.5 Tests.

4.5.1 Fineness. Place a No. 20 and a No. 100 sieve, conforming to RR-S-366, over a collecting pan. Place approximately 100 grams of the material, accurately weighed, on the top sieve and shake the assembly for 30 minutes in a Ro-Tap machine, or equivalent, geared to impart  $300 \pm 15$  gyrations and  $150 \pm 1$  taps per minute. Weigh the material retained on each sieve, and calculate the percentage of material passing each sieve.

4.5.2 Setting time. Place a 100-gram portion of the gypsum in a suitable mixing container, and pour exactly 41 ml. of distilled water held at room temperature ( $77^\circ \pm 5^\circ\text{F}$ ), over the material. Record the initial time of addition of the water. Stir the mixture for 2 minutes to form a smooth paste. Immediately pour the paste into a round dish measuring approximately 2-1/2 inches in diameter and 1/2 inch in depth (see 6.3). The mixture shall be tested for setting 20 minutes after the initial addition of the water, and again 5 minutes later, using Gillmore needles conforming to weight, diameter and form to the "final needles" described in ASTM method C266. The needle plunger shall be released at the specified intervals of 20 and 25 minutes, and quickly re-engaged  $2 \pm 1/4$  seconds after release in each instance. The needle shall penetrate to the bottom of the dish at the 20 minute interval, to indicate non-setting of the gypsum, while the needle penetration shall not exceed 0.5 mm at the 25 minute interval, to indicate that the material has set.

4.5.3 Shrinkage and expansion. Place a 300 gram portion of the material in a suitable mixing container, and pour exactly 123 ml. of distilled water held at room temperature ( $77^\circ \pm 5^\circ\text{F}$ ), over the material. Record the initial time of addition of the water. Allow the water to soak into the material for 2 minutes and then stir the mixture for 2 additional minutes to form a smooth paste. Immediately pour the paste into a 1 by 1 by 9 inch mold, and allow it to set for at least 1 hour. Remove the block from the mold and taper-trim both ends of the block to form 1/4 by 1/4 inch ends. The surface of the trimmed ends shall be made smooth and flat. Measure the length of the trimmed block to the nearest 0.001 inch by means of a vernier caliper. Place the block in an atmosphere conditioned to a temperature of  $70^\circ$  to  $80^\circ\text{F}$ , and a relative humidity of 30 to 50 percent. When the block has dried completely, remeasure its length to the same degree of accuracy as before. The block shall be considered completely dried when 2 consecutive weighings, made at 24 hour intervals, agree within 0.01 percent of each other. No increase in the initial length of the test block shall occur (see 3.4). Calculate the percentage of shrinkage as follows:

$$\text{Percent shrinkage} = \frac{(\text{Initial length} - \text{dried length})}{\text{Initial length}} \times 100$$

#### 4.5.4 Compression strength.

4.5.4.1 Specimens. Prepare a paste of the material with distilled water, mixing the ingredients in the proportion of 41 ml. of water to every 100 grams of the calcined gypsum used, as specified in 4.5.2. With the prepared paste, fill 5 metal cubic molds.

4.5.4.2 Molds. Molds for making test specimens shall be 2 inch split cube molds made of noncorrodible material and sufficiently rigid to prevent spreading during molding. The mold shall have not more than 3 cube compartments and be separable into not more than 2 parts. When assembled, the parts of the molds shall be firmly held together, and dimensions shall conform to the following requirements: Interior faces shall be plane surfaces with a maximum variation of 0.001 inch for 2 new molds and 0.002 inch for old molds; distance between opposite faces, and height of the molds, measured separately for each cube compartment shall be  $2 \pm 0.005$  inch. for new molds or  $2 \pm 0.020$  inch for old molds; angle between adjacent interior faces and between interior faces and to and bottom planes of the mold shall be  $90 \pm 0.05$  deg. measured at points slightly removed from the intersection of the faces.

4.5.4.3 Procedure. Allow the material in the molds to set for 1 hour, remove the set blocks from the molds, and dry them completely in an atmosphere conditioned to a temperature of 70° to 80°F and a relative humidity of 30 to 50 percent, as specified in 4.5.3. Mark the top side of the blocks so that each block may be placed in the compression testing machine with its marked side up. Place a block in the machine and apply the compression load at the rate of  $20,000 \pm 2,000$  pounds per minute, until the block is crushed. Record the load required to crush each of the 5 blocks. Calculate the average compression strength in terms of pounds per square inch. The materials shall be rejected if the compression strengths are not as indicated in 3.5.

### 5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. Calcined gypsum shall be packaged 1 pound net weight in metal containers of suitable size conforming to type V, class 2 of PPP-C-96, or 100 pound shipping paper sacks conforming to type II, IV, or V as specified, of construction number 12X, of UU-S-48.

5.1.2 Level C. Unless otherwise specified, calcined gypsum shall be packaged in metal containers or sacks as specified in 5.1.1, except as follows: The exterior coating shall not be required for the can of PPP-C-96, and the construction number 10X bag of UU-S-48 shall be used (see 6.2).

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5.2 Packing. Packing shall be level A or C as specified (see 6.2)

5.2.1 Level A. Containers as specified in 5.1.1 shall be packed in accordance with the overseas shipment requirements of the appendix to PPP-C-96. Paper sacks as specified in 5.1.1 shall be packed in accordance with the overseas shipment requirements of table XII of UU-S-48.

5.2.2 Level C. Either 50 pounds or 100 pounds, as specified (see 6.2), of calcined gypsum shall be packed in a paper shipping sack conforming to style B, type optional, construction numbers 4X or 10X, respectively, of UU-S-48.

5.3 Marking. In addition to any special marking specified by the procuring activity (see 6.2), all containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

6.1 Intended use. Calcined gypsum is used in the manufacture and assembly of level vials for fire control equipment, also as an ingredient in fillers used in inert ammunition.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Selection of applicable levels of packaging and packing.
- (c) Unit quantities required.

6.3 A dish, such as Catalog No. 4357, A. H. Thomas Co., Philadelphia, Pa., has been found to be a suitable container for holding the calcined gypsum in making the setting time determination (see 4.5.2).

6.4 Supersession. This specification supersedes MIL-G-20098B dated 31 July 1963 and PA-PD-290(Rev. 1), dated 21 October 1955. Type I is applicable where previous issues of MIL-G-20098 are referenced. Type II replaces PA-PD-290.

Custodian:  
 Army - MU  
 Air Force - 84

Preparing activity:  
 Army - MU

Review activities:  
 Army - MU, MD  
 Air Force - 84, 85

Project No. 5610-0056

User activities:  
 Army - MI, EL



SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
<p><b>INSTRUCTIONS:</b> This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side; staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.</p>		
SPECIFICATION		
ORGANIZATION		
CITY AND STATE	CONTRACT NUMBER	
MATERIAL PROCURED UNDER A <input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO (If "yes", in what way?)		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

DD FORM 1426  
1 JAN 66

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.