U. S. Gov't
Master
Specification
No. 247

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
George K. Burgess, Director

CIRCULAR OF THE BUREAU OF STANDARDS, No. 205

[Issued March 7, 1925]

UNITED STATES GOVERNMENT MASTER SPECIFICATIONS FOR GYPSUM PLASTER

FEDERAL SPECIFICATIONS BOARD SPECIFICATIONS No. 247

This specification was officially promulgated by the Federal Specifications Board on November 5, 1924, for the use of the Departments and Independent Establishments of the Government in the purchase of gypsum plaster.

CONTENTS

I. TYPES

This specification covers four types of gypsum plaster: W, wood-fibered plaster; N, neat plaster; B, sanded brown coat plaster; and S, sanded scratch coat plaster.

The calcined gypsum to be used as an addition to lime putty for the finish coat of plaster is covered by the Federal Specifications Board Specification for Calcined Gypsum (F. S. B. Spec. No. 248).

33781°—25

II. MATERIAL AND WORKMANSHIP

Gypsum plaster sold under this specification consists essentially of calcined gypsum to which has been added at the factory some of the materials which must be mixed with it in the preparation of a wall plaster.

Wood-fibered plaster contains some wood fiber, retarder, and sometimes a material added to improve its working quality.

Neat plaster contains retarder and may or may not contain hair and some material added to improve its working quality.

Ready sanded brown coat plaster contains all of the ingredients necessary, except water.

Ready sanded scratch coat plaster contains all of the ingredients necessary, except water.

III. GENERAL REQUIREMENTS

Specifications for calcined gypsum (F. S. B. No. 248) in effect at date of opening of bids shall form part of this specification.

IV. DETAIL REQUIREMENTS

The chemical composition and physical properties of gypsum plaster shall conform to the requirements given in Table 1.

TABLE 1.—*Properties of gypsum plasters*

Property	Wood fibered W	Neat N	Sanded brown coat B	Sanded scratch coat S
Content of $CaSO_4.\frac{1}{2}H_2O$, minimum, per cent	48.5	51.5	11.5	15.0
Content of wood fiber, minimum, do	1.0			
Content of sand, maximum, do			75.0	66.7
Time of set, minimum, hours	1.5	1.5	2.0	1.5
Time of set, maximum, do	8.0		6.0	7.0
Tensile strength, minimum, lbs./in.^{2}	125.0	150.0	50.0	75.0

V. METHOD OF INSPECTION AND TESTS

1. SAMPLING.—At least 3 per cent of the packages shall be sampled. Samples shall be taken from both the surface and the center of the packages. The material so obtained shall be thoroughly mixed and quartered to provide a 15-pound sample. This shall be placed immediately in an air-tight container, sealed, and sent to the laboratory. Samples shall not be taken from broken packages.

2. CHEMICAL ANALYSIS.—(*a*) *Preparation of sample.*—Dry about 1 pound of the material, spread in a thin layer in a suitable dish, in an oven at about 45° C. for two hours. Cool in an atmosphere free from moisture. Screen 100 g of this material through a No. 14 sieve to remove any hair or wood fiber. (Probably some of the sand will also

be retained.) Weigh the material passing through the sieve, and record this weight as "per cent fines." Grind about 10 g of this material until it all passes a No. 100 sieve, using extreme care that the material be not unduly exposed to moisture or overheating. Store in an air-tight container until used.

(*b*) *Calcium oxide.*—Place 0.5 g of the sample in a porcelain casserole. Add about 25 cc of 1:5 HCl and evaporate to apparent dryness on a hot plate. Cool, and add enough concentrated HCl to wet thoroughly. Add about 10 cc of water, boil, filter, and wash. Put the filtrate back in the same casserole. Evaporate to dryness, and heat to about 120° C. for one hour. Cool. Add enough concentrated HCl to wet thoroughly. Add about 25 cc of water, boil, filter, and wash. Add a few drops of HNO_3 to the filtrate and boil to insure oxidation of the iron. Add 2 g NH_4Cl previously dissolved in water. Make alkaline with NH_4OH. Digest hot for a few minutes until the precipitate coagulates. Filter and wash. To the filtrate add 5 g $(NH_4)_2C_2O_4$ dissolved in water. Digest hot for one-half hour, making sure that the filtrate is always alkaline with NH_4OH. Filter, wash, and ignite the precipitate in a platinum crucible over a strong blast to constant weight. Multiply this weight by 200 to find the per cent calcium oxide in the "fines."

(*c*) *Sulphur trioxide.*—Dissolve 0.5 g of the sample in 50 cc of 1:5 HCl. Boil. Add 100 cc of boiling water and continue boiling for five minutes. Filter immediately and wash thoroughly with hot water. Boil, and while boiling, add slowly 20 cc of a boiling 10 per cent solution of $BaCl_2$. Digest hot for one hour or until precipitate settles. Filter and wash. Dry carefully. Ignite over Bunsen burner at lowest heat possible until filter paper is burned off. Ignite at bright red heat for 15 minutes and weigh as $BaSO_4$. Multiply this weight by 68.67 to find the per cent sulphur trioxide in the "fines."

(*d*) *Combined water.*—Heat 1 g of the sample to constant weight in a covered crucible at 215 to 230° C. The loss of weight, multiplied by 100, gives the per cent combined water in the "fines."

(*e*) *Calculation.*—Substitute the percentages found above in the equations $CaO:SO_3:H_2O = 56:80:9$. It will be found that one, and probably two, of the ingredients is present in excess of the amount required to satisfy these equations. Select that ingredient which shows the greatest deficiency from the theoretical amount. If this ingredient is CaO, multiply the per cent CaO as found by 2.59 to find the per cent $CaSO_4.1/2H_2O$; if SO_3, multiply the per cent SO_3 by 1.81; if H_2O multiply per cent H_2O by 16.11. The per cent $CaSO_4.1/2H_2O$ thus found is then multiplied by the "per cent fines" and divided by 100 to reduce it to the basis of sample as received.

3. Wood Fiber.—Dry 100 g of the material for two hours at 45° C. Screen through a No. 14 sieve. Weigh the material retained on the sieve. Transfer it to a suitable dish and ignite to constant weight. The loss of weight is equal to the per cent wood fiber.

4. Sand.—Place 100 g of the material on a No. 100 sieve. Wash the material through the sieve by means of a stream of water from a faucet. Wash until the water comes through clear. Dry the material retained on the sieve and ignite to constant weight. This weight is equal to the per cent sand.

5. Testing Consistency.—To a known volume of water add a known weight of the sample. Sift the sample into the water by shaking it through a No. 4 sieve. Let soak for two minutes. Stir to an even fluidity and transfer immediately to a brass cylinder mold, 2 inches diameter by 4 inches high, mounted on a glass plate. Both the mold and the plate shall be clean and wet when the sample is introduced. Fill the mold, work the material to remove air-bubbles and strike off level. Immediately raise the mold by lifting it vertically upwards without distorting the specimen. The specimen, when thus released, will slump down on the glass plate. Measure its final height.

The mixture shall be considered of "testing consistency" when the final height is 3½ inches.

If the final height is greater or less than 3½ inches, repeat, using fresh materials throughout and varying the ratio of sample to water.

6. Time of Set.—Mix 200 g of the sample with enough water to make a paste of "testing consistency." For quantity of water and directions for mixing, see preceding section. Test with Vicat needle. Clean the needle from particles of adhering plaster after each test. Set is considered complete when the needle no longer penetrates to the bottom of the specimen.

The frequency of the penetrations will depend upon the character of the material, and is, therefore, left to the discretion of the operator; provided, that the time of set shall be determined to the nearest five minutes.

For this test, it is absolutely essential that all dishes and utensils be clean. Especially must they be free from all traces of set gypsum. Distilled water must be used.

7. Tensile Strength.—Mix 750 g of the sample with enough water to make a paste of "testing consistency." For quantity of water and directions for mixing see section V, 5 above. Cast in a five-gang briquet mold, moving the containing vessel back and forth over the mold while casting. Work slightly to remove air bubbles, and strike off level. Remove the briquets from the mold as soon as they are hard enough to handle. Store in the air at a temperature

of between 60 and 100° F. Weigh once a day. Test when the weight has become constant within 0.1 per cent.

In computing the average strength, any briquet whose strength varies more than 15 per cent from the average may be discarded. In case three or more briquets vary 15 per cent from the average, the results shall be discarded and the tests repeated.

This average strength shall be not less than the minimum requirement given in section 4.

VI. PACKING AND MARKING

1. Packing.—Gypsum plasters are shipped in packages.

2. Marking.—Each package of gypsum plaster shall be legibly marked with a description of the contents (as noted above), the name of the manufacturer, the brand (if any), and the net weight of the contents; also with some means of identification stating the particular contract on which the purchase and shipment were made.

VII. ADDITIONAL INFORMATION

Wood fibered plaster may be used either with or without the addition of sand, for either scratch or brown coat.

Neat plaster may be had either with or without hair. That with hair may be mixed with two parts (by weight) of sand for scratch coat. Either the fibered or unfibered plaster may be mixed with three parts of sand for brown coat.

Sanded brown coat and scratch coat plasters contain all necessary ingredients for the respective coats, except the water. It is essential that no sand be added to these plasters.

VIII. GENERAL SPECIFICATIONS

No details.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY