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Standard Methods for PHYSICAL TESTING OF GYPSUM BOARD PRODUCTS, GYPSUM LATH, GYPSUM PARTITION TILE OR BLOCK, AND PRECAST REINFORCED GYPSUM SLABS¹

This standard is issued under the fixed designation C 473; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 These methods cover the physical testing of gypsum board products, gypsum lath, gypsum partition tile or block, and precast reinforced gypsum slabs.

1.2 The methods appear in the following order:

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1.3 The values stated in inch-pound units are to be regarded as the standard. The SI

equivalents of inch-pound units may be approximate.

FLEXURAL STRENGTH OF GYPSUM BOARDS OR GYPSUM LATH

2. Test Specimens

2.1 Cut test specimens from at least three gypsum boards or laths to comprise a sample. Cut two specimens, each 12 in. (305 mm) by approximately 16 in. (406 mm) from each board or lath in the sample, one having the 16-in. dimension parallel to the fiber of the surfacing material and the other at right angles thereto. Cut the specimens at least 4 in. (102 mm) away from the open ends and edges of the board or lath except in the case of the 16-in. wide lath, where it is impossible to do so.

2.2 Weigh the specimens to within 1 g, and then condition at a temperature of $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$) in an atmosphere having a relative humidity of $50 \pm 2\%$.² Individually test the specimens after constant weight is reached.

3. Procedure

3.1 Support each specimen centrally on fixed parallel bearings, 14 in. (356 mm) on centers, and apply the load on a similar bearing

¹ These methods are under the jurisdiction of ASTM Committee C-11 on Gypsum and Related Building Materials and Systems and are the direct responsibility of Subcommittee C11.01 on Specifications and Test Methods for Gypsum Products.

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² Laboratory test results indicate that conditioning temperatures may range from 70 to 100°F (21 to 38°C) without significantly affecting the results. Relative humidity, however, is critical.

midway between the supports. When testing perforated gypsum lath, position the specimens so that the load is not applied over any perforations. All bearings and load surfaces shall be true, shall engage the full width of the test specimen, and shall be rounded to a radius of $\frac{1}{8}$ in. (3.2 mm). Apply the test load at a uniformly increasing rate of 1 lbf/s (0.07417 N/s), with a permissible variation of $\pm 10\%$ in the rate. Apply the load with a device independent of manual control of the rate of loading during an individual sample test and maintain the specified rate of loading over all finite time intervals during a test.

4. Report

4.1 Calculate the average breaking load in pounds-force or newtons of the specimen cut from the board or lath in each direction, and report the results of the flexural strength tests for the load applied across the fiber and the load applied parallel to the fiber of the surfacing.

HUMIDIFIED DEFLECTION OF GYPSUM BOARDS

5. Test Specimens

5.1 Cut test specimens from at least three gypsum boards to comprise a sample. Cut two specimens 12 by 24 in. (305 by 610 mm) from each board in the sample. The 12-in. dimension shall be parallel to the fiber of the surfacing material. Take specimens at least 12-in. away from the ends and edges of gypsum boards 36 in. (914 mm) or more in width. Cut specimens from the center of gypsum boards that are narrower than 36 in. (914 mm) as noted in Fig. 1.

5.2 Condition the specimens in an atmosphere of $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$) and $50 \pm 2\%$ relative humidity for at least 24 h before testing.

6. Procedure

6.1 Suspend each specimen face down on parallel and level bearing edges, having $\frac{1}{8}$ -in. (3.2-mm) radii, 12 in. (305 mm) long and 23 in. (584 mm) apart in an atmosphere of $90 \pm 3^\circ\text{F}$ ($32 \pm 1.7^\circ\text{C}$) and $90 \pm 3\%$ relative humidity for 48 h.

6.2 Measure the humidified deflection of each specimen as the distance between a straightedge placed on the top end edges of the

board and the upper surface of the board at its center. Take measurements to the nearest $\frac{1}{16}$ in. (1.6 mm).

7. Report

7.1 Report the humidified deflection as the average of the specimens to the nearest $\frac{1}{8}$ in. (3.2 mm).

CORE, END, AND EDGE HARDNESS OF GYPSUM BOARDS

8. Test Specimens

8.1 Cut test specimens from at least three gypsum boards to comprise a sample. For core hardness tests, cut specimens approximately 19 by 3 in. (483 by 76 mm) minimum from the center of each of three sample boards, with the 19-in. dimension perpendicular to the paper-bound edges of the gypsum boards. The dimension parallel to the paper surfacing fibers will vary depending on the specific punch length and opening in the testing machines. When the sample is placed in the tester, place the loading arm in a horizontal position with the punch resting on the sample. It is preferred that the specimens be sawed, rather than cut with a knife. Saw cuts along the 19-in. dimension shall be smooth and square with the 3-in. minimum dimension, as well as with the board surface.

8.2 Condition specimens to constant weight at a temperature of $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$) and relative humidity of $50 \pm 2\%$.² Test specimens individually after constant weight is reached.

9. Procedure for Core Hardness

9.1 Clamp or secure the specimen in a fixed vertical position on its 19-in. (483-mm) dimension edge. Use a steel punch, 0.099 ± 0.003 in. (2.515 ± 0.076 mm) in diameter, with the bearing surface machined to a 90° angle in reference to the punch center line. Position the punch at a parallel plane to the board specimen paper surfaces and on the center of the gypsum core edge, equidistant from the paper covered surfaces of the board specimen. Apply the test load at a uniformly increasing rate of 1 lbf/s (0.07417 N/s), with a permissible variation of $\pm 10\%$ in the rate. Apply the load with a device independent of manual control of the rate of loading during an individual sample test and maintain the specified rate of loading over all

finite time intervals during a test. The core hardness shall be the load required to force the steel punch a distance of $\frac{1}{2}$ in. (13 mm) into the core of the specimen. (The flexural strength testing equipment may be modified to conduct the core hardness test.) Secure three tests on one 19-in. edge of each specimen at least 4 in. (102 mm) apart, and calculate the numerical average. Discard any single test that varies from the average by more than 15 % and repeat the test (see Fig. 2 for test setup schematic).

10. Report

10.1 Report core hardness as the average load in pounds-force or newtons from the average of the three sample boards.

11. Procedure for End Hardness

11.1 Use the same procedure for end hardness test as for core tests except cut the test specimens from each opposite mill cut end of the board, with the 19-in. (483-mm) dimension perpendicular to the paperbound edges of the gypsum boards, and run tests only on the mill cut edge of the samples. (see Fig. 2 for test setup schematic).

12. Report

12.1 Report the end hardness as the average load in pounds-force or newtons for the two specimens from each of the three sample boards, a total of six test results.

13. Procedure for Edge Hardness

13.1 Use the same procedure for edge hardness test as for core tests except cut the 19 by 3-in. (483 by 76-mm) test specimens from the opposite edges of the board with the 19-in. dimension of the specimens parallel with the paperbound edges of the gypsum boards.

13.2 Cut a $\frac{1}{4}$ to $\frac{1}{2}$ -in. (6.4 to 13-mm) strip of paper from the paper-covered edge of the test specimens exposing the core for test. These test areas shall be at least 4 in. (102 mm) apart. Calculate the individual results and report for the three sample boards, making a total of six test results (see Fig. 2 for test setup schematic).

14. Report

14.1 Report the edge hardness as the average load in pounds-force or newtons for the two

specimens from each of the three sample boards, a total of six test results.

NAIL PULL RESISTANCE OF GYPSUM BOARDS

15. Test Specimens

15.1 Cut test specimens from at least three gypsum boards to comprise a sample. Cut five specimens 6 by 6 in (152 by 152 mm), from a strip cut across the width of a 48-in. (1219-mm) gypsum board starting at least 4 in. (102 mm) in from the edge. Cut a total of five specimens from more than one full width strip from gypsum boards less than 38 in. (965 mm) wide. Do not cut the specimen closer than 3 in. (76 mm) from the gypsum board edges.

15.2 Drill a $\frac{1}{64}$ -in. (2.778-mm) diameter pilot hole through the thickness of the gypsum board in the center of each test specimen and perpendicular to the surface.

15.3 Condition specimens to constant weight at $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$) and 50 ± 2 % relative humidity.²

16. Apparatus

16.1 Figure 3 shows a schematic of a nailpull resistance apparatus adaptable to a typical flexural-strength apparatus commonly used in the gypsum industry. Key features of the adaptation involve use of a machined test "nail," meeting the requirements of 17.1, that can be fitted onto the load level arm of the flexural strength apparatus. The base plate, with a 3-in. (76-mm) diameter hole in the center, supports the gypsum board test specimen during the test.

17. Procedure

17.1 Center the specimen face up on the base plate and manually lower the test "nail" inserting the nail shank into the pilot hole until the nailhead is flush with the surface of the sample. The nail shank shall be 0.099 ± 0.003 in. (2.515 ± 0.076 mm) in diameter and the nailhead shall be 0.250 ± 0.005 in. (6.350 ± 0.127 mm) in diameter. Apply the test load at a uniformly increasing rate of 1 lbf/s (0.07417 N/s), with a permissible variation of ± 10 % in the rate. Apply the load with a device independent of manual control of the rate of loading during an individual sample test and maintain the specified rate of loading over all finite time intervals during a test.



18. Report

18.1 Report the nail-pull resistance as the average force in pounds-force or newtons for the 15 specimens tested. If the values for one or two specimens vary more than 15 % from the average of the 15, discard them and report the nail-pull resistance as the average of the remaining specimens. If the nail-pull resistance of three or more specimens vary more than 15 % from the average, discard the results and repeat the test.

NOMINAL THICKNESS OF GYPSUM BOARDS OR GYPSUM LATH

19. Test Specimens

19.1 Use at least three gypsum boards or gypsum lath as a sample. Use full-size gypsum boards or gypsum lath for test specimens.

19.2 Mark the individual boards or lath to be tested, score on both sides, and break at 12 in. (305 mm) from each end, discarding the two ends prior to testing. Retain the remaining part of each gypsum board or gypsum lath as a test specimen.

20. Procedure

20.1 Use a micrometer gage for determining the thickness measurement to 0.001 in. (0.025 mm). The micrometer shall be a 1-in. (25.4-mm) hand micrometer, with ¼-in. (6.35-mm) diameter anvils graduated to 0.001 in.

20.2 Mark measurement points at approximately equal points across the width at each end of the board or lath excluding the tapered, beveled or recessed edges if applicable. The micrometer contact shall be firm but shall not indent the paper. Measure the thickness of the gypsum board or gypsum lath with the micrometer at least ½ in. (13 mm) from cut ends. Take a minimum of six readings at each end of the 48-in. (1220-mm) wide gypsum board, five readings at each end of the 32-in. (813-mm) wide gypsum board or gypsum lath, four readings at each end of the 24-in. (610-mm) wide gypsum board or gypsum lath, or three readings at each end of the 16-in. (406-mm) wide gypsum board or gypsum lath.

21. Report

21.1 Calculate the nominal thickness of each specimen as the average of the individual mi-

cro-meter readings taken on each board. Report the nominal thickness as the average nominal thickness of three gypsum board or gypsum lath specimens in the sample.

RECESSED OR TAPERED-EDGE DEPTH OF GYPSUM BOARDS

22. Test Specimens

22.1 Use at least three gypsum boards as a sample.

22.2 Mark the individual boards to be tested, score on both sides, and break 12 in. (305 mm) from each end, discarding the two ends prior to testing. Retain the remaining part of each gypsum board as a test specimen.

23. Procedure

23.1 Use the micrometer gage described in 20.1.

23.2 The micrometer contact shall be firm, but shall not indent the paper. Take two micrometer readings on each end of the board (total of four readings) 6 in. (152 mm) from each edge, and at least ½ in. (13 mm) from the cut end. Take the average of the four micrometer readings as the average thickness of one test specimen. Take two readings on each edge of the test specimen, 6 in. (152 mm) from the cut end, and ¾ in. (9.5 mm) from the extremity of the paper bound edge (total of four readings). Take the average of these four readings as the average thickness of the tapered or recessed edge.

23.3 Subtract the specimen edge thickness from the specimen thickness to determine the depth of the recessed or tapered-edge gypsum board.

24. Report

24.1 Report the difference between the average edge thickness and the average nominal board thickness of the three gypsum board specimens, as the depth of the recessed or tapered edge.

WIDTH OF GYPSUM BOARDS OR GYPSUM LATH

25. Test Specimens

25.1 A sample shall consist of a minimum of three gypsum boards or gypsum lath.



26. Procedure

26.1 Measure the width of an individual board or lath to the nearest $\frac{1}{32}$ in. (1 mm) with an accurate T-square, straight rule, or pocket rule. Place the rule perpendicular to the paper bound edges of the gypsum boards or gypsum lath, when measurements are taken. The width of the board or lath is the distance between extremities of the edges, so in cases where the edge or edges are beveled (slope in or out) with the face or back of the board or lath, or are round, determine the overall distance. One exception is tongue and groove edge board, the width of which is the distance between the tip of the tongue and the bottom of the groove.

26.2 The width of an individual board or lath shall be the maximum of two readings taken at least 48 in. (1220 mm) apart and about 6 in. (152 mm) away from both ends of the board or lath. Cut off 6 in. (152 mm) from both ends before taking measurements at ends of tongue and groove-edge boards.

27. Report

27.1 Report the width as the average width of a minimum of three specimens.

LENGTH OF GYPSUM BOARDS OR GYPSUM LATH

28. Test Specimens

28.1 A sample shall consist of a minimum of three gypsum boards or gypsum lath.

29. Procedure

29.1 Measure the length of an individual board or lath to the nearest $\frac{1}{16}$ in. (1.59 mm) with an accurate rule. Place the rule parallel with board or lath edges when measurements are taken. The length of the board or lath shall be the distance between extremities of the ends, so in cases where the ends are beveled, determine the overall distance.

29.2 The length of an individual board or lath shall be the maximum of two readings taken about 3 in. (76 mm) away from both edges.

30. Report

30.1 Report the length as the average length of a minimum of three specimens.

WATER RESISTANCE OF CORE-TREATED WATER REPELLENT GYPSUM BOARDS

31. Test Specimens

31.1 Use at least three gypsum boards as a sample.

31.2 Prepare a 12 by 12-in (305 by 305-mm) test specimen cut from the center of the gypsum board being tested by scoring and breaking. Cut specimens approximately centered between both edges and at least 6 in. (152 mm) from either end. Do not treat the edges of the specimen nor damage the surface paper.

31.3 Condition the specimens to constant weights, within 0.1 %, at a temperature of $70 \pm 5^\circ\text{F}$ ($21 \pm 2^\circ\text{C}$), in an atmosphere having a relative humidity of 50 ± 2 %, and then weigh to within 0.5g.

32. Procedure

32.1 Immerse the sample flatwise in a bath of water at a constant temperature of $70 \pm 1^\circ\text{F}$ ($21 \pm 0.5^\circ\text{C}$) with a head of 1 in. (25.4 mm) of water over the top of the sample, which shall be positioned in the water bath so that it does not lie flat on the bottom of the container.

32.2 Upon removal from the bath, wipe excess water from the surfaces and edges of the specimen and weigh immediately to within 0.5 g.

33. Report

33.1 Calculate the gain in weight for each specimen as a percentage of the original weight as determined in 31.3 and report the average percentage as the water absorption of the gypsum board.

SURFACE WATER RESISTANCE OF GYPSUM BOARDS WITH WATER-REPELLENT FACE PAPER

34. Test Specimens

34.1 Use at least three gypsum boards as a sample.

34.2 Cut three specimens 5 in. (127 mm) square from the field of each sample board.

34.3 Condition the specimens to constant weight, within 0.1 %, at a temperature of $70 \pm 5^\circ\text{F}$ ($21 \pm 2^\circ\text{C}$), in an atmosphere having a relative humidity of 50 ± 2 %, and then weigh to within 0.05 g.

35. Procedure

35.1 Place the conditioned test specimens in the Cobb Tester,³ previously conditioned to $70 \pm 2^\circ\text{F}$ ($21 \pm 1^\circ\text{C}$), with the side to be exposed to water facing up. Fill the Cobb ring with tap water adjusted to a temperature of $70 \pm 1^\circ\text{F}$ ($21 \pm 0.5^\circ\text{C}$), resulting in a 1-in (25-mm) head of water above the test area of the specimen, and allow the specimen to remain in the ring for 2 h. After 2 h have elapsed, pour the water out of the Cobb ring and remove the test specimen from the Cobb Tester. Immediately, remove excess water from the specimen by blotting with a dry absorbent paper towel, and weigh the specimen to the nearest 0.05g.

36. Report

36.1 Calculate the average difference between the dry and wet weights of the test specimens and report this as the surface water absorption of the board samples.

DETERMINATION OF TYPE X GYPSUM LATH

37. Test Specimens

37.1 Use at least three gypsum laths as a sample.

37.2 Cut two specimens, 2 by 12 in. (51 by 305 mm) from each lath (see Fig. 4) with the 12-in. direction parallel to the folded edges of the lath. Drill holes in each specimen as shown in Fig. 5.

NOTE 1—Extreme care should be taken in handling of the specimens so that the gypsum core is not fractured.

38. Procedure

38.1 Position two natural gas Meker burners $1\frac{3}{4}$ in. (44.4 mm) apart with the grids facing and the axial center lines of the burners aligned (see Fig. 6).

38.2 Suspend the samples to be tested from a pin so that the distances from either burner to the center line of the sample are equal, the sample is vertical, the axial center lines of the burners pass through the center of the sample, and the surfaces of the sample are parallel to the burner grids. Apply a 1000-gf (9.8-N) load to the sample by means of a pin inserted in the lower hole.

38.3 Supply natural gas to the burners from a single source using rubber tubing containing

a Y fitting. After the source, and before the Y, install a gas meter and manometer in the line.

38.4 Start timing with the ignition of the burners. For the duration of the test the temperatures, measured $\frac{3}{16}$ in. (4.8 mm) from sample surfaces at the sample midpoint, shall be $1550 \pm 50^\circ\text{F}$ ($843 \pm 28^\circ\text{C}$). Measure the temperatures with a potentiometer used in conjunction with Chromel-Alumel thermocouples (0.065-in. (1.65-mm) wire). Take care, while testing, to prevent loose pieces of charred paper from resting against the thermocouple wires (see Fig. 7).

38.5 The natural gas pressure to the burners shall be equivalent to 5 in. H_2O (1245 Pa) and usage shall be $0.151 \pm 0.005 \text{ ft}^3$ ($0.0042 \pm 0.0001 \text{ m}^3$)/min while the test is in progress. Record the gas consumption with the gas meter.

39. Report

39.1 The duration of the test is 30 min. Consider those samples that are intact after 30 min. to be Type "X" lath. Consider those that fail before 30 min to be regular lath. Four out of every five samples of the same test lot should indicate similar results.

DETERMINATION OF TYPE X GYPSUM BOARD

40. Test Specimens

40.1 Each specimen shall be 2 by 16 in. (50.8 by 406 mm) with the long direction of the specimen parallel to the machine direction of the board. A tolerance of $\pm \frac{1}{32}$ in. ($\pm 0.8 \text{ mm}$) is allowable. The specimen shall be cut on a saw rather than scored and snapped. Specimens shall be taken at least 8 in. (203 mm) from any mill edge or end of the board being tested.

40.2 Condition each specimen for a period of 24 h in a $68 \pm 5^\circ\text{F}$ ($18 \pm 3^\circ\text{C}$) and $50 \pm 5\%$ relative humidity. Drill a $\frac{3}{4}$ -in. (3.6-mm) hole through the core 1 in. (25.4 mm) from one end of each specimen to accommodate the weight suspension clip.

40.3 Cut four samples from each board to be tested.

41. Apparatus (see Figs. 8 and 9)

41.1 *Brass Base Plate*, $\frac{1}{4}$ in. (6.4 mm), 6 by 18 in. (152 by 457 mm).

³ Cobb Size Tester, with 100-cm² cylinder and neoprene gasket, is available from W. & L. E. Gurley, Troy, N. Y.

41.2 *Sample Stop*— $\frac{3}{8}$ -in. machine screw mounted in a base with a long nut to provide a minimum of $\frac{1}{4}$ -in. adjustment in height.

41.3 *Mixing Chamber*, made from nominal $1\frac{1}{2}$ by $\frac{1}{2}$ -in. copper reducer.

41.4 *Line Valves*, $\frac{3}{8}$ in. (9.5 mm), two lever handles have been rebored to a $\frac{1}{32}$ -in. (7.1-mm) orifice.

41.5 *Copper Reducers*, two, nominal $\frac{1}{2}$ by $\frac{3}{8}$ in.

41.6 *Copper Tube*, Type “L” $\frac{3}{8}$ in. (9.5 mm) ID.

41.7 *Copper Elbows*, nominal $\frac{3}{8}$ in., six.

41.8 *Wing-Tip Burner*, nominal $\frac{3}{8}$ by 2 in. with 0.040-in. (1-mm) opening.

41.9 *Sample Holder*, with $\frac{1}{2}$ in. (12.7 mm) brass rod base, swivel back.

41.10 *Threaded Disconnect*, (nominal) $\frac{1}{2}$ in.

41.11 Natural gas (methane) and pressurized air regulated by flowmeter and needle valves.⁴ The natural gas (methane) and pressurized air are brought together from the separate flowmeters through a “Y” connection just ahead of the threaded disconnect (41.10). The air-gas mixture moves into a mixing chamber (41.3) that also acts as a constant-pressure reserve. From this point the fuel mixture passes through two balancing level valves (41.4) and is distributed to the wing-tip burners (41.8). The balancing lever valves are used to proportion the correct amount of fuel between the upper and lower burners to keep the midpoint of the flames at the same plane as the specimen.

42. Procedure

42.1 Begin the test by igniting the gas and increasing the flow with the needle valve until the flowmeter reads 20 standard ft³/h (0.00016 m³/s). Then add to air approximately 60 standard ft³/h (0.00047 m³/s). Position an 8-in. (203-mm) probe with a 20-gage (AWG) (0.8-mm) Chromel-Alumel thermocouple with bare bead attached in the specimen holder. Then record eight temperature points axially, four across the center line of the flame and two above and two below at midpoints (see Fig. 4). The average center line temperature shall be $1850 \pm 50^\circ\text{F}$ ($1066 \pm 28^\circ\text{C}$). The average of the top and bottom midpoint readings shall be within 25°F (14°C) of each other.

42.2 Using the proper sized specimen holder for the thickness of the gypsum board being used, insert the conditioned specimen securely

in the specimen holder face side up at a 90° angle to the plane of the burners. Be sure the specimen is equidistant between burners. This will necessitate making a different specimen holder for $\frac{3}{8}$ -in. (15.9-mm) board specimens. Fasten a weight suspension clip to the end of the specimen and attach the proper weight in accordance with the thickness of the specimen:

Thickness	Weight
$\frac{1}{2}$ in. (12.7 mm)	150.0 g (Note 2)
$\frac{3}{8}$ in. (15.9 mm)	187.5 g (Note 2)

NOTE 2—The weight per thickness includes the weight of the weight suspension clip.

42.3 Swivel the specimen into the plane of the flames and immediately start timing.

42.4 Time to failure is determined by the specimen breaking or deflecting to the point it comes in contact with the stop, which is positioned 1 in. (25.4 mm) in from the end of the specimen, and adjusted so it is $1\frac{1}{2}$ in. (38.1 mm) below the bottom surface of the specimen when the test is started.

43. Report

43.1 Report the failure time of each material as the average time of four specimens in minutes and seconds to the closest 1 s.

COMPRESSIVE STRENGTH OF GYPSUM PARTITION TILE OR BLOCK

44. Test Specimens

44.1 Test not less than five full-size tile or block specimens. Dry the specimens at a temperature of $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$) in an atmosphere having a relative humidity of not more than 50%.² Weigh the specimens at 1-day intervals until constant weight is attained. At the option of the manufacturer or purchaser, strength tests may be conducted on specimens that are dried at room temperature. However, in cases of controversy, dry all test specimens to constant weight as prescribed herein.

45. Procedure

45.1 Test the specimens in the position in which the tile or block is designed to be used,

⁴ Flowmeters manufactured by Dwyer Instrument Co., P. O. 3373, Michigan City, Ind. 46306, have been found satisfactory for this purpose. For gas model VFA 6 flowmeter range 4-0-30 standard ft³/h with a brass valve. For air model VFA 8 SSV, range 10-100 standard ft³/h with a stainless steel valve.



and bed on and cap with a felt pad not less than $\frac{1}{8}$ in. (3.2 mm) nor more than $\frac{1}{4}$ in. (6.4 mm) in thickness. At the option of the manufacturer or purchaser, or in cases of controversy, the specimens may be suitably capped with calcined gypsum mortar, or the bearing surfaces of the tile may be planed or rubbed smooth and true. When calcined gypsum is used for capping, conduct the test after the capping has set and the specimen has been dried to constant weight in accordance with 44.1.

45.2 The loading head shall completely cover the bearing area of the specimen, and the applied load shall be transmitted through a spherical bearing block of proper design. The speed of the moving head of the testing machine shall be not more than 0.05 in./min (0.02 mm/s).

46. Report

46.1 Calculate the average compressive strength of the specimens tested and report this as the compressive strength of the tile or block.

FLEXURAL STRENGTH OF PRECAST REINFORCED GYPSUM SLABS

47. Test Specimens

47.1 Test not less than five full-size short-span slabs nor less than five full-size long-span slabs. Dry the specimens to constant weight at a temperature of $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$), in an atmosphere having a relative humidity of not more than 50 %.²

48. Procedure

48.1 Place the slab symmetrically over the supports flatwise on the bearing edges and either apply equal loads at points one fourth from each support through bearing edges against the upper surface of the slab; or apply a uniformly distributed load over the slab between the supports. With the load lines parallel to the supports, apply the loads normal to the upper surface of the slab. The clear span between supports shall be 80 in. (2.03 m) for long-span slabs, and $27\frac{1}{2}$ in. (0.70 m) for short-span slabs. Apply the load at a uniform rate, or in increments not in excess of 20 lbf/ft² (958 Pa) such as to result in failure of the specimen in 10 to 20 min. In addition, determine the deflection of the long-span slabs at midspan to the nearest 0.001 in. (0.03 mm) for

each 20-lbf/ft² (958-Pa) increment of loading.

NAIL RETENTION OF PRECAST REINFORCED GYPSUM SLABS

49. Test Specimens

49.1 Test sections of full thickness and at least 6 in. (152 mm) in length and width from five short-span slabs or five long-span slabs. Dry the specimens to constant weight at a temperature of $85 \pm 15^\circ\text{F}$ ($29.5 \pm 8.5^\circ\text{C}$), in an atmosphere having a relative humidity of not more than 50 %.²

50. Procedure

50.1 Drive not less than three copper roofing nails 0.120 in. (3.05 mm) in diameter to a depth of 1 in. (25.4 mm). Pull out the nails axially in such a manner that the force required to effect the pull-out can be measured in pounds-force (or newtons).

51. Report

51.1 Report the pull-out load as the average force required to pull out all the nails in a given sample.

WEIGHT OF GYPSUM BOARD OR GYPSUM LATH

52. Test Specimens

52.1 A sample shall consist of a minimum of three gypsum boards or gypsum lath.

53. Procedure

53.1 Measure the length and width of each specimen in accordance with Sections 25 to 27 on Width of Gypsum Boards or Gypsum Lath, and Sections 28 to 30 on Length of Gypsum Boards or Gypsum Lath. Weigh the specimens on a suitable scale and record the weight to the nearest $\frac{1}{4}$ lb (0.1 kg). Calculate the weight in accordance with the following equation:

$$W = \frac{144 \times 10^3 \times P}{L \times B} \left(W = \frac{10^8 \times P}{L \times B} \right)$$

where:

W = weight, lb/1000 ft² or kg/100 m²,

P = weight of specimen, lb or kg,

L = length of specimen, in. or mm, and

B = width of specimen, in. or mm.

54. Report

54.1 Report the weight, as the average calculated weight, in lb/1000 ft² or kg/100 m² of the three gypsum boards or gypsum lath in the sample.

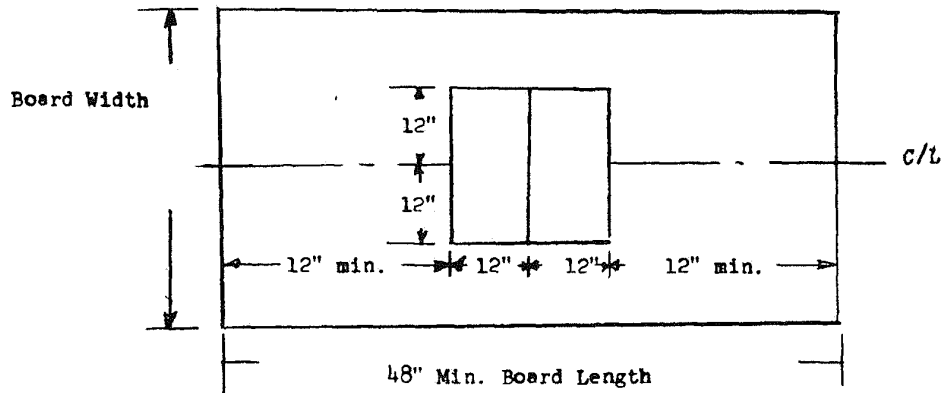


FIG. 1 Sample Selection Detail for Humidified Deflection Test

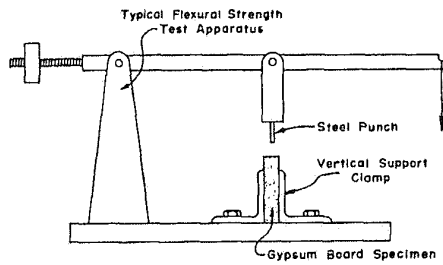


FIG. 2 Apparatus Schematic for Core, End, and Edge Hardness Test

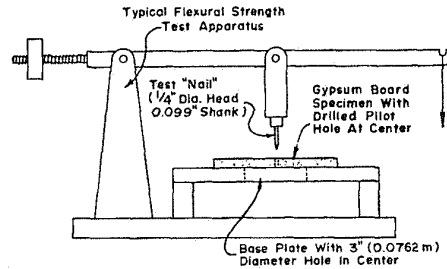


FIG. 3 Apparatus Schematic for Nail-Pull Resistance Test

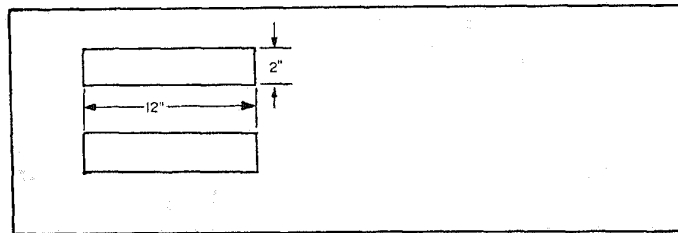


FIG. 4 Sample Selection Detail

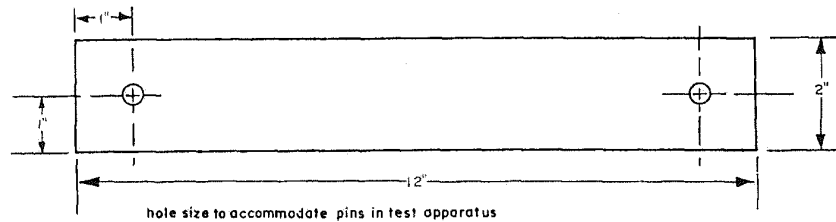


FIG. 5 Sample Drilling Detail

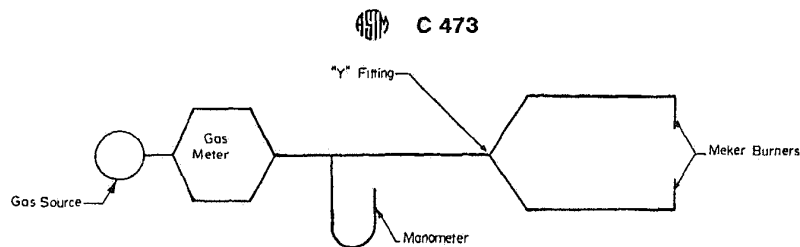


FIG. 6 Gas Line Schematic

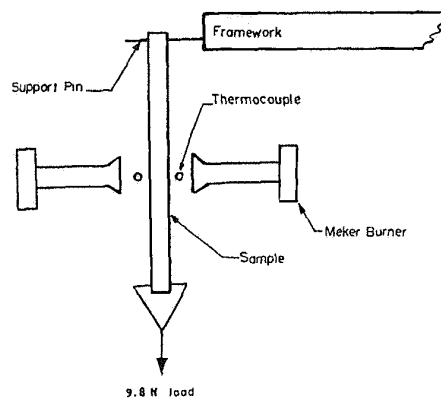
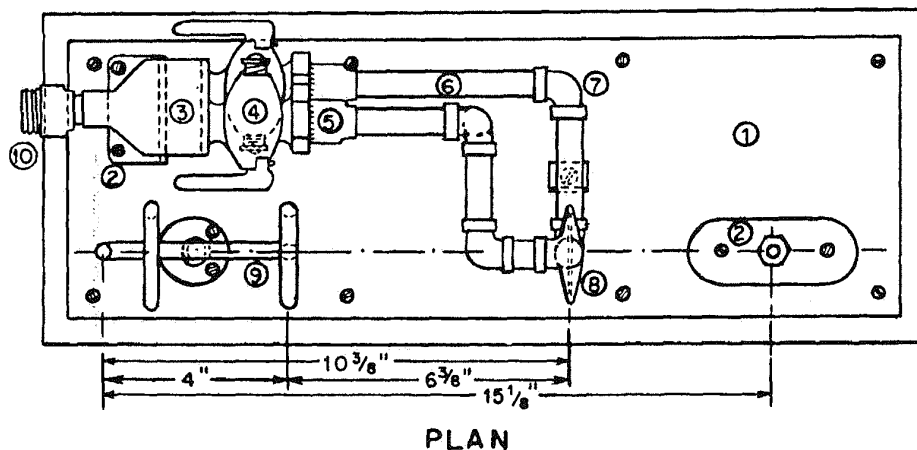


FIG. 7 Sketch of Test Apparatus



PLAN

FIG. 8 Plan of Test Apparatus

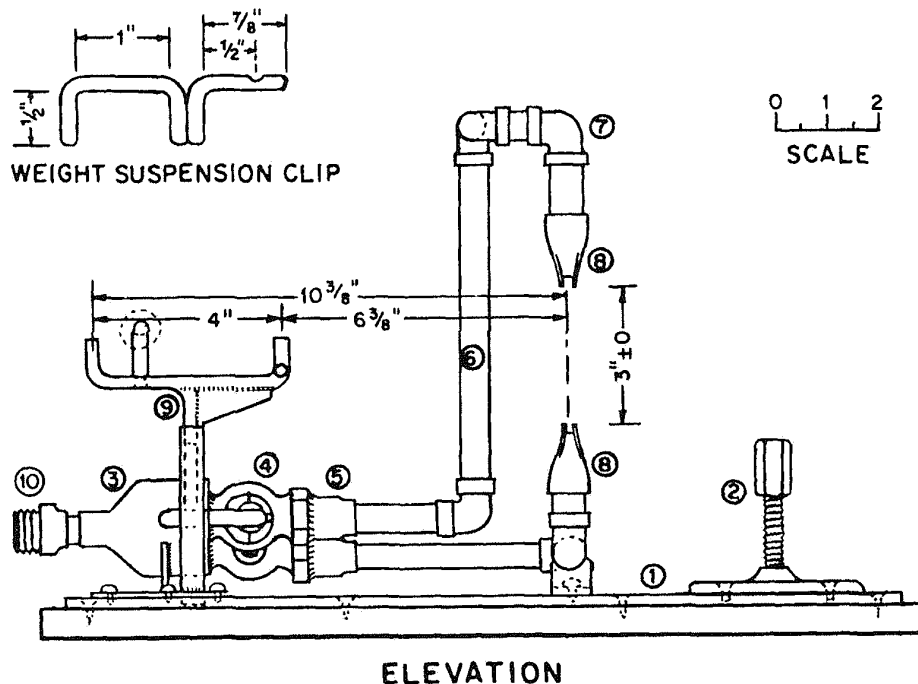


FIG. 9 Elevation of Test Apparatus

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