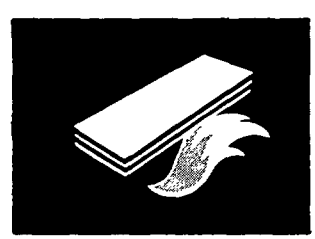
AIA FILE NO. 23

RESEARCH PROVES

GYPSUM WALLBOARD
IN SHOWER AREAS

Gypsum Association
201 North Wells Street
Chicago, Illinois 60606

1350 N. Highland Avenue
Hollywood, California 90028



PLAINTIFF'S EXHIBIT
GP-661

SGP 0024892

AIA FILE NO. 23-L



INTERIOR OF SHOWER STALL
Rotating sprinkler (top, center) sprayed uniform flow of water on all systems simultaneously—at above-average rate of 4 gallons per minute. Note how joints between specimens were sealed with Tile Contractors' Association of America's recommended ceramic tile adhesive . . . to prevent migration of water.

Gypsum Wallboard in Shower Areas

Exhaustive 59-week test—approximating 20 years of service for a family of four—by independent research laboratory proves durability of gypsum products as bases to receive ceramic tile in bath and shower areas.

A TEST PROGRAM, conducted by an independent laboratory, revealed the performance of four basic types of backing wall or base systems which receive ceramic tile in bath and shower areas.

Purposes of the test were:

1. To determine the effectiveness of gypsum products when installed in accordance with recommendations of the Gypsum Association.
2. To determine the effectiveness of gypsum wallboard construction when installed contrary to recommended specifications.
3. To evaluate the performance of gypsum wallboard constructions using adhesives that clearly show by test that they comply with CS-181-52.
4. To compare performance of the gypsum wallboard and gypsum lath and plaster constructions with Portland cement-plaster over metal lath, and asbestos cement board — all constructed with recommended procedures.

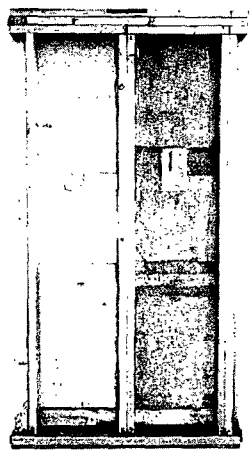
Gypsum Association recommendations for use of gypsum wallboard as a base to receive ceramic tile are:

1. A ¼ in. minimum clearance between paperbound edge of gypsum wallboard and the tub.
2. Apply wallboard same as in other rooms.

Close-up view reveals condition of backing systems after 59-week test equaling 20 years' use for a family of four. Note excellent performance of gypsum wallboard (left) installed under Gypsum Association recommended procedure. Two plaster systems (gypsum plaster over gypsum lath—specimen 2-3; Portland cement-plaster over metal lath—specimen 2-2) also gave satisfactory performance. Failure is evident of gypsum wallboard (right) installed with nonrecommended procedures.



GYPSUM WALLBOARD . . . installed in accordance with Gypsum Association recommendations.



GYPSUM PLASTER . . . over gypsum lath (specimen 2-3) installed in accordance with Gypsum Association recommendations; Portland cement-plaster over metal lath (specimen 2-2) installed in accordance with American Standard Specification, A42.3-1946.



GYPSUM WALLBOARD . . . (specimen 3-1) using cut edges, small pieces, paperbound edge abutting edge of receptor base; gypsum wallboard (specimen 3-2) using cut edges, small pieces, skim coat omitted and paperbound edge abutting edge of receptor.

3. Two coats of recommended adhesive — skim coat and bedding coat.

Three identical shower stalls were erected for the test. Each shower stall was composed of framing material, three different base systems, a ceramic tile adhesive recommended by the Tile Contractors' Association of America, and ceramic tile. The base systems tested were:

Shower stall No. 1

Panel (1)—Regular ½-in. gypsum wallboard installed in accordance with Gypsum Association recommended procedure.

Panel (2)—Same as panel number one except without a skim coat of adhesive.

Panel (3)—Same as panel number one except without an adhesive dam and with the grout joint broken at the receptor line.

Shower stall No. 2

Panel (1)—Asbestos cement board installed in accordance with manufacturer's recommendations.

Panel (2)—Portland cement-plaster over metal lath in accordance with American Standard Portland Cement Plastering Specification—A42.3—1946.

Panel (3)—Gypsum lath and plaster installed in accordance with Gypsum Association recommendations.

Shower stall No. 3

Panel (1)—Regular ½-in. gypsum wallboard using cut edges and small pieces of wallboard. Paperbound edge of board abutted edge of receptor.

Panel (2)—Regular ½-in. gypsum wallboard using cut edges and small pieces. Also, paperbound edges abutted edge of receptor and skim coat omitted.

Panel (3)—Regular ½-in. gypsum wallboard with cut edge of wallboard abutting receptor base.

To insure conformance with good construction practice, personnel from the appropriate trades installed the backing materials for ceramic tile.

ENVIRONMENTAL CONDITIONS

A lawn-type, rotating sprinkler was installed in each shower stall to provide simultaneous exposure to all systems — force of the spray was deliberately much greater than that found in average shower areas. The amount, pressure and temperature of water was controlled — identical for all construction specimens. Precautionary techniques were utilized to prevent the passage of moisture from one system to another. Exhaust fans and protective polyethylene curtains on shower stall doors were also installed to prevent exposure to the rear faces of backing systems. Moisture sensing devices were installed in each specimen to determine moisture content of backing materials prior to water spray exposure.

[illegible]

A heavy water spray of four gallons per minute at 110°F. was applied to each specimen for 10 continuous minutes in every hour — an exposure of 40 gallons in 10 minutes. This procedure continued — 10-minute exposure, 50-minute rest period — 24 hours per day for five days. At the end of this five-day cycle, the water was shut off and data gathering functions were performed. The test continued for 59 weeks.

In addition to moisture content readings, each specimen was inspected for its general condition. All signs of failure, water leaks or cracks in grout lines were recorded.

CONCLUSIONS

The conclusions of the testing laboratory clearly support the use of gypsum products as backing materials to receive ceramic tile in bath and shower areas when installed in accordance with recommendations of the Gypsum Association. Of all systems tested . . . "Satisfactory performance of backing systems receiving ceramic tile application were obtained with the following constructions:

a. Gypsum wallboard (½ in. thick) installed in accordance with applicable Gypsum Association recommendations.
b. Gypsum plaster over gypsum lath, installed in accordance with applicable Gypsum Association recommendations.
c. Portland cement-plaster over metal lath."

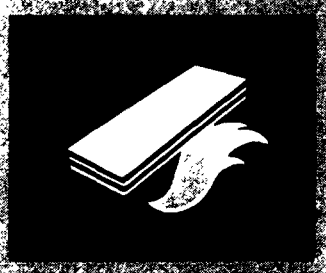
The following highlights of the research findings were also reported by the lab:

"The adverse effect of installing gypsum wallboard with either the paperbound or cut edge abutting the shower receptor base was clearly evident and should be avoided.

". . . poor performance may be anticipated where numerous pieces of gypsum wallboard are used or where the skim coat has been omitted.

"Dimensional changes in the assembly containing the asbestos cement board as a result of temperature variations, produced extensive grout joint cracking early in the program."

Results of this test program support the use of gypsum wallboard and gypsum plaster over gypsum lath as backing systems to receive ceramic tile in bath and shower areas when installed in accordance with Gypsum Association recommendations and used with ceramic tile adhesives which have been proven to comply with CS-181-52.



Gypsum Association Communications are available upon request for installation of gypsum wallboard (AIA File 23-C) in bath and shower areas and specifications for application of gypsum wallboard to receive ceramic, plastic or metal tile, or plastic laminate and panels by adhesive application.
For copies, contact your local gypsum representative or write:

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201 N. Wells St., Chicago, Illinois 60606
1350 N. Highland Avenue, Hollywood, California 90028

SGP 0024895

GYPSUM ASSOCIATION
201 NO. WELLS ST., CHICAGO, ILLINOIS, 60606
1350 N. HIGHLAND, HOLLYWOOD, CALIF., 90028

RECOMMENDATIONS FOR USE OF WEDGE BLOCK IN HANDLING GYPSUM BOARD

A new wedge block has revolutionized the handling of gypsum board products. The wedge (Fig. 1 and 2) is simple in design and easy to use.

Before the advent of the wedge block, it was not unusual for two or even three men to fill orders. Now, the fork-lift truck operator can, by himself, handle any order. Stacking gypsum board is simplified too—with the added bonus of less dunnage.

The wedge blocks can be easily obtained from cabinet makers. Fig. 1 supplies all of the necessary specifications. Cost of the wedge is between $20 and $30. And, if the wedge is used with normal care, it will provide many years of satisfactory service . . . paying for itself over and again by reducing man-hours and damaged board.

A step-by-step procedure for using the wedge is shown on the reverse side of this bulletin.

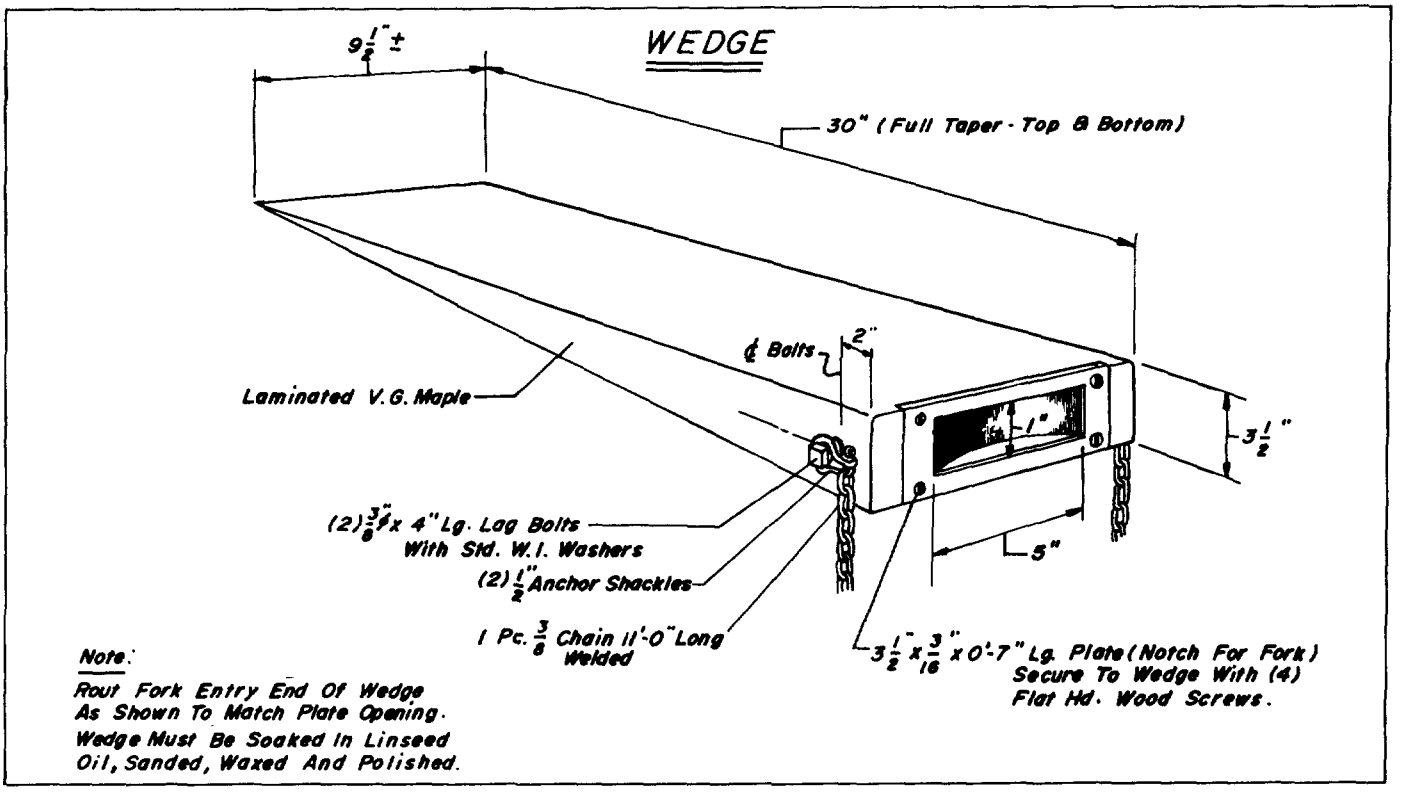


Fig. 1—These specifications can be used by a cabinet maker in your area to make the wedge block.

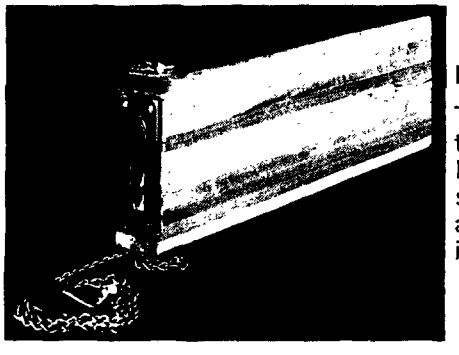
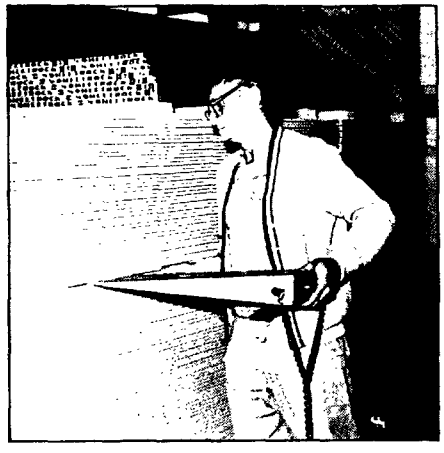


Fig. 2—
This photograph reveals the wedge block's laminated maple construction, notch for fork and chain for removing wedge.

SGP 0024896

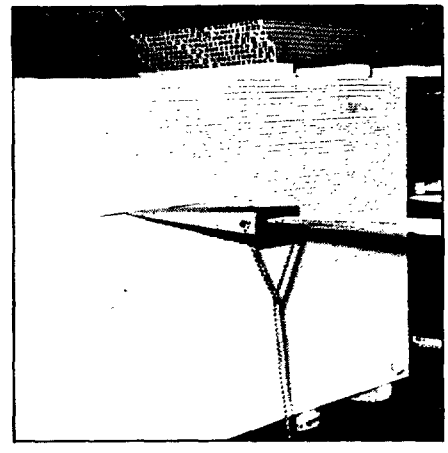
Procedure for Use of Wedge Block

Step 1

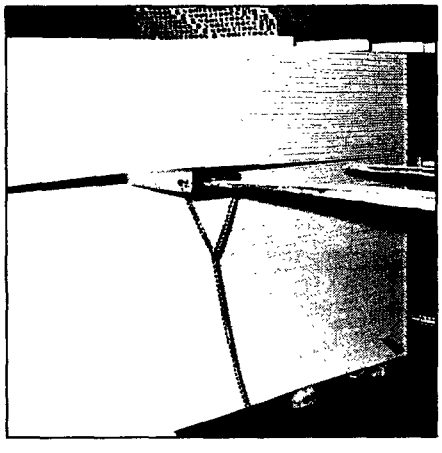


The fork-lift operator inserts the wedge by hand under the precise number of sheets required (left). He then mounts the truck and guides the fork into the special notch of the wedge block (right).

Step 2

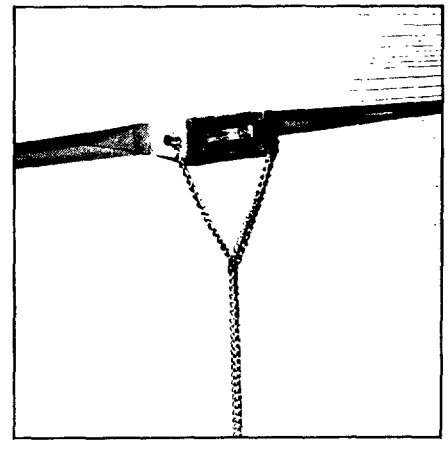


Step 3

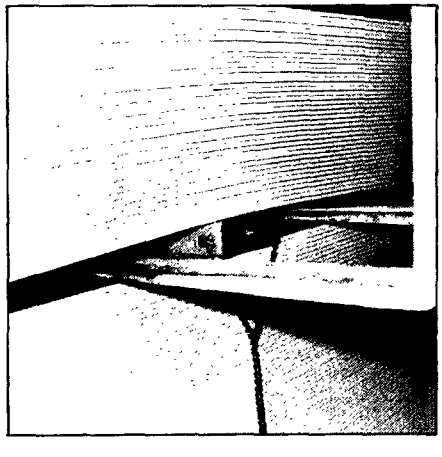


The fork-lift truck is then slowly moved forward, pushing the wedge block into the stack of board (left). When the wedge block is fully inserted, the truck is backed off—leaving ample space for insertion of forks (right).

Step 4

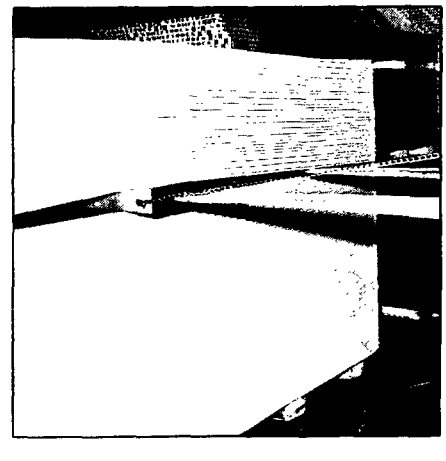


Step 5



The forks are inserted in space provided by the block and board is delivered to destination (left). Special feature of block (right) is chain which is fastened to truck for removing wedge after board has been stacked—eliminating dunnage.

Step 6



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SGP 0024897

GYPSUM ASSOCIATION
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1956 N. HIGHLAND, HOLLYWOOD 28, CALIF.

SPECIAL RECOMMENDATIONS

GYPSUM WALLBOARD in BATH-SHOWER AREAS

INTRODUCTION

Gypsum wallboard has been used for many years as a surface to receive ceramic tile in bath and shower areas. It provides a modern and economical method of construction—replacing other more time consuming methods. This type of construction complies with the Minimum Property Standards as published by the Federal Housing Authority and is approved by most building code authorities throughout the country. For good performance, the following recommendations should be observed.

FIXTURE PLACEMENT

The tub, shower receptor or pan shall be positioned with respect to studs so that its lip is flush with the outside face of the wallboard. Furring out the studs behind the fixture is sometimes necessary.

WALLBOARD INSTALLATION

Use full size sheets of wallboard to eliminate butt joints. The wallboard shall be ½ inch thick or greater and applied horizontally with the paperbound edge down toward the tub, shower receptor or pan.

A ¼ inch minimum clearance or space between the paperbound edge of the wallboard and the tub, receptor or pan must be provided to prevent capillary migration of water. Use a ¼ inch thick temporary wood spacer, nails driven ¼ inch above the fixture or other suitable means to assure this space above the lip of these fixture units. All joints shall be taped, and nailheads and joints treated with two coats of joint compound.

WATERPROOFING OF WALLBOARD

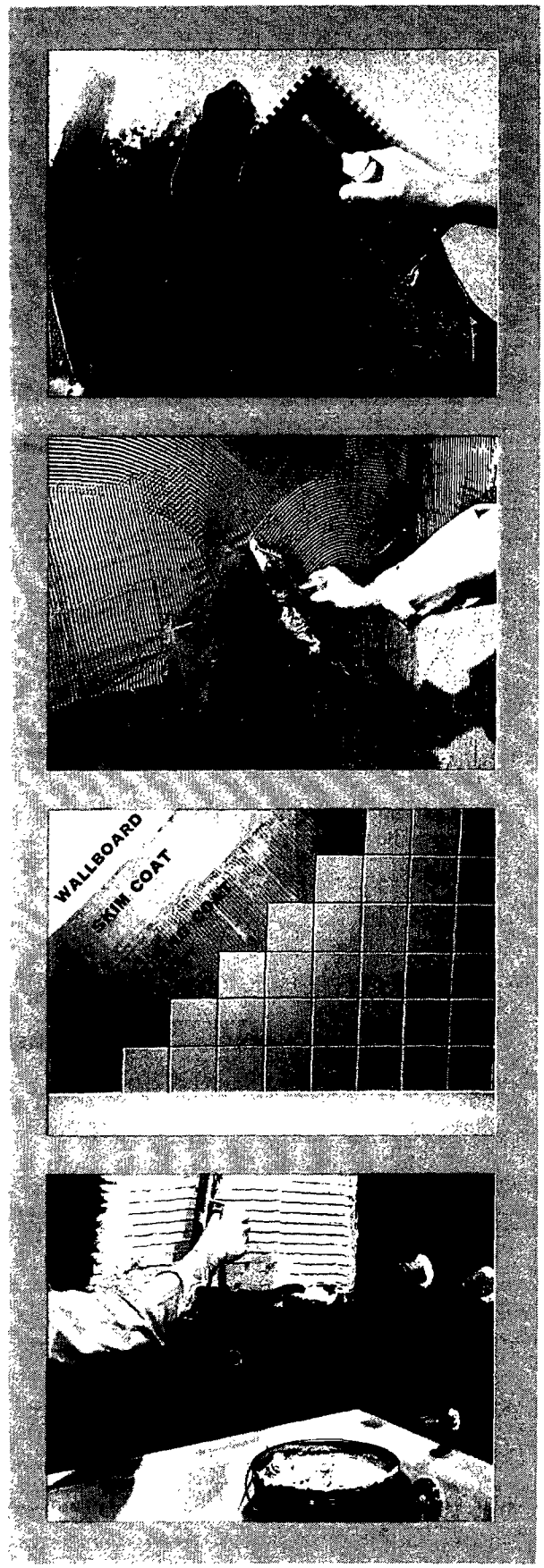
This may be accomplished by one of two methods.

1. With the flat edge of a trowel, a full 1/16 inch skim coat of an approved grade of tile adhesive shall be evenly applied to the entire surface to receive the tile. Apply to the bottom edge of wallboard and fill the cut-out spaces around pipes, soap dishes, towel bars, etc. Allow to stand well beyond the normal "take-up" time, preferably 24 hours. The recommended adhesives are those tested and found to comply with Commercial Standard 181-52 for ceramic tile adhesives. Particular attention is called to a list of such adhesives as published by the Tile Contractors' Association of America. All have been tested by an independent laboratory and found to comply with CS 181-52.

   After the skim coat has hardened, so that it will not be grooved by the notches of the trowel, a bedding coat of the same adhesive is applied in the usual manner. The bedding coat shall extend down over the lip of the tub to form a water dam behind the bottom edge of the tile.

2. A waterproof sealer may be used in lieu of the skim coat of tile adhesive. Acceptable sealers shall be only those specifically made for the purpose, and compatible with the tile adhesive, such as certain rubber base sealants. A heavy brush application of sealer is necessary. All edges of cut-outs for pipes, soap dishes, towel bars, etc., must be sealed—and then caulked with waterproof, nonhardening caulking compound.

   After the sealer coat has thoroughly dried, the bedding adhesive is then trowelled on to receive the tile. The bedding coat must be compatible with the sealer. The recommended adhesive for ceramic tile is one complying with CS 181-52.



AIA FILE NO. 23-L

INSTALLATION

OF GYPSUM WALLBOARD TO RECEIVE CERAMIC TILE BY ADHESIVE APPLICATION

A. GENERAL

All work shall be performed in accordance with the requirements of American Standards Association Specifications for Gypsum Wallboard Finishes A97.1, except as herein modified.

B. FRAMING

1. Framing members shall be plumb and true. If necessary, fur out studs around tub enclosure and shower stall so that the inside face of the lip of the fixture will be flush with the face of the gypsum wallboard.

2. Appropriate blocking, headers or supports shall be provided for tub, plumbing fixtures, soap dishes, grab bars, towel racks, etc., as may be required.

3. Suitable blocking shall be installed between all studs when gypsum wallboard is to be surfaced with ceramic tile more than 5/16 inches thick. When required, one row of blocking shall be located approximately 1 inch above the top of the tub or receptor and another row at the midpoint between the tub and ceiling.

C. MATERIALS

1. Gypsum wallboard shall be ½ inch or ⅝ inch in thickness and comply with the requirements of ASTM Designation C36 for gypsum wallboard.

Insulating or foil surface wallboard shall not be used.

2. The waterproofing material shall prevent the passage of free water or water vapor to the backing material. If an adhesive is used for this purpose, it shall comply with the requirements of CS 181-52 for ceramic tile adhesive. The recommended adhesives are those independently tested and found to comply with the Commercial Standard. (See Tile Contractors' Association of America list.)

3. Receptor and pan shall have an upstanding lip or flange 1 inch higher than the water dam or threshold of shower.

D. APPLICATION

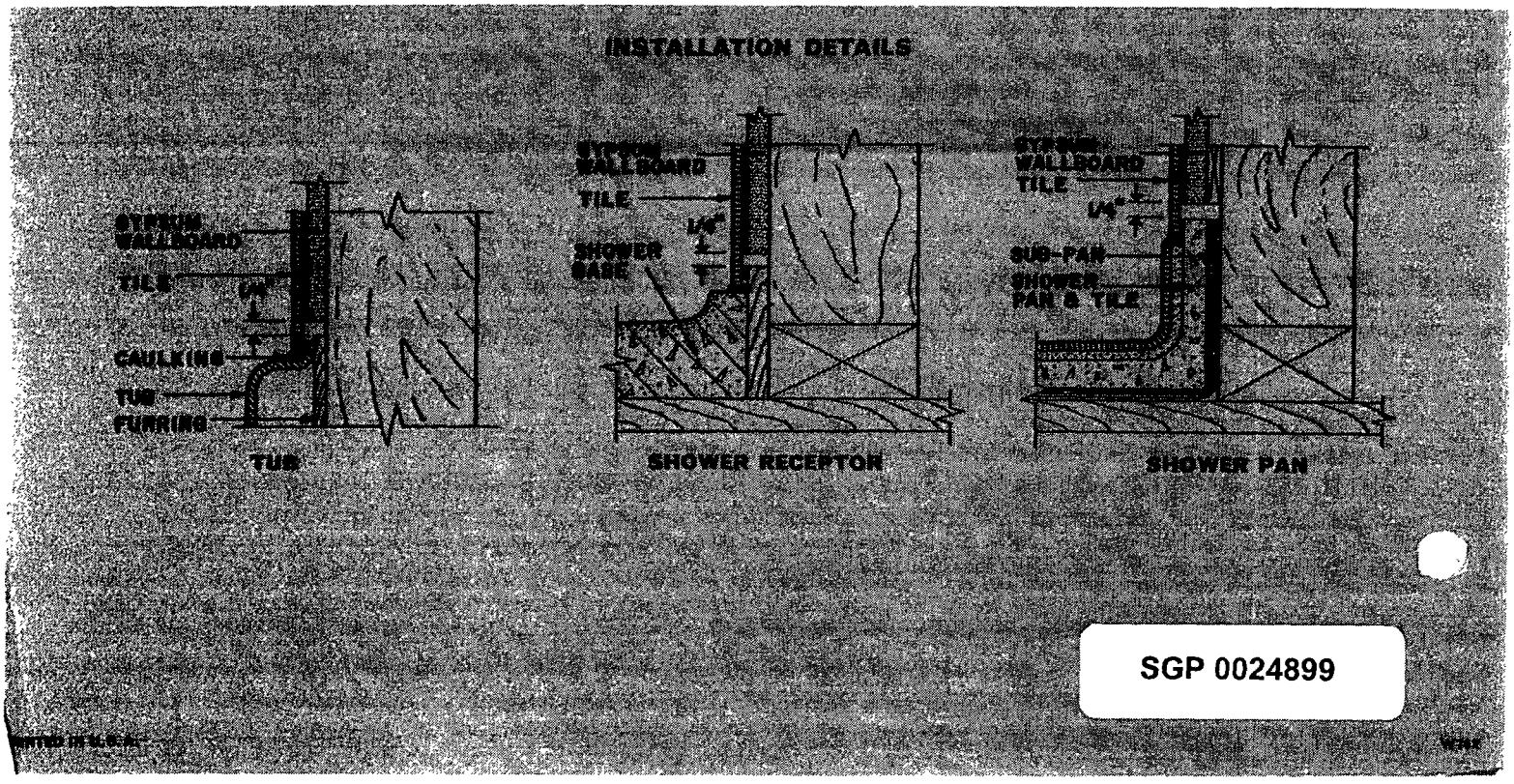
1. Tub, shower receptor or pan shall be installed prior to the erection of the gypsum wallboard.

2. Gypsum wallboard shall be applied horizontally with the paperbound edge abutting the top edge of a temporary wood strip (or spacing nails), which shall allow a minimum of ¼ inch space between the lip of the tub, receptor or pan and the gypsum wallboard. All joints and nailheads shall be treated.

3. Where gypsum wallboard is to receive ceramic tile more than 5/16 inch thick, nails shall be spaced a maximum of 4 inches o.c.

4. The surface of the wallboard shall be covered with a skim coat of adhesive, in a continuous film, to a 1/16 inch thickness and allowed to dry well beyond the normal "take-up" time, preferably 24 hours. When a waterproof sealer is used in lieu of the adhesive, it shall be applied with a heavy brush application to the entire surface to receive the tile. All edges of cut-outs made in the gypsum wallboard for pipes, fixtures, etc., shall be made watertight in a like manner.

5. Before placing ceramic tile, all openings around pipes, soap dishes, grab bars, towel racks, etc., shall be filled with adhesive or caulked flush with waterproof, nonhardening caulking compound. The tile shall then be applied and the lower edge shall overlap the upstanding lip of tub, receptor or pan. The space between the fixture and the tile shall be filled with a nonsetting caulking or tile grout compound.



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Special Recommendations

Application of GYPSUM WALLBOARD ON EXTERIOR LOCATIONS

(METAL FRAME CONSTRUCTION)

CSI-0925

MATERIALS AND APPLICATION:

Gypsum wallboard (½ or ⅝ inches thick) may be used for canopies, parking garage ceilings and, in general, any horizontal (or downwardly inclined) exterior ceiling area not exposed directly to the elements.

Materials and application shall be in strict conformance with the requirements of USAS A97.1 for the Application and Finishing of Gypsum Wallboard, except as modified below:

Provisions shall be made as required to assure that the gypsum wallboard is protected from direct exposure to water.

The wallboard shall be applied horizontally to the framing members. Framing members shall be spaced no more than 16 inches on center when ½ inch gypsum wallboard is used or no more than 24 inches on center when ⅝ inch gypsum wallboard is used.

The wallboard shall be fastened to the framing members with self-drilling, self-tapping gypsum wallboard screws spaced a maximum of 12 inches on center.

In large ceiling expanses control joints shall be used and spaced not to exceed 30 feet on center.

Wallboard joints and screw heads shall be finished in the usual manner prescribed for interior ceilings.

When joint treatment is employed caution must be exercised to assure that the joint is not subjected to temperatures below 55°F. until dry.

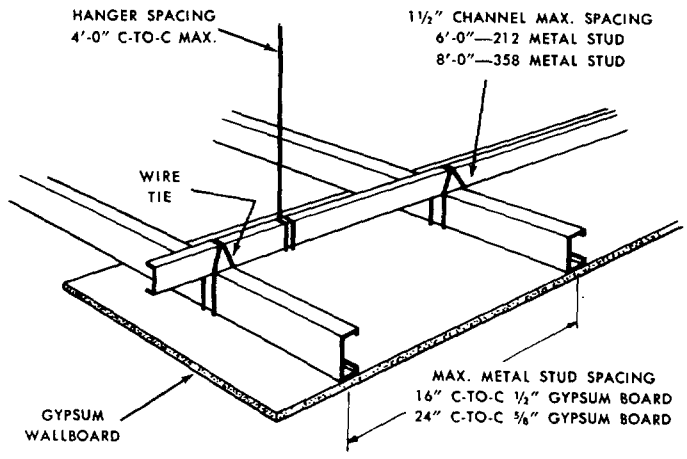
VENTILATION:

Adequate ventilation shall be provided for the space immediately above such installations.

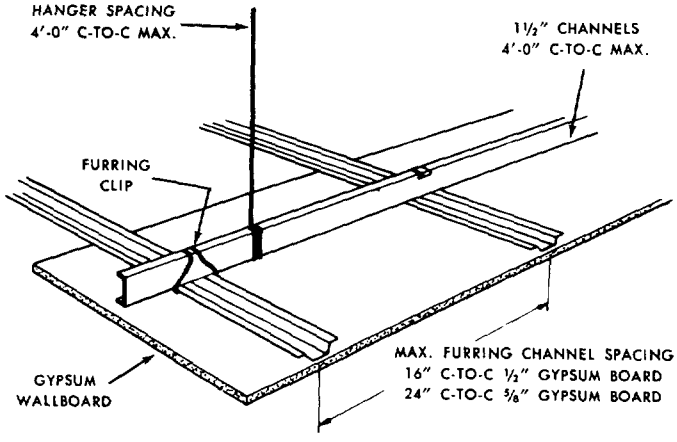
PAINTING:

The surface of the board shall be painted with not less than two coats. The first coat shall be a solvent-thinned, oil or oleoresinous paint or primer. The second coat shall be any top-line emulsion or solvent-type exterior paint product.

EXTERIOR SOFFIT
METAL FRAME CONSTRUCTION



METAL STUD DETAILS



FURRING CHANNEL DETAILS

CSI-0925

SGP 0024900

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1350 N. HIGHLAND, HOLLYWOOD, CALIF. 90028
Special Recommendations

AIA FILE NUMBER 23-L

Application of
GYPSUM WALLBOARD ON EXTERIOR LOCATIONS

MATERIALS AND APPLICATION:

Gypsum wallboard (1/2 or 5/8 inches thick) may be used for carport and open porch ceilings and the soffits of eaves that are horizontal or incline downward away from the building.

Materials and application shall be in strict conformance with the requirements of American Standard for Gypsum Wallboard Interior Finishes A97, except as modified below:

Nails for 1/2 inch board shall be the annular ringed gypsum wallboard nail GWB-54, complying with the requirements of ASTM Designation C380-58T. Nails for 5/8 inch board shall meet the same requirements except that the length shall be 1-3/8 inches.

Suitable drips and mouldings shall be provided around the perimeter to protect from direct exposure to water. The edges of the board shall be placed not less than 1/4 inch from masonry.

The wallboard shall be applied horizontally on nailing members spaced not to exceed 24 inches on center.

Joints may be covered with battens or finished with joint treatment.

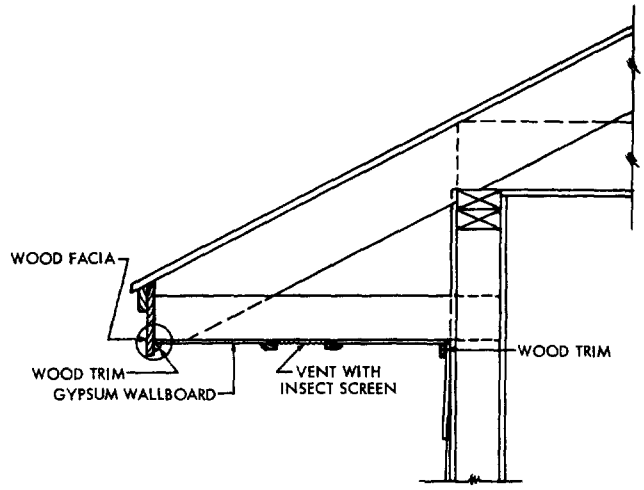
Nailheads shall receive joint treatment in the usual manner.

VENTILATION:

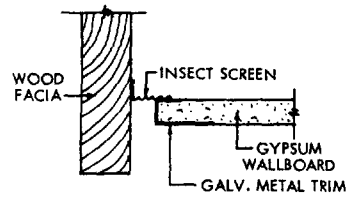
Adequate ventilation shall be provided for the space immediately above such installations. (Note: The minimum acceptable ventilation shall be as required in the current Minimum Property Requirements of the Federal Housing Administration.)

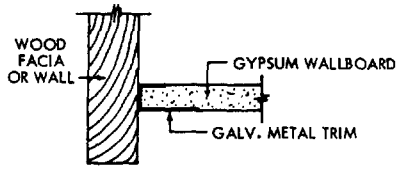
PAINTING:

The exposed surface of the board shall be painted with not less than two coats of exterior type oleoresinous or water-thinned emulsion paint.

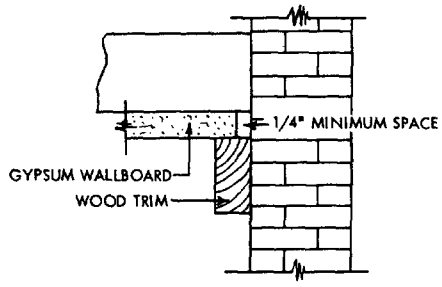


FRAME WALL





ALTERNATE FACIA DETAILS



MASONRY WALL

AIA FILE NUMBER 23-L

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SGP 0024901
April, 1959

GYPSUM ASSOCIATION
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1350 N. HIGHLAND, HOLLYWOOD, CALIF. 90028
Special Recommendations

"FLOATING" INTERIOR ANGLE METHOD of Application for Gypsum Wallboard

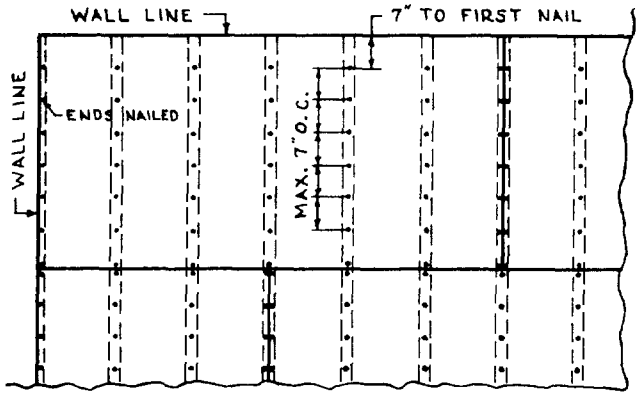
The "Floating Angle" method of application of gypsum wallboard was developed to reduce possible wallboard cracking caused by stress at intersections of framed walls and ceilings.

This method applies only to gypsum wallboard application when finished with tape and joint cement (an adhesive) treatment. Certain nails are eliminated in all interior angles, both at the horizontal angle where ceiling and sidewalls meet, and in the vertical angle where sidewalls intersect. The "floating" interior angle application method may be used with (1) conventional nailing and (2) double nailing. The following changes apply to the above two nailing methods. When "floating" interior angles, changes apply only to nailing at angles. All other specifications remain the same. (Consult A.S.A. A97.1, 1958)

CONVENTIONAL NAILING METHOD

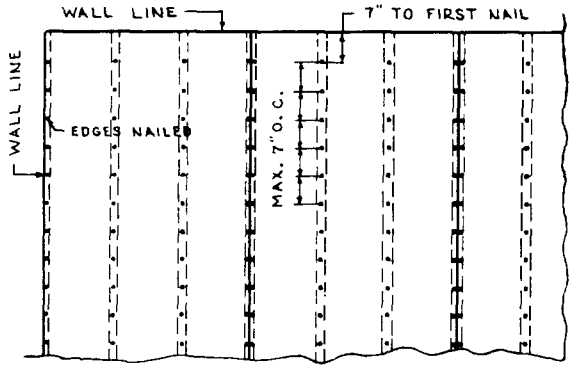
A. Ceilings — (Always apply ceilings first)

Horizontal Application. Use recommended framing practices for corner nailing. Wallboard must fit snugly into all corners. Conventional nailing shall be used where the ends of the boards abutt the wall intersection. At the wall-ceiling intersection where the long edges of the board parallel the intersection, the first nail shall be nominally seven in. from the wall intersection. Conventional nail spacing shall be used in the remainder of the ceiling area.



CEILING — HORIZONTAL APPLICATION
(LOOKING UP)
CONVENTIONAL NAILING

Vertical Application. Conventional nailing shall be used where the long edges of the board abutt the wall intersection. At the wall and ceiling intersections where the ends of the board parallel the intersections, the first nail shall be nominally seven in. from the wall intersection. Conventional nail spacing shall be used in the remainder of the ceiling area.



CEILING — VERTICAL APPLICATION

(LOOKING UP)

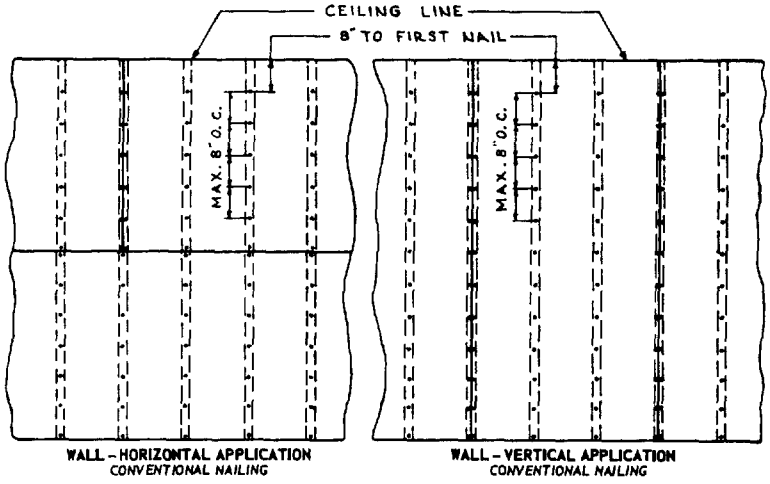
CONVENTIONAL NAILING

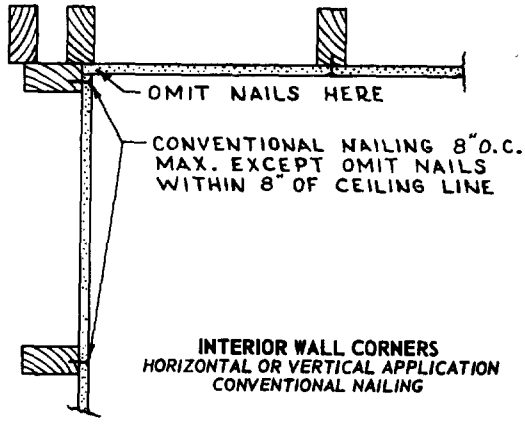
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B. Sidewalls —

All wallboard must be applied to maintain firm contact at ceiling line, in order to support the ceiling boards previously applied. Along the ceiling intersection, omit nails directly at the ceiling angle. The first nail shall be nominally eight in. from the ceiling intersection. At all vertical interior angles, omit only the corner nailing of the board first applied and to be overlapped in the angle. The overlapping board is to be nailed in the conventional manner, eight in. on center. Conventional nail spacing shall be used in the remainder of the wall area.





DOUBLE NAILING METHOD

Refer to standard specifications for the "double nailing" method. Note that the perimeter nailing is the same as the "conventional nailing method", but the field of the board is nailed in pairs (1½ to 2 in.) approximately 12 in. on center on both sidewalls and ceilings. To adapt this method to "floating corners", follow the changes listed under conventional nailing method as they apply to the perimeters of the gypsum board at the interior angles.

GYPSUM ASSOCIATION SPECIFICATIONS

GEORGIA-PACIFIC
GYPSUM DIVISION

INSTALLATION OF SCREW-TYPE STEEL FRAMING MEMBERS TO RECEIVE GYPSUMBOARD

GYPSUM ASSOCIATION
201 North Wells Street Chicago, Illinois 60606
1800 North Highland Avenue Hollywood, California 90028

SGP 0024958

GYPSUM ASSOCIATION SPECIFICATIONS FOR THE INSTALLATION OF SCREW-TYPE STEEL FRAMING MEMBERS TO RECEIVE GYPSUMBOARD

1. Scope and General Provisions

1.1 These specifications are intended to describe the minimum requirements and methods of installing screw type steel framing and furring members to receive gypsumboard, including related items and accessories.

1.2 Provisions to be included elsewhere by the specifier, but not a part of these specifications, are to be found in Appendix A.

1.3 Where a specific degree of fire resistance is required for gypsum wallboard assemblies and constructions, applicable building code regulations shall be followed. Details of constructions to achieve the required fire resistance may be obtained from official reports of fire tests conducted at recognized fire testing laboratories in accordance with American National Standard Methods of Fire Tests of Building Construction and Materials, ANSI A2.1-1968 (ASTM E119-67).

1.4 This standard shall be coordinated with American National Standard Specifications for the Application and Finishing of Gypsum Wallboard, ANSI A97.1-1965.

2. Definitions and Terms

2.1 **Framing or Furring Member.** Where either the term "framing member" or "furring member" is used, it refers to those portions of the screw type steel framing, furring, blocking, etc., which serves as a base to receive gypsum wallboard or backing board. Unless otherwise specified herein, the metal surface to receive the abutting ends or edges of the wallboard or backing board shall be not less than 1-1/4 in. wide. For internal corners or angles, or wallboard support at other than abutting ends or edges, the bearing surface shall be not less than 3/4 in.

2.2 **Metal Framing.** Where the term "metal framing" is used, it refers to metal joists, studs, runners (track), channels, angles, etc. which serve as a base to receive gypsum board.

2.3 **Metal Furring.** Where the term "metal furring" is used, it refers to metal framing used either as direct furring members (attached directly to the building structure) or as cross furring members (attached at right angles to main runners attached directly to, or suspended from, the building structure).

3. Materials

The materials shall conform to the applicable requirements of the following specifications:

3.1 **Runners.** Runners shall be formed of not less than .021 in. nominal thickness hot dipped or electro galvanized steel. They shall be of the designated width with legs not less than 1 in. high, slightly bent in to hold the studs by friction.

3.2 **Studs.** Studs shall be formed of not less than .021 in. nominal thickness, bare steel exclusive of protective coating hot dipped or electro galvanized steel. They shall be of the designated width with flanges not less than 1-1/4 in. wide to receive the gypsum wallboard. The edge of the flange shall be bent back 90° and doubled over to form a 3/16 in. minimum return.

3.3 **Furring Channel.** Furring channel shall be formed of not less than .021 in. nominal thickness, bare steel exclusive of protective coating hot dipped or electro galvanized steel. They shall be "hat" shaped with a face of not less than 1-1/4 in. wide to receive the gypsum wallboard. Flanges shall have a rolled edge and shall be not less than 1/2 in. wide. The furring channel shall be not less than 7/8 in. deep and 2-3/4 in. wide.

3.4 **Angles.** Angles (90°) shall be formed of not less than 22 gauge galvanized steel and shall have legs of not less than 1 in. wide.

3.5 **Tie Wire and Hanger Wire.** Tie wire and hanger wire shall be of galvanized, soft annealed steel, or of a material and size having superior corrosion-resistance and equivalent strength to the galvanized steel wire specified. Wire diameters specified herein correspond with U. S. Steel wire gauge numbers.

3.6 **Cold-rolled or Hot-rolled Channels.** Channels shall be fabricated from cold-rolled or hot-rolled steel, free of rust, of the following minimum weights per thousand lineal feet:

SIZE, IN.	COLD-ROLLED, lb	HOT-ROLLED, lb
3/4"	300	300
1-1/2"	475	1120
2"	590	1260

Note: A rust-inhibitive coating is recommended.

4. Delivery, Handling and Storage

4.1 All materials shall be delivered in the original packages, containers or bundles bearing the brand name and the name of the manufacturer or the supplier for whom the product is manufactured.

4.2 All materials shall be kept dry, preferably by being stored inside the building under roof. Where necessary to store material outside, it shall be stacked off the ground, properly supported on a level platform and fully protected from the weather.

5. Installation of Metal Framing and Furring

5.1 **Runner (Track) and Stud Installation.**

5.1.1 Runner (track) shall be aligned accurately at floor and ceiling and securely anchored approximately 2 in. from the runner ends. Floor runner shall be secured not to exceed 24 in. o.c. and ceiling runners as detailed with fasteners as follows:

Runners to Concrete Slabs – use concrete stub nails, shielded screws, or power driven fasteners.

Runners to Wood – use suitable screws to provide at least 1 in. penetration or nails to provide 1-1/2 in. penetration into the wood.

Runners to Suspended Ceilings – use "Molly" type expandable fasteners, toggle bolts, or screws into main runners, furring channel, splines, or "Tee" bars. Runners may be attached to "Tee" bars with special clamps.

5.1.2 At partition corners, extend one runner to the end of the corner and butt the other runner to it, allowing clearance for the gypsumboard thickness as necessary. Runners shall not be mitered.

5.1.3 Studs shall be positioned vertically in the runners, spaced no greater than the maximum framing spacing specified for the finish specified (16 in.) (24 in.) on centers. Anchor all studs located adjacent to door and window frames, partition intersections and corners to runner flanges by screws, crimping or welding through each stud and runner flange. When necessary, studs shall be securely spliced with a minimum 8 in. nested lap in which one (1) screw per stud flange is required.

5.1.4 A stud shall be located adjacent to (not more than 2 in. from) all door frame jambs, abutting partitions, partition corners and other construction. Studs shall be securely anchored to the jamb anchor clips of each door or borrow light frame by bolt, screw attachment or welding. Over metal door and borrowed light frames, a cut-to-length section of runner track with a web-flange bend at each end, shall be placed horizontally and securely attached to the adjacent vertical studs. A cut-to-length stud shall be positioned at the location of vertical joints over the door frame header extending to the ceiling runner.

5.1.5 At partition corners, install a stud so that it forms the outside corner. Following application of a single layer of gypsumboard to this stud, install second stud in the abutting runner and screw-attach web through gypsumboard into flange of first stud. A three (3) stud conventional corner is an acceptable alternate.

5.1.6 *Stud Spacing and Height Limitations*

5.1.6.1 Note: Table I provides for the 1-5/8 in., 2-1/2 in., and 3-5/8 in., stud widths–consult manufacturer's literature for spacing limitations at other stud widths.

TABLE I

MAXIMUM FRAMING SPACING

SINGLE-PLY[1] WALLBOARD (THICKNESS)	USE	APPLICATION	MAXIMUM SPACING OF FRAMING MEMBERS
3/8 in.	Ceilings Sidewalls	Horizontal (H) H or V	16 in. o.c. 16 in. o.c.
1/2 in.	Ceilings Ceilings Sidewalls	Vertical (V) Horizontal (H) H or V	16 in. o.c. 24 in. o.c. 24 in. o.c.
5/8 in.	Ceilings Ceilings Sidewalls	Vertical (V) Horizontal (H) H or V	16 in. o.c. 24 in. o.c. 24 in. o.c.

[1] Consult ANSI A97.1, Table 3, for maximum stud spacing of two-ply gypsumboard by thickness.

5.1.6.2 Consult manufacturer's literature for stud height limitations.

5.2 **Chase Wall Partitions.** Install double row of runners and studs as specified above, spaced apart as required. To insure partition will be as rigid as a single row of studs with gypsumboard both sides, cross brace opposite studs by one of the following procedures:

(1) Install minimum 12 in. deep drywall gussets at, or near, third points of stud height with three screws into each stud.

(2) Install cross braces of stud or runner horizontally not over 4 ft. o.c. by screwing cross brace web to each stud flange.

(3) Other methods may be used which provide equivalent rigidity.

5.3 **Furring Channel Installation–Direct Attachment to Masonry or Concrete.**

5.3.1 Attach furring channels to masonry or concrete surfaces, either vertically or horizontally. Furring channel maximum spacing shall comply with the maximum framing spacing specified in ANSI A97.1, Tables 1 and 3. For channels positioned horizontally, attach a furring channel not more than 4 in. from both the floor and ceiling lines. Secure channels with fasteners occurring on alternate channel flanges and spaced 24 in. o.c.

5.4 **Wall Furring—Bracket System**

5.4.1. Attach adjustable wall furring brackets, with serrated edges faced upward, to masonry wall in the following spacing pattern: 48 in. o.c. vertically, 6 in. maximum from floor and ceiling, 36 in. o.c. horizontally, 4 in. maximum from columns or other abutting construction, and as required above and below windows. Fasten each bracket through hole closest to serrated edges.

5.4.2 Lay 3/4 in. channels horizontally on furring brackets so that channel flanges engage serrated edges of bracket. Be certain each channel is plumbed to align with ceiling and base channels. Wire-tie channels to each bracket with a double strand of 16 gauge or a triple strand of 18 gauge wire. Bend each excess bracket length down and inward toward wall.

5.4.3 Vertically position drywall furring channels with wing flanges against channels and space them a maximum of 16 in. o.c. for 3/8 in. thick wallboard and 24 in. o.c. for 1/2 in. or 5/8 in. thick wallboard. Wire-tie each furring channel intersection with a double strand of 16 gauge or a triple strand of 18 gauge wire.

5.5 **Wall Furring—Stud System.** Where walls must be furred out greater distances than wall furring brackets will provide, use steel studs as specified in 5.1. Brace back to main wall as specified in 5.2.

5.6 **Soffits.** Frame soffits by attaching runners to ceilings and walls as specified in 5.1.1. Provide steel runner, stud, or angle for backing of all outside corners. Provide hangers or spacers (cut-to-length pieces of stud or runner) from ceiling runner to outside corner and from outside corner to vertical surface. If the hanger or spacer length does not exceed the maximum framing spacing specified for the gypsum board specified, hangers or spacers may be spaced up to 4 ft. 0 in. o.c. maximum.

6. Suspended or Furred Ceilings

6.1 **Hangers and Inserts for Suspended Ceilings.** Hangers shall be of ample length. Hangers (without inserts) shall be secured to steel reinforcement in concrete so as to develop the full strength of the hangers which are attached to them.

6.1.1 Hangers for suspended ceilings under wood construction shall conform with the requirements of Table 2, both as to size and maximum area to be supported, except as modified in this section. Hangers shall be attached to supports by one of the following methods:

TABLE 2.

MINIMUM SIZES FOR WIRE AND RIGID HANGERS

		HANGERS	MAXIMUM CEILING AREA SUPPORTED SQ FT	MINIMUM SIZE OF HANGERS
HANGERS FOR SUSPENDED CEILINGS			14	10 ga. galvanized wire (0.1350 in. dia.)
			16	9 ga. galvanized wire (0.1483 in. dia.)
			18	8 ga. galvanized wire (0.1620 in. dia.)
			20	3/16 in. dia., mild steel rod[1]
			22.5	7/32 in. dia., mild steel rod[1]
			25	1/4 in. dia., mild steel rod[1]
			28	1 in. x 3/16 in. mild steel flat[2]
ATTACHMENTS FOR RUNNERS AND FURRING DIRECTLY TO BEAMS AND JOISTS	FOR SUPPORTING RUNNERS	SINGLE HANGERS BETWEEN BEAMS[3]	9	12 ga. galvanized wire (0.1055 in. dia.)
			14	10 ga. galvanized wire (0.1350 in. dia.)
			18	8 ga. wire
		DOUBLE WIRE LOOPS AT BEAMS OR JOISTS[3]	9	14 ga. galvanized wire (0.0800 in. dia.)
			14	12 ga. wire
			18	10 ga. wire
	FOR SUPPORTING FURRING WITHOUT RUNNERS[3] (WIRE LOOPS AT SUPPORTS)	TYPES OF SUPPORT:		
		CONCRETE	9	14 ga. wire
		STEEL OR WOOD	9	16 ga. galvanized wire (0.0625 in. dia.) (two loops)[4]

[1] It is highly recommended that all rod hangers be protected with a zinc or other equally rust-inhibitive coating.

[2] It is highly recommended that all flat hangers be protected with a zinc coating or with a rust-inhibitive paint.

[3] Inserts, special clips or screws, or other devices of equal strength may be substituted for those specified.

[4] Two loops of No. 18 gauge wire may be substituted for each loop of No. 16 gauge wire for attaching steel furring to steel or wood joists.

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(1) Insertion in holes drilled a minimum of 3 in. above bottom of joists and with the upper end of the hanger twisted three times around itself, or

(2) Attach to 30d nails driven on a downward slant into sides of joists with not less than 3 in. penetration and at least 5 in. from bottom edges, not over 36 in. on centers and with the upper end of the hanger in each case twisted three times around itself, or

(3) Secure with four 1-1/2 in. No. 9 gauge wire staples driven horizontally or on a downward slant into sides of joists, three near the upper end of the loop and the fourth to fasten the loose end, or

(4) Where purlins exceed 4 ft. on centers, 1-1/2 in. No. 0 screw eyes or equal may be fastened into heavy wood flooring at not over 3 ft on centers so that they will support an area not over 9 sq ft. The upper end of the hanger shall be inserted in the screw eye and in each case twisted three times around itself.

(5) Flat hangers, if used, shall be spiked to sides of joists with two 12d nails driven through holes drilled in the hanger and clinched at least 3 in. above bottom of joists.

6.1.2 Wire shall be zinc-coated (galvanized). Rods and flats shall be of mild steel. Gauges and sizes specified are the minimum permissible.

6.1.3 Wire for attaching runners and furring directly to concrete beams and joists, to steel beams and joists, and to wood beams and joists shall be of the gauge sizes specified in Table 2.

6.1.4 Hangers for supporting main runners of suspended ceilings shall be as specified in Table 2.

6.1.5 Where 1 x 3/16 in. inserts are used, 7/16 in. diameter holes shall be punched on the center line at the lower ends, to permit flat steel hangers with 3/8 in. diameter round-head stove bolts to be bolted tightly to the inserts.

6.1.6 Lower ends of flat hangers shall be bolted to main runners, or bent tightly around runners and bolted tightly to the main part of the hanger with 3/8 in. diameter round-head stove bolts.

6.1.7 Holes in both inserts and hangers shall not be nearer to the ends than 3/8 in.

6.1.8 Wire or rod hangers shall be saddle-tied or wrapped around main runners so as to prevent turning or twisting of the runners and to develop the full strength of the hangers.

RUNNERS AND FURRING MEMBERS

6.2 **Main Runners for Suspended Ceilings.** Main runners for the various spacings of hangers shall be as specified in Table 3.

6.2.1 Main runner ends and sides shall not come in contact with abutting masonry or reinforced concrete walls or partitions. Clearance of not less than 1 in. from main runner ends and 1/8 in. from runner sides shall be provided. A main runner shall be located within 6 in. of the paralleling walls to support the ends of the cross furring. The ends of main runners at walls shall be supported by hangers located not more than 6 in. from such ends.

6.2.2 When main runners are spliced, the ends shall be overlapped not less than 12 in. (with flanges of channels interlocked) and securely tied near each end of the splice with double loops of two strands of No. 18 gauge galvanized wire (0.0475 in. minimum diameter).

TABLE 3.

MINIMUM SIZES AND MAXIMUM SPANS AND SPACINGS FOR MAIN RUNNERS [1, 2]

MINIMUM SIZE AND TYPE	MAXIMUM SPAN BETWEEN HANGERS OR SUPPORTS	MAXIMUM CENTER TO CENTER SPACING OF RUNNERS
1-1/2 in. – 0.475 lb per ft, cold rolled channel	3 ft 0 in.	5 ft 0 in.
1-1/2 in. – 0.475 lb per ft, cold rolled channel	3 ft 6 in.	4 ft 6 in.
1-1/2 in. – 0.475 lb per ft, cold rolled channel	4 ft 0 in.	4 ft 0 in.
1-1/2 in. – 1.12 lb per ft, hot rolled channel	4 ft 0 in.	6 ft 0 in.
2 in. – 1.26 lb per ft, hot rolled channel	3 ft 6 in.	8 ft 0 in.
2 in. – 0.59 lb per ft, cold rolled channel	3 ft 6 in.	6 ft 0 in.

[1] These spans are based on webs of channels being erected vertically.

[2] Other sections of hot or cold rolled members of equivalent beam strength may be substituted for those specified.

TABLE 4.
MINIMUM SIZES AND MAXIMUM SPANS AND SPACINGS FOR FURRING MEMBERS

TYPE OF FURRING	MAXIMUM [1] SPACING C. TO C.	MAXIMUM SPAN
Furring Channel (Drywall Hat Shaped)	24 in.	4 ft 0 in.
1-5/8 in. Stud (Erected with open side up and against support)	24 in.	5 ft 0 in.
2-1/2 in. Stud (Erected with web vertical to support) [2]	24 in.	6 ft 0 in.
3-5/8 in. Stud (Erected with web vertical to support) [2]	24 in.	8 ft 0 in.

[1] Consult ANSI A97.1, Tables 1 and 3, for maximum spacing as determined by gypsumboard thickness.
[2] A 6-in. length of same size stud shall be nested to form a "box" at each saddle tie.

6.3 Furring Members for Suspended Ceilings. Furring for various spacings of main runners of structural supports shall be as specified in Table 4.

6.3.1 Furring shall be securely saddle-tied to main runners or structural supports with double No. 16 gauge galvanized wire, or attached with special clips, or special screws, or equivalent attachments.

6.3.2 When furring members are spliced, the ends shall be overlapped not less than 8 in. (with flanges of channels interlocked) and securely tied near each end of the splice with double loops of two strands of No. 18 gauge wire.

6.3.3 Furring member ends and sides shall not come in contact with abutting masonry or reinforced concrete walls or partitions. The provisions of 5.2.1 are applicable.

6.4 Furring channels applied direct to wood framing shall be applied with screws providing 1 in. penetration or as otherwise specified by the manufacturer.

APPENDIX A

(This Appendix is not a part of the *Gypsum Association Specifications for the Installation of Screw-Type Steel Framing Members to Receive Gypsumboard,* but is included to facilitate its use and provide general information and suggestions for inclusion to be made elsewhere by the user.)

General Information

A1. The work includes all labor, materials, services, equipment, and scaffolding required to complete the installation of the screw type steel framing in accordance with the drawings and specifications.

A2. Scaffolding shall be erected and maintained in strict conformity with applicable laws and ordinances.

A3. The work shall be coordinated with the work of other trades.

A4. The following work shall be included: _____

_____

The following work shall not be included: _____

_____

A5. Where required, natural or artificial heat, or light, or both, shall be furnished by: _____

in accordance with the following: _____

A6. Surfaces and openings shall be examined before framing or furring are applied thereto and the proper authorities notified and unsatisfactory conditions corrected prior to application of framing or furring.

A7. Insulating blankets or flanges of blankets shall not be applied over framing member surfaces that are to receive gypsum wallboard or backing board.

A8. Attics or similar unheated spaces above gypsum wallboard ceilings shall be adequately ventilated as follows: Provide effective cross ventilation for all spaces between roof and top floor ceilings by screened louvers or other approved and acceptable means. Ratio of total net free ventilating area to area of ceiling shall be not less than 1/150, except that ratio may be 1/300 provided a vapor barrier having a transmission rate not exceeding one perm is installed beneath the ceiling framing or furring or on the warm side of the ceiling insulation.

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Characteristics, properties or performance of materials or systems herein described are based on data obtained under controlled test conditions. The Gypsum Association and the member companies make no warranties or other representations as to their characteristics, properties or performance under any variation from such conditions in actual construction.

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PUBLICATIONS

The following technical literature on the use of gypsum construction is published by the Gypsum Association:

American National Standard Specifications for Gypsum Plastering, ANSI A42.1

American National Standard Specifications for Interior Lathing and Furring, ANSI A42.4

American National Standard Specifications for Reinforced Gypsum Concrete, ANSI A59.1

American National Standard Specifications for the Application of Gypsum Wallboard and Backing Board, Including Finishing, ANSI A97.1

Manual of Gypsum Lathing and Plastering

Design Data – Fire Resistance/Sound Control

Design Data, Gypsum Wallboard

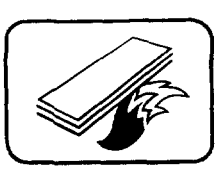
Recommended Guide for Gypsum Drywall Construction

Design Data – Poured Gypsum Roof Decks

How to Inspect a Gypsum Roof Deck

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GYPSUM ASSOCIATION SPECIFICATIONS

GeorgiaPacific
GYPSUM DIVISION

APPLICATION OF GYPSUM BASE FOR GYPSUM VENEER PLASTERS

AND

APPLICATION OF GYPSUM VENEER PLASTER

NATIONAL BUREAU
FOR LATHING AND PLASTERING, INC.

INTERNATIONAL ASSOCIATION
OF WALL AND CEILING CONTRACTORS

GYPSUM ASSOCIATION
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GYPSUM ASSOCIATION SPECIFICATIONS FOR THE APPLICATION OF GYPSUM BASE FOR GYPSUM VENEER PLASTERS

1. Scope and General Provisions

1.1 These specifications describe the minimum requirements and methods of applying gypsum base for gypsum veneer plaster including related items and accessories.

1.2 Where a specific degree of fire resistance is required for gypsum base and veneer plaster systems, a special fire resistant base may be required. Details of constructions to achieve the required fire resistance may be obtained from official reports of fire tests[1] conducted at recognized fire testing laboratories in accordance with the *American National Standard Methods of Fire Tests of Building Construction and Materials,* ANSI A2.1 (ASTM E119).

1.3 **General Information.** Appendix A gives general information and also suggestions for inclusions to be made elsewhere by the specifier. It is not a part of these specifications. The work shall be properly coordinated with the work of other trades.

2. Definition, Terms and Materials

2.1 **Gypsum Base for Veneer Plasters** (hereinafter referred to as "gypsum base"). Where the term "gypsum base" is used, it refers to veneer plaster base as defined in the ASTM Specifications C588.

2.1.1 *Gypsum Backing Board.* Where the term "backing board" is used, it refers to gypsum backing board as defined in ASTM C442.

2.1.2 *Type "X"* is special fire retardant gypsum base for use in specific fire rated systems.

2.1.3 *Insulating (Foil Backed) Gypsum Base.* Either regular, Type "X", gypsum base, or backing board with foil laminated to the back surface. The foil provides thermal insulation and is a vapor barrier in compliance with applicable ASTM Specifications for the individual products.

2.2 **Edge.** Where the term "edge" is used, it refers only to the paperbound edge, the long dimension of the gypsum base.

2.3 **End.** Where the term "end" is used, it refers to the mill-cut or field-cut end. At such cuts, the gypsum core is exposed.

2.4 **Framing Member.** Where the term "framing member" is used, it refers to any segment of the framing, furring, blocking, etc., which serves as a support for the gypsum base.

2.5 **Fastener.** Where the term "fastener" is used, it refers to nails, screws or staples used for the application of the gypsum base or backing board.

2.6 **Horizontal Application.** Where the term "horizontal application" is used, it refers to gypsum base application where the paperbound edges are applied at right angles to the framing members.

2.7 **Vertical Application.** Where the term "vertical application" is used, it refers to gypsum base applied where the paperbound edges are parallel to the framing members.

2.8 **Reinforced Joint.** Where the term "reinforced joint" is used, it refers to a joint between gypsum base boards which is reinforced.

2.9 **Joint Reinforcing Embedment.** Where the term "embedment" is used in conjunction with joint reinforcement, it refers to the material used to embed the joint reinforcement.

2.10 **Gypsum Veneer Plaster.** Where the term "veneer plaster" is used, it refers to gypsum veneer plaster as defined in ASTM Specification C587.

2.11 **Reinforcing.** High strength, non-corrosive reinforcing strip providing sufficient strength to meet the joint strength requirements of ASTM C587.

2.12 **Water.** Shall be clean, fresh and suitable for domestic consumption.

[1] Where the size or thickness of wood or metal members specified herein exceeds that required for the fire rating, these specifications shall govern; and where the spacing of fasteners specified herein is less than that required for the fire rating, these specifications shall govern, since the framing size and thickness indicated in the fire test report are the minimum required for the fire rating and framing and fastener spacing is the maximum required.

Characteristics, properties or performance of materials or systems herein described are based on data obtained under controlled test conditions. The Gypsum Association and the member companies make no warranties or other representations as to their characteristics, properties or performance under any variation from such conditions in actual construction.

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2.13 **Steel Nails.** All, including annular ring nails, shall meet the requirements of ASTM C514 or as required for specific fire ratings.

2.14 **Screws.** For application to wood framing, a specially designed metal screw as recommended by the manufacturer of the gypsum base shall be used. Screws for application to metal framing shall meet the requirements of ASTM C646.

2.15 **Backing Board Staples.** Number 16 USS gauge flattened galvanized wire with 7/16" wide crown minimum outside measure and divergent points. Staples are to be used only for the first ply of two-ply application over wood framing. Leg lengths are as follows:

Backing Board Thickness	Leg Length
3/8"	1"
1/2"	1-1/8"
5/8"	1-1/4"

2.16 **Reinforcing Staples.** Flattened galvanized wire with legs of sufficient length to hold the reinforcing in place.

2.17 **Metal Framing** shall meet the requirements of ASTM C645.

2.18 **Accessories** (cornerbead, edge trim, control joints, etc.) shall be made from galvanized steel or other corrosion resistant materials of suitable thickness and design for the intended use. Flanges shall be free from dirt or grease, or other materials that may affect the bond of veneer plaster or decoration.

3. Delivery, Handling and Storage

3.1 All materials shall be delivered in the original packages, containers or bundles bearing the brand name and manufacturer (or supplier) identification.

3.2 All materials shall be kept dry, preferably by being stored under roof. Where necessary to store gypsum base outside, it shall be stacked off the ground, properly supported on a level platform, and fully protected from the weather and from damage.

4. Application of Gypsum Base

For general information, including scaffolding, heating and ventilation, and general wood framing requirements, see Appendix A. These requirements shall be met prior to application of the gypsum base.

4.1 **Method of Cutting and Installation.** Gypsum base shall be cut by scoring and breaking or by sawing, working from the face side. All cut edges and ends of the gypsum base shall be smoothed where necessary, to obtain neat jointing. Cutouts for pipes, fixtures, or other openings shall be neatly made. Where gypsum base meets projecting surfaces, it shall be scribed and neatly cut.

4.1.1 In general, gypsum base should be applied first to the ceiling and then to the walls. On exterior walls, exterior sheathing or other exterior weather protection should be in place before application of the gypsum base.

4.1.2 Fastening into top or bottom plates is not required. While the fasteners are being driven, the base shall be held in firm contact with the underlying support. Application of fasteners shall proceed from the central portion of the base to the ends and edges.

4.1.3 Nails shall be driven home with the heads even with the surface of the gypsum base. Take care to avoid damage to the face and core of the gypsum base.

4.1.4 Screws shall be driven with a screw driver to provide screwhead penetration even with the gypsum base surface. Take care to avoid undue damage to the face and core of the gypsum base or stripping the framing member around the screw.

4.1.5 *Backing Board Staples* shall be driven with the crown at right angles to the paperbound edges of the backing board, except where the paperbound edges fall on and are parallel to the framing members, then the staples shall be driven parallel to the edges. Staples shall be driven in such a manner that the crown bears tightly against the backing board, but does not cut into the face paper.

4.2 **Fasteners.**

4.2.1 *Nail Spacing.* Nails shall be spaced a maximum of 7" o.c. on ceilings and a maximum of 8" o.c. on walls.

4.2.2 *Screw Spacing.* On wood framing, screws shall be spaced a maximum of 12" o.c. for ceilings and 16" o.c. for walls where the framing members are 16" o.c. Screws shall be spaced a maximum of 12" o.c. for ceilings and walls where the framing members are 24" o.c. On light gauge steel framing, screws shall be spaced a maximum of 12" o.c.

4.2.3 Nails for single-ply application over wood members shall be as shown in Table 1.

TABLE 1

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GYPSUM BASE THICKNESS	NAILS
3/8"	1-1/8" or 1-1/4" nails per ASTM C514.
1/2"	1-1/4" or 1-3/8" nails per ASTM C514.
5/8"	1-3/8" or 1-1/2" nails per ASTM C514.

NOTE: For specific fire rated single-ply constructions, nails or screws shall conform with the applicable fire test report.

TABLE 2

ALLOWABLE HEIGHTS FOR PARTITIONS WITH STEEL STUDS

(Maximum safe allowable partition heights for screw type stud partitions and chase walls with 1/2 inch gypsum board applied both sides. Height limits are based on deflection limits of 1/120 at a load of 5 psf.)

STUD SPACING (INCHES)	GYPSUM BOARD FACING ON EACH SIDE	STUD WIDTH (INCHES)					
		1-5/8	2-1/2	3-1/4	3-5/8	4	6
16	1/2" Single Layer	11'-0"	14'-8"	17'-10"	19'-5"	20'-8"	18'-10"
24	1/2" Single Layer	10'-0"	13'-5"	16'-0"	17'-3"	18'-5"	17'-8"
24	1/2" Double Layer	12'-4"	15'-10"	18'-3"	19'-5"	20'-8"	19'-0"

NOTES:

1. Where studs are continuous through suspended ceilings to underside of floor or roof above, and ceiling adds stability to the partition, or studs are adequately braced from a point at or below specified limiting height, limiting heights may be increased 50 per cent.
2. For recommended maximum heights based on criteria other than safety, consult individual gypsum board and/or stud manufacturer's technical literature.

TABLE 3

MAXIMUM FRAMING SPACING

SINGLE-PLY BASE (THICKNESS)	USE	APPLICATION	MAXIMUM SPACING OF FRAMING MEMBERS
3/8" [1]	Ceilings	Horizontal	16" o.c.
	Sidewalls	Horizontal or Vertical	16" o.c.
1/2"	Ceilings	Vertical	16" o.c.
		Horizontal	16" o.c.
	Sidewalls	Vertical or Horizontal	16" o.c.
5/8"	Ceilings	Vertical	16" o.c.
		Horizontal	24" o.c.
	Sidewalls	Vertical or Horizontal	24" o.c.

[1] 3/8" gypsum base is approved over wood framing with two coat systems only.

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4.3 **Height Limitations.** The maximum heights of steel stud framed, nonbearing partitions for which gypsum veneer base is recommended appear in Table 2.

5. Application of Single-Ply Gypsum Base

5.1 The maximum spacing for framing members for single-ply gypsum base construction shall not exceed those shown in Table 3.

5.2 In single-ply installation, all ends and edges of gypsum base shall occur over framing members, except that this is not required for joints at right angles to framing members.

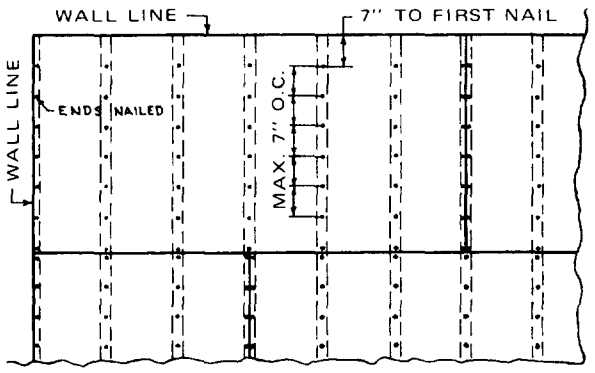
5.3 Staggering of vertical joints on both same and opposite sides of a partition is recommended.

5.4 **Floating Interior Angles.** To help minimize the possibility of nail popping in areas adjacent to a wall and ceiling intersection to be finished with joint treatment, the floating angle method of application shall be used. This method is applicable where single nailing, double nailing or screw attachment is used. Base shall be applied to ceilings first.

5.4.1 *Ceilings.* Installation shall be in accordance with Section 4.2 except that the first attachment into each ceiling framing member framed perpendicular to the intersection shall be located 7" to 8" out from the wall intersection.

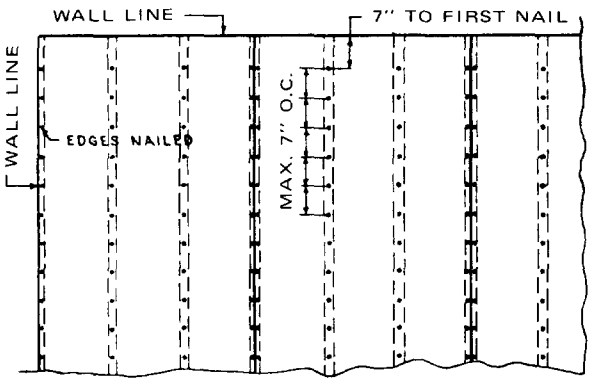
5.4.2 *Sidewalls.* Base on sidewalls shall be applied so as to provide a firm support for the floated edge of the ceiling base. Installation shall be in accordance

with Section 5 except that at the top of the wall, the first attachment into each stud shall be located 7" to 8" down from the ceiling intersection. (See Figures 1 and 2.)



CEILING – HORIZONTAL APPLICATION
(LOOKING UP)
CONVENTIONAL NAILING

Figure 1



CEILING – VERTICAL APPLICATION
(LOOKING UP)
CONVENTIONAL NAILING

Figure 2

At sidewall vertical angles, Figure 3, only the overlapping board shall be fastened to the corner framing. The overlapping board shall be applied so as to bring the back of the underlying board into firm contact with the face of the stud behind it.

6. Adhesive Nail-On Application

6.1 Except as herein modified, application shall be in accordance with Section 5. "Single-Ply Application over Wood Framing."

6.2 Adhesive shall comply with the *Specifications for Adhesives for Fastening Gypsum Base to Wood Framing* (ASTM C557).

6.3 Surfaces of gypsum base and framing to be adhered by the adhesive shall be free from dust, dirt, grease or any other foreign matter which could impair bond.

6.4 A bead of adhesive shall be applied to the face of all wood framing members, except plates, which support the gypsum base. It shall be of sufficient size that when the base is applied, the adhesive will spread to an average width of 1", approximately 1/16" thick as shown in Figure 4.

(1) Where a joining of two adjacent pieces of base occurs (ends or edges) on a framing member and joints are to be treated, a serpentine or zig-zag bead of adhesive shall be applied.

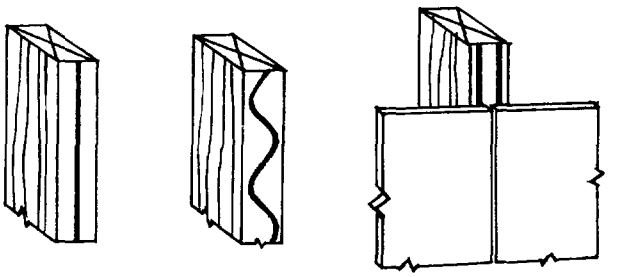


Figure 4

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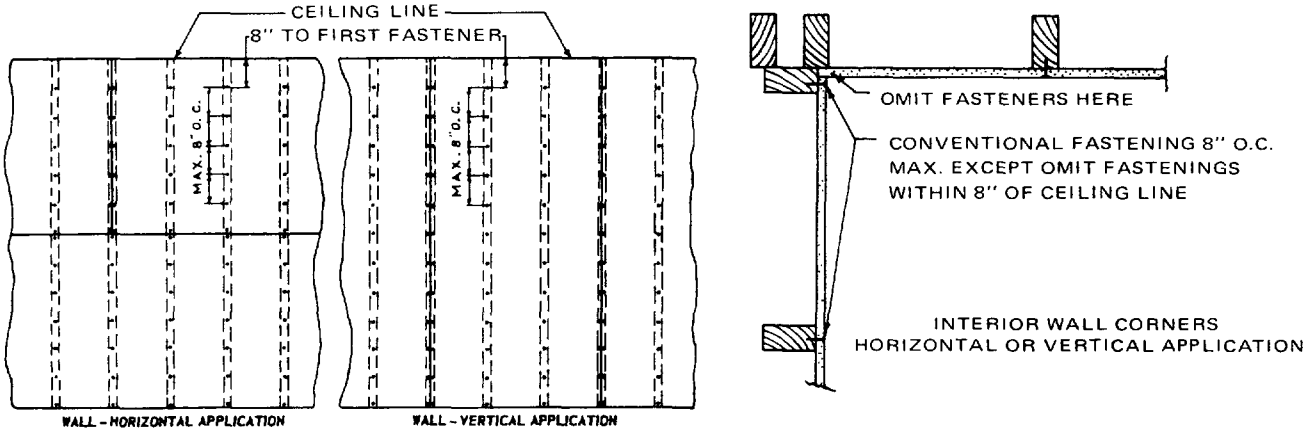


Figure 3

(2) The adhesive container shall be clearly marked with the "open time" of the adhesive. Adhesive shall be applied to no greater area than can be covered with base within the "open time" (usually 15 to 30 minutes).

6.5 **Fastener Spacing.** Fasteners for adhesive nail-on shall be spaced as follows:

(1) Ceilings:

a. Horizontal Application: Drive nails or screws at each framing-edge intersection and 16" o.c. along each board end, 3/8" from each edge and end. One field nail or screw per framing member is required at midpoint location between edges.

b. Vertical Application: Space nails or screws 16" o.c. along the board edges and ends, 3/8" in from each edge or end. Fasteners are spaced 24" o.c. on intermediate framing members.

(2) Walls:

a. Horizontal Application: Drive nails or screws at each framing-edge intersection and 16" o.c. along each board end, 3/8" in from each edge and end. No field nails or screws are required.

b. Vertical Application: Space nails or screws 24" o.c. along the board edges and 16" o.c. at each board end, 3/8" in from each edge or end. No fasteners are required on intermediate framing members.

7. Application Over Existing Surfaces

7.1 Where gypsum base is used over uneven or broken surfaces, and on the interior of all exterior masonry or concrete walls or columns, gypsum base shall be applied over furring strips or furring channels and installed in accordance with Section 5 of this Specification and A1 and A2 of the Appendix.

(1) Over reasonably smooth, sound, existing surfaces such as gypsum wallboard or plaster, in good condition, applied to wood framing, gypsum base shall be applied by using fasteners long enough to penetrate not less than 3/4" into the underlying framing members. Fasteners shall be spaced according to 4.2.1 or 4.2.2. Alternately, the gypsum base may be applied by fastener and adhesive attachment in accordance with Section 6 of this Specification.

(2) Over reasonably smooth, solid interior surfaces such as concrete or unit masonry, the gypsum base shall be applied as specified in Section 6 or by adhesive application in strict accordance with the gypsum base manufacturer's recommendations.

8. Insulating Gypsum Base

8.1 The application of insulating gypsum base shall conform to all of the foregoing specifications for the application of gypsum base except it shall not be used in the following areas:

(1) For the second ply on a two-ply laminating system.

(2) For laminating direct to masonry.

8.2 The reflective surface of insulating gypsum base shall be placed against the face of the framing members. *To obtain full efficiency as an insulating material, a minimum of 3/4" air space shall be provided next to the foil.*

9. Application of Two-Ply Gypsum Base To Framing Members.

9.1 The maximum spacing for framing members and the application direction for both plies of two-ply gypsum base construction with no adhesive between plies shall comply with Table 3.

9.2 The maximum spacing for framing members for two-ply gypsum base construction with adhesive between plies shall comply with Table 4.

TABLE 4

GYPSUM BASE THICKNESS		APPLICATION DIRECTION		MAXIMUM SPACING OF FRAMING
CEILINGS				
Base	Face	Base	Face	
3/8"	3/8"	H	H or V	16" o.c.
1/2"	3/8" or 1/2"	V	H or V	16" o.c.
		H	H or V	24" o.c.
5/8"	1/2"	H or V	H or V	24" o.c.
5/8"	5/8"	H	H or V	24" o.c.
SIDEWALLS				
Base	Face	Base	Face	
3/8"	3/8"	H or V	H or V	16" o.c.
1/2"	3/8" or 1/2"	H or V	H or V	24" o.c.
5/8"	1/2" or 5/8"	H or V	H or V	24" o.c.

9.3 The first ply of gypsum base shall be applied with nails, screws or staples of the size and type required in Section 2 and Table 1, spaced according to Table 5. The heads of the fasteners shall be driven flush with the surface of the gypsum base.

TABLE 5

ATTACHMENT SPACING FOR BASE PLY OVER WOOD OR METAL FRAMING

FASTENER	NAILS	SCREWS	STAPLES
FRAMING	Wood	Wood or Metal	Wood
NO ADHESIVE BETWEEN PLIES	16" o.c.	24" o.c.	16" o.c.
ADHESIVE BETWEEN PLIES	Section 4.2.1	Section 4.2.2	7" o.c.

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9.4 When no adhesive is used between plies, the face layer shall be applied with the number of nails or screws required for normal single-ply application. Nails used for the face layer shall be long enough to penetrate at least 3/4" into wood framing members. Screw length shall be as recommended by the manufacturer of the gypsum base.

9.5 When a laminating adhesive is used between plies, the adhesive shall be an adhesive specifically recommended by the gypsum base manufacturer for two-ply gypsum base application. Joints in the face ply need not occur over framing members. Parallel joints of the two plies shall be staggered (offset) at least 8". Laminating procedures shall be as recommended by the gypsum base manufacturer.

9.6 When the face ply is adhesively installed, it shall be held firmly in place with temporary fasteners or shoring (supports, props, headers, etc.) in sufficient quantity to insure adequate pressure for bonding. When adequate bond has developed, the supports shall be removed. If nailed, the temporary nails shall be (a) removed, (b) driven well below the surface, or (c) driven tightly against the surface and dimpled in the usual manner.

10. Semi-Solid Veneer Plaster Base Partitions

10.1 **Face Panels.** 1/2", 5/8" or multiple thicknesses of regular or Type "X" gypsum base, 4 ft wide.

10.2 **Gypsum Ribs.** The gypsum ribs shall be 1" material or of multilayer materials laminated to the required thickness. They shall be a minimum 1" thick, 6" wide, and approximately 6" shorter than floor-ceiling height unless full lengths are required for fire stops or fire resistance.

10.3 **Runners.** Wood of thickness equal to partition core or metal runners complying with the requirements of ASTM Designation C645. Runners shall be 1" minimum height.

10.3.1 Floor and ceiling runners shall be securely fastened with fasteners spaced not to exceed 24" o.c.

10.4 **Laminating Compound.** Laminating compound shall be as recommended by the gypsum base manufacturer.

10.5 Erect vertical runners or ribs where required to provide proper support at locations such as exterior walls, partition junctions, terminals, external corners and door bucks.

10.6 Gypsum base panels are positioned vertically and laminated to gypsum ribs located at face panel vertical joints and at vertical center line of panel for 24" spacing or at third points for 16" spacing.

10.7 Ribs may be laminated to face panels prior to erection or as erection of partition proceeds. Erect a starter face panel vertically at an intersecting wall. The starter panel must be plumb and secured to floor, ceiling and vertical runners attached to intersected partition.

10.8 Erect next face panel adjacent to starter panel, butting its edge firmly to starter panel. Continue erection of face panels, laminating exposed faces of ribs as work progresses. Stagger joints.

10.9 Openings in partitions for doors, electrical outlets, etc., shall be carefully and accurately marked and cut.

10.10 Laminating adhesive, as recommended by the gypsum base manufacturer, shall be of a consistency and be applied in such a manner that it will cover approximately three-fourths of the rib surface after lamination.

10.11 Nails, staples or screws shall be used as required to insure a continuous bond between face panels and ribs. If nails are used, drive nails downward at about 45 degrees through face panel into all ribs. Remove or set temporary nails after laminating compound is thoroughly dry and prior to application of joint reinforcement.

10.12 **Additional Ribs.** To further reinforce openings or changes in direction of partition, additional ribs may be laminated in place at the following locations:

External Corners. Between both pairs of face panels abutting the corner.

Butting Walls. Between the face panels of a partition to reinforce junction of an abutting wall.

Door Openings. A vertical rib should be located within 3" of door frame for reinforcement, and a rib should be placed horizontally over the door head. If space above door head to ceiling is over 24", install rib sections, so that face panels do not span over 24" in this area.

11. Solid Gypsum Base Partitions

11.1 **Face Panels.** 1/2", 5/8", or multiple laminations of regular Type "X" gypsum base of 4 ft. width.

11.2 **Core.** 1" thick gypsum backing board, either single or multiple layers in 2 ft or 4 ft widths.

11.3 **Runners.** A minimum of 26 gauge metal or construction grade wood.

11.4 **Laminating Adhesive.** Laminating adhesive shall be as recommended by the gypsum base manufacturer.

11.5 Floor and ceiling runners shall be installed according to partition layout and secured not more than 24" o.c. Install vertical runners at required locations such as exterior walls, exterior corners, and door frames. Partitions shall be secured at floor and ceiling according to details or as otherwise required.

TABLE 6

MINIMUM SIZES FOR WIRE AND RIGID HANGERS

		HANGERS	MAXIMUM CEILING AREA SUPPORTED SQ. FT.	MINIMUM SIZE OF HANGERS
HANGERS FOR SUSPENDED CEILINGS			14	10 ga. galvanized wire (0.1350 in. dia.)
			16	9 ga. galvanized wire (0.1483 in. dia.)
			18	8 ga. galvanized wire (0.1620 in. dia.)
			20	3/16" dia., mild steel rod[1]
			22.5	7/32" dia., mild steel rod[1]
			25	1/4" dia., mild steel rod[1]
			28	1" x 3/16" mild steel flat[2]
ATTACHMENTS FOR RUNNERS AND FURRING DIRECTLY TO BEAMS AND JOISTS	FOR SUPPORTING RUNNERS	SINGLE HANGERS BETWEEN BEAMS[3]	9	12 ga. galvanized wire (0.1055 in. dia.)
			14	10 ga. galvanized wire
			18	8 ga. wire
		DOUBLE WIRE LOOPS AT BEAMS OR JOISTS[3]	9	14 ga. galvanized wire (0.0800 in. dia.)
			14	12 ga. wire
			18	10 ga. wire
	FOR SUPPORTING FURRING WITHOUT RUNNERS[3] (WIRE LOOPS AT SUPPORTS)	TYPES OF SUPPORT:		
		CONCRETE	9	14 ga. wire
		STEEL OR WOOD	9	16 ga. galvanized wire (0.0625 in. dia.) (two loops)[4]

[1] It is highly recommended that all rod hangers be protected with a zinc or other equally rust-inhibitive coating.

[2] It is highly recommended that all flat hangers be protected with a zinc coating or with a rust-inhibitive paint.

[3] Inserts, special clips or screws, or other devices of equal strength may be substituted for those specified.

[4] Two loops of No. 18 gauge (0.0475 in. dia.) wire may be substituted for each loop of No. 16 gauge wire for attaching steel furring to steel or wood joists.

11.6 Application of laminating adhesive and erection of the panels shall be in accordance with the gypsum base manufacturer's recommendations. The gypsum base shall be laminated to the backing board with sufficient pressure to insure good bond. Joints of gypsum base and backing board shall be staggered. Use fasteners to insure intimate and continuous bond between gypsum base and backing board.

12. Suspended or Furred Ceilings

12.1 **Hangers and Concrete Insert Anchors for Suspended Ceilings.** Hangers shall be of ample length. Hangers used without inserts shall be secured to steel reinforcement in concrete so as to develop the full strength of the hangers which are attached to them.

12.1.1 Hangers for suspended ceilings under wood construction shall conform with the requirements of Table 6 both as to size and maximum area to be supported, except as modified in this section. Hangers shall be attached to supports by one of the following methods:

(1) Insert wire hangers in holes drilled a minimum of 3" above bottom of joists and twist the upper end of the hanger three times around itself, or

(2) Attach wire hangers to 30d nails driven on a downward slant into sides of joists with not less than 3" penetration and at least 5" from bottom edges, not over 36" on centers and twist the upper end of the hanger in each case three times around itself, or

(3) Secure wire hangers with 4½" No. 9 gauge wire staples driven horizontally or on a downward slant into sides of joists, three near the upper end of the loop and the fourth to fasten the loose end, or

(4) Where purlins exceed 4 ft on centers, fasten 1½" No. 0 screw eyes or equal into heavy wood flooring at not over 3 ft on centers so that they will support an area not over 9 sq ft. The upper end of the wire hanger shall be inserted in the screw eye and in each case twisted three times around itself.

(5) Flat rigid hangers, if used, shall be spiked to sides of joists with two 12d nails driven through holes drilled in the hanger and clinched at least 3" above bottom of joists.

12.1.2 Wire shall be zinc-coated (galvanized). Rods and flats shall be of mild steel. Gauges and sizes specified are the minimum permissible.

12.1.3 Wire for attaching runners and furring directly to concrete beams and joists, to steel beams and joists, and to wood beams and joists shall be of the gauge sizes specified in Table 6.

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TABLE 7

SPANS AND SPACINGS FOR MAIN RUNNERS [1], [2]

MINIMUM SIZE AND TYPE	MAXIMUM SPAN BETWEEN HANGERS OR SUPPORTS	MAXIMUM CENTER TO CENTER SPACING OF RUNNERS
1-1/2" – 0.475 lb per ft, cold rolled channel	3'-0"	5'-0"
1-1/2" – 0.475 lb per ft, cold rolled channel	3'-6"	4'-6"
1-1/2" – 0.475 lb per ft, cold rolled channel	4'-0"	4'-0"
1-1/2" – 1.12 lb per ft, hot rolled channel	4'-0"	6'-0"
2" – 1.26 lb per ft, hot rolled channel	3'-6"	8'-0"
2" – 0.59 lb per ft, cold rolled channel	3'-6"	6'-0"

[1] These spans are based on webs of channels being erected vertically.
[2] Other sections of hot or cold rolled members of equivalent beam strength may be substituted for those specified.

12.1.4 Hangers for supporting main runners of suspended ceilings shall be as specified in Table 6.

12.1.5 Where 1" by 3/16" concrete inserts are used, 7/16" diameter holes shall be punched on the center line at the lower ends, to permit flat steel hangers with 3/8" diameter round-head stove bolts to be bolted tightly to the inserts.

12.1.6 Lower ends of flat hangers shall be bolted to main runners, or bent tightly around runners and bolted tightly to the main part of the hanger with 3/8" diameter round-head stove bolts.

12.1.7 Holes in both inserts and hangers shall not be nearer to the ends than 3/8".

12.1.8 Wire hangers shall be saddle-tied to main runners so as to prevent turning or twisting of the runners and to develop the full strength of the hangers. Smooth or threaded rod hangers shall be attached to inserts and runners with special attachments.

12.2 **Main Runners for Suspended Ceilings.** Main runners for the various spacings of hangers shall be as specified in Table 7.

12.2.1 Main runner ends and sides shall not come in contact with abutting masonry or reinforced concrete walls or partitions. Clearance of not less than 1" from main runner ends and 2" from runner sides shall be provided. A main runner shall be located within 6" of the paralleling walls to support the ends of the cross furring. The ends of the main runners at walls shall be supported by hangers located not more than 6" from such ends.

12.2.2 When main runners are spliced, the ends shall be overlapped not less than 12" (with flanges of channels interlocked) and securely tied near each end of the splice with double loops of No. 16 (or double loops of twin strands of No. 18), gauge galvanized wire.

12.3 **Furring Members for Suspended Ceilings.** Furring for various spacings of main runners or structural supports shall be as specified in Table 8.

12.3.1 Furring shall be securely saddle-tied to main runners or structural supports with double No. 16 gauge galvanized wire, or attached with special clips, or special screws, or equivalent attachments.

12.3.2 When furring members are spliced, the ends shall be overlapped not less than 8" (with flanges interlocked) and securely tied near each end of the splice with double loops of No. 16 gauge wire or of twin strands of No. 18 gauge wire.

12.3.3 Furring member ends and sides shall not come in contact with abutting masonry or reinforced concrete walls or partitions.

12.4 Furring channels applied direct to wood framing

TABLE 8

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SPANS AND SPACINGS OF FURRING MEMBERS

TYPE OF FURRING	MAXIMUM[1] SPACING C. TO C.	MAXIMUM SPAN
Furring Channel (Drywall Hat Shaped)	24"	4'-0"
1-5/8" Stud (Erected with open side up and against support)	24"	5'-0"
2-1/2" Stud (Erected with web vertical to support)[2]	24"	6'-0"
3-5/8" Stud (Erected with web vertical to support)[2]	24"	8'-0"

[1] Consult Tables 3 and 4 for maximum spacing as determined by gypsum base thickness.
[2] A 6" length of same size stud shall be nested to form a "box" at each saddle tie.

shall be applied with screws providing 1" penetration or as otherwise specified by the manufacturer of the furring channels.

12.5 Application of gypsum base to ceiling furring shall be in accordance with Sections 4, 5, and 6 of these specifications, and Section A-2 of Appendix A.

APPENDIX A

(This appendix gives general information and inclusions to be made elsewhere by the specifier. It is not part of the *Gypsum Association Specifications for the Application of Gypsum Base for Gypsum Veneer Plasters.)*

A1 General Information

Scaffolding shall be constructed and maintained in strict conformity with applicable laws and ordinances.

The work shall be properly coordinated with the work of other trades.

A2 Framing Requirements

The following requirements should be included in the project specification for proper framing and furring to receive the gypsum base:

A2.1 All framing members to which gypsum base will be fastened shall be straight and true and shall be spaced not to exceed the maximum spacings shown in 5.1 or 9.2. Framing and bridging members should be adequate to carry the design or code loading. The deflection of horizontal members supporting gypsum base shall not exceed 1/360 of the span under full design load. The fastening surface of any framing or furring member should not vary more than 1/8" from the plane of the faces of adjacent framing or furring members. Additional framing should be provided as necessary for the support of fixtures and equipment.

A2.2 Wood framing to receive gypsum wallboard or gypsum backing board shall meet the minimum requirements of FHA for single or multi-family dwellings; it shall be of the proper grade for the intended use; and if 2" x 4" nominal size or larger, it shall bear the grade mark of a recognized inspection agency.

A2.3 For partitions located parallel to and between ceiling members, headers not more than 24" o.c. must be provided to fasten ceiling runners prior to erection of ceiling.

A2.4 When gypsum base is nailed to wood cross furring on ceilings, these members shall have a minimum cross section of 1½" x 1½" and be spaced in accordance with the requirements of Section 5.1 or 9.2. Where screw application is used, the wood furring member may be ¾" x 2½" minimum size.

A2.5 When solid surfaces are furred with wood to receive gypsum base, wood members shall not be less than ¾" thick and 1½" wide. Furring shall be attached in such a manner as to provide a solid nailing base.

A2.6 Insulating blankets or flanges of blankets shall not be applied over framing members surfaces that are to receive gypsum base.

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A3 Heating and Ventilation Requirements

A3.1 Proper ventilation above veneer plaster ceilings shall be provided by cross ventilating the space between roof and top floor ceilings by screened louvers or other acceptable means.

A3.1.1 Ratio of total net free ventilating area of ceiling shall be not less than 1/150, except that ratio may be 1/300 provided: (1) Insulating (foil back) gypsum base is installed or an approved vapor barrier is installed on the warm side of the ceiling; or (2) at least 50% of the required ventilating area is provided by ventilators at least 3 ft above eave and cornice vents which provide the balance of the required ventilation.

A3.1.2 Attic space accessible and suitable for future rooms or walled-off storage shall have at least 50% of the required ventilating area located as near the high point of the ventilated space as practicable and above the level of any future ceiling.

A3.2 Ventilation should be provided to remove excess moisture prior to, during, and after application of gypsum base and plastering.

A3.3 If the outdoor temperature at the building site is less than 55°F, heat the building to a temperature in the range of 55°F to 70°F for 24 hours prior to, during, and after gypsum base installation and plastering until the permanent heating system is in operation.

A4 Cable Electric Radiant Heating Systems for Ceilings

The application of gypsum base under this specification shall be performed in accordance with the requirements of this specification except as follows:

A4.1 Gypsum base shall be a minimum of ½" in thickness. The gypsum base shall be applied horizontally to framing members. Attachment shall be as required in Section 5.

A4.2 Electric heating cables shall be securely attached to the gypsum base in accordance with the recommendations of either the gypsum base or cable manufacturer or supplier.

A4.3 Cables shall run at right angles to gypsum base paper bound edges. Do not position cables directly over joints which run parallel to direction of cable run.

A4.4 Position cables no closer than 6" from all wall-ceiling intersections and openings.

A4.5 All inspections and testing of the heating system shall be completed before application of the veneer plaster.

A4.6 Under no operating conditions shall the heating cable exceed a temperature of 125°F.

GYPSUM ASSOCIATION SPECIFICATIONS FOR THE APPLICATION OF GYPSUM VENEER PLASTER

SGP 0024976

1. Scope and General Provisions

1.1 These specifications are intended to describe the minimum requirements and methods of applying gypsum veneer plaster.

1.2 Where a specific degree of fire resistance is required for veneer plaster systems, applicable building code regulations shall be followed. Details of construction to achieve required fire resistance may be obtained from official reports of fire tests conducted at recognized fire testing laboratories in accordance with *American National Standard Methods of Fire Tests of Building Construction and Materials,* ANSI A2.1 (ASTM E119).

1.3 To secure, in largest measure, the desired results from veneer plastering, it is recommended that those who use this standard coordinate its provisions with accompanying *Specifications for the Application of Gypsum Base for Gypsum Veneer Plasters.*

1.4 General information regarding matters of a contractural nature concerning veneer plaster work will be found in Appendix A. Additional technical information related to veneer plastering is provided in Appendix B.

2. Definitions, Terms and Materials

2.1 **Veneer Plastering System.** Where the term "veneer plastering system" is used, it refers to a system of plastering wherein gypsum veneer plaster is applied to a 4 ft wide gypsum base material designed to receive the plaster which may be applied in one or more coats normally not exceeding 1/4" total thickness.

2.2 **Gypsum Base for Veneer Plasters** (hereinafter referred to as "gypsum base"). Where the term "gypsum base" is used, it refers to gypsum base as defined in ASTM Specification C588.

2.3 **Reinforced Joint.** Where the term "reinforced joint" is used, it refers to a joint between gypsum base boards which has been reinforced.

2.4 **Reinforcing.** High strength, non-corrosive strip providing sufficient strength to meet the joint strength requirements of ASTM Specification C587.

2.5 **Joint Reinforcing Embedment.** Where the term "embedment" is used in conjunction with joint reinforcement, it refers to the material used to embed the joint reinforcement.

2.6 **Two Coat or Two Component System.** Where the term "two coat or two component system" is used, it refers to a veneer plaster system involving separate materials for basecoat and finish coat.

2.7 **One Coat or One Component System.** This term refers to veneer plaster systems designed for trowel or machine application directly over approved gypsum bases in a single coat or double back operation.

2.8 **Veneer Plasters.** Specifications for veneer plasters shall conform to ASTM Specification C587.

2.8.1 *Basecoat.* Veneer plaster designed to be trowel or machine applied as the first coat of two coat or two component systems.

2.8.2 *Smooth Trowel Finish.* Veneer finish plaster designed to be trowel applied and finished as the finish coat over basecoat veneer plaster in two coat or two component systems.

2.8.3 *Texture Finish.* Veneer finish plaster designed to be trowel or machine applied as the finish coat over basecoat veneer plaster in two coat or two component systems.

2.9 **Liquid Bonding Compounds.** Bonding compounds may be used at the discretion of the specifier. See Appendix B.

2.10 **Water.** Water shall be clean, fresh, suitable for domestic consumption, and free from such amounts of mineral and/or organic substances as would affect the set of the plaster.

3. Delivery and Protection of Materials

3.1 All manufactured materials shall be delivered in the original packages, containers, or cartons bearing the name of the product and manufacturer (or supplier).

3.2 Plasters and other cementitious materials shall be kept dry until ready to be used; they shall be kept off the ground, under cover, and away from sweating walls and other damp surfaces.

4. Preparations for Plastering

4.1 **Temperature.** When the prevailing outdoor temperature at the building site is less than 55°F, a uniform temperature of not less than 55°F, and not more than 70°F shall be continuously maintained in the building for a period of not less than one week prior to application of plaster, while plastering is in progress, and for a period of at least one week after plaster is dry. (Permitting the building to adjust to uniform temporary heating conditions minimizes the possibility of plaster cracks due to structural movements caused by thermal changes.) Heat shall be well distributed in all areas, and deflection or protective screens shall be used to prevent concentrated or uneven heat on plaster near the heat source. Where required, heat shall be furnished by _____ . *(NOTE: The name of the parties who shall furnish heat and mechanical ventilation may be inserted here, or the provisions of Section A5 of Appendix A may be used.)*

4.2 **Ventilation.** To properly dry the plaster during and subsequent to its application, ventilation shall be provided. (Only a portion of the water used in mix-gypsum plaster is necessary for the chemical reaction which sets and hardens the plaster. The excess amount required for mixing and application must be dried out after the set has taken place.) In glazed buildings, ventilation shall be accomplished by keeping windows open approximately 3" top and bottom (or side-pivoted windows approximately 4") to provide air circulation. For enclosed areas or buildings which lack natural ventilation, provisions shall be made to exhaust the moist air to the outside by mechanical means such as temporary circulators, exhaust fans, or the air conditioning system.

4.2.1 If glazed sash are not in place and the building is subjected to hot, dry winds or temperature differentials from day to night of 20°F or more, openings shall be screened with cheesecloth or similar materials. (Free circulation of hot, dry winds over the face of freshly applied plaster should be prevented. It causes "dry-outs" by removing the water from the plaster before the setting action is completed.)

4.2.2 See B2 of Appendix B for provisions for ventilating portions of underside of roofs enclosed with lath and plaster ceilings.

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4.3 **Examination.** All surfaces including, but not limited to, unit masonry, monolithic concrete, gypsum bases of all types, and accessories which are to receive veneer plaster shall be carefully examined before the veneer plaster is applied, and the proper authorities shall be promptly notified of all unsatisfactory conditions. No veneer plaster shall be applied until after such unsatisfactory conditions are rectified to the satisfaction of the plastering contractor and made suitable for the application of veneer plaster.

4.3.1 Veneer plaster shall not be applied over any surfaces of unit masonry or concrete which have been coated with any bituminous compound or other detrimental water-proofing or damp-proofing agent.

4.4 **Conditioning of Surfaces to Receive Veneer Plaster.**

4.4.1 Masonry surfaces on which suction must be reduced shall be properly wet down immediately before the plaster is applied.

4.4.2 Accessories, such as corner beads, control joints, casing beads, etc. shall be carefully examined to see that they are straight, curved, plumb, level, square, or true to the required angles, as the case may require, before the plaster is applied.

4.6 **Monolithic Concrete Surfaces.** Monolithic concrete surfaces shall be cleaned of all dust, loose particles, and other foreign matter. Grease and oil shall be completely removed. Any further preparation shall be as recommended by the veneer plaster manufacturer.

4.7 **Gypsum Veneer Plaster Base Joint Reinforcement.** All interior angles and flat joints shall be reinforced prior to application of the veneer plaster over the field of the board.

4.7.1 *Interior Angles.* Position and secure reinforcement with staples, veneer plaster, or adhesive. When stapling, staple along ceiling edge only for wall-to-ceiling angles and along one edge for wall-to-wall angles. When securing reinforcement with veneer plaster, reinforcement must be thoroughly embedded so that embedment material is both under and covering reinforcement.

4.7.2 *Flat Joints–Two Coat or Two Component Systems.* Center reinforcement over joint line of gypsum base and secure with staple, veneer plaster, or adhesive. Keep reinforcement tight and flat against gypsum base and, when stapling, position staples no greater than 24" apart, staggered along each edge.

(NOTE: Methods described under 4.7.3 below, may also be used for two coat or two component systems if desired.)

4.7.3 *Flat Joints–One Component Systems.* One of the following methods must be used in lieu of that described under 4.7.2 to minimize incidence and severity of joint beading and/or cracking when one component veneer plaster systems are used.

4.7.3.1 *Reinforcement Stapled Over Set Veneer Plaster.* Tightly trowel veneer plaster over joint line leaving plaster feathered out to a width of about 6" flush with face of gypsum base. Allow plaster to set; then secure reinforcement over joint line as described under 4.7.2 above.

4.7.3.2 *Reinforcement Secured and Embedded With Veneer Plaster.* Apply reinforcement over joint line as described under 4.7.2 above. Tightly trowel plaster over reinforcement along joint line to give thorough embedment of reinforcement. Allow joint plaster to set before proceeding with general plastering.

4.7.3.3 *Reinforcement Embedded* (no staples). Tightly trowel embedment material to a depth of about 1/32", working trowel in both directions along joint line. Center reinforcement over joint line. Firmly and evenly press reinforcement into soft embedment material using a little soft material on the trowel to bury it completely, and leave embedment material feathered out to a width of about 6" flush with face of gypsum base. Allow embedment material to set before proceeding with general plastering.

(NOTE: Gypsum base and reinforcement shall be protected from overspray of other materials.)

5. Plaster Thickness

5.1 Plaster shall be of the following thickness measured from the face of the base to which it is applied exclusive of joint treatment or material used to straighten masonry surfaces.

Basecoats (Trowel Applied) ...	1/16" minimum
Basecoats (Spray Applied)	1/16" minimum
Finishes (Two Coat Systems) ..	1/32" to 1/16"
One Component Systems	3/32" minimum

6. Mixing

Material that has partially set shall not be retempered or used. Frozen, caked, or lumpy material shall not be used. Each batch shall be mixed separately. Mixers shall be thoroughly cleaned after each batch so as not to accelerate following batches. (This can be done by spray hosing the mixer paddle and containers immediately after each batch.) Water ratios and other techniques used for mixing shall conform to the manufacturers recommendations for specific veneer plaster products. In the absence of explicit directions, the following practices and recommendations shall apply:

6.1 **Equipment.** A paddle type agitator fitted to a ½ hp heavy duty, electric drill, rated 650 RPM (under

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load), and a clean drum of convenient size are recommended for rapid, efficient mixing of veneer plasters.

6.2 **Mixing Procedure**

(1) Put all but 1 or 2 quarts of the proper amount of water in mixer drum for each bag of veneer plaster to be mixed.

(2) Add veneer plaster to water and immediately mix until uniformly wetted. Veneer plaster may be added while agitator is turning.

(3) Continue mixing, adding water as required to obtain desired lump-free mortar fluidity.

(4) When mixing plasters for spray application, mix to fluidity such that 75-90 per cent of batched mortar will pass an 8 x 8 mesh screen without shaking.

(5) Do not over mix. Three to four minutes suffices to attain fluidity.

6.3 **Setting Time.** Setting time is carefully controlled at the time of manufacture and no job adjustment should be made. Should veneer plaster setting time problems develop under extreme job situations, consult manufacturer of veneer plaster for recommendations.

6.3.1 Gauging, moulding, or casting plasters, lime, Keene's Cement, etc. *shall not* be used to adjust veneer plaster setting time.

7. Application of Plasters

Veneer plasters have widely differing working properties, physical characteristics, and limitations regarding their compatibility with bases for application and use with one another. To secure the desired results only those particular application methods and/or techniques, limitations and procedures set forth by individual manufacturers for their products shall be followed. In the absence of manufacturer's directions, the following practices and recommendations shall apply.

7.1 **Basecoat—Trowel Application.** Basecoat shall be applied with sufficient material and pressure to provide good bond on gypsum bases or other bases as approved by the veneer plaster manufacturer and straightened to a true surface without application of water.

7.2 **Basecoat—Spray Application.** First spray flat joints beads, and interior angles, and work material by hand tools to cover reinforcement, fill beads, straighten angles, and feather out plaster over joints. Proceed with full areas by spraying with a broad sweeping motion holding nozzle close enough to surface to avoid excessive overspray and build-up in angles. First apply a light coating while moving in one direction; then immediately double back over the same area sweeping nozzle in the opposite direction to obtain a level coat which requires no further working, and is suitable to receive the finish coat upon setting.

7.3 **Finish and Single Bag Plasters.** Finish coats may be applied over "green", partially dry, or dry basecoat. One coat or one component products shall be applied *directly* to gypsum base, or other bases approved by the veneer plaster manufacturer.

7.3.1 *Smooth Trowel Finish.* Plaster shall be applied by trowelling in with firm pressure, then doubling back and filling out to a true, even surface. After plaster has become firm, it shall be well trowelled with a minimum amount of water to a smooth finish, free from cat-faces, trowel marks, blemishes or other imperfections.

7.3.2 *Texture Finishes.* Plaster shall be applied over the gypsum base or basecoat by trowelling in thoroughly, building up to an even surface, and then floating with a variety of tools. It may also be sprayed (depending on the type of texture desired) to a true, even, surface free from slick spots or other blemishes.

APPENDIX A

General Information

A1 The work shall include all labor, materials, services, equipment, and scaffolding required for the completion of the plastering on the project in accordance with the plans and specifications.

A2 Scaffolding shall be constructed and maintained in strict conformity with applicable laws and ordinances, and so as not to interfere with and obstruct the work of others.

A3 The work shall be properly coordinated with the work of other trades.

A4 The following work shall be included:

_____

_____

_____

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The following work shall not be included:

_____

_____

_____.

A5 Where required, natural or artificial heat or natural or mechanical ventilation, or both heat and ventilation shall be furnished by _____.

in accordance with the following:

_____

_____

_____.

A6 Surfaces shall be carefully examined before the plaster is applied thereto, and the proper authorities notified of all unsatisfactory conditions.

A7 Surfaces of unit masonry or concrete that are to receive plaster shall not prior to plastering be coated with any bituminous compound or other detrimental water-proofing or damp-proofing agent.

APPENDIX B

Technical Information

B1 **Bonding Compounds.** Bonding compounds such as those of the vinyl polymerization type have been satisfactorily used to bond plaster to portland cement concrete and other sound surfaces. Such bonding agents may be used at the discretion of the specifier who may require performance records from the bonding agent manufacturer. The bonding agent shall be applied in accordance with the bonding agent manufacturer's directions.

B2 **Heating and Ventilation Requirements.** Proper ventilation above veneer plaster ceilings shall be provided by cross ventilating the space between roof and top floor ceilings by screened louvers or other acceptable means.

B2.1 Ratio of total net free ventilating area of ceiling shall be not less than 1/150, except that ratio may be 1/300 provided: (1) Insulating (foil back) gypsum base is installed or an approved vapor barrier is installed on the warm side of the ceiling; or (2) at least 50% of the required ventilating area is provided by ventilators at least 3 ft above eave and cornice vents which provide the balance of the required ventilation.

B2.2 Attic space accessible and suitable for future rooms or walled-off storage shall have at least 50% of the required ventilating area located as near the high point of the ventilated space as practicable and above the level of any future ceiling.

B2.3 Ventilation should be provided to remove excess moisture prior to, during, and after application of gypsum base and plastering.

B2.4 If the outdoor temperature at the building site is less than 55°F, heat the building to a temperature in the range of 55°F to 70°F for 24 hours prior to, during and after gypsum base installation and plastering until the permanent heating system is in operation.

B3 **Application of Veneer Plaster Over Electric Radiant Heat Cable.** Application of veneer plaster over electric radiant heating cable shall be performed in accordance with the requirements of this specification except as follows:

B3.1 Treatment of flat joints per 4.7.3 shall be done *before* installation of the electric heating cable.

B3.2 All inspections and testing of the heating system shall be completed before application of the veneer plaster.

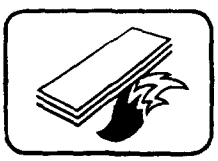
B3.3 Veneer plaster shall be applied in a tight scratch coat working the trowel parallel to the heating cable. Plaster thickness shall be flush with the cables. Immediately double back before the scratch application has set and build up to a thickness to cover the cables with a minimum of 1/16" and a maximum of 1/8" of veneer plaster.

B3.4 Finish as recommended by the veneer plaster manufacturer or as described in 7.3.

B3.5 Heating system shall not be turned on until the veneer plaster has dried. The heating system should be deactivated and supplemental heat should be provided, as required, while paint is being applied. If the room temperature is more than 15°F below the desired temperature after decoration is completed, the heat should be turned on in increments to raise the temperature 5°F at a time.

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GYPSUM ASSOCIATION
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Special Recommendations

APPLICATION OF RIGID PREDECORATED PANELS TO GYPSUM SUBSTRATE

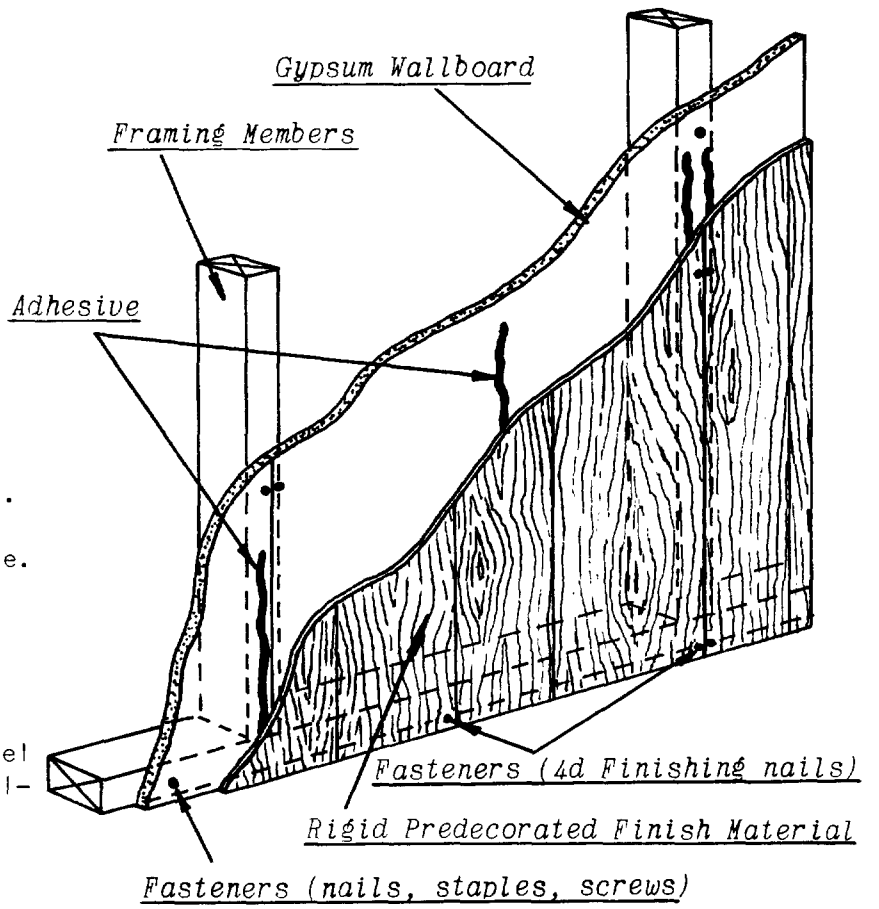
PURPOSE

The addition of gypsum wallboard as a substrate when using predecorated panels provides increased FIRE RESISTANCE and SOUND CONTROL.

APPLICATION

Use 3/8 in. or 1/2 in. gypsum wallboard. Attach to studs with 1-3/8 in. wallboard nails, 1 in. drywall screws (metal studs) or drywall stud adhesive. Joints need not be taped or sealed. Install the gypsum wallboard vertically with the edges centered on the framing members.

The rigid predecorated panels should be applied using a bead of panel adhesive over each stud. Secure paneling at top and bottom plates with 4d. finishing nails 12 in. o.c. and one at mid-height per stud.



TEST RESULTS

	Paneling (No Gypsum)	Paneling With 3/8 in. Gypsum	Paneling With 1/2 in. Gypsum
Burn thru Time	8 min.	42 min.	73 min. (plus)
Better Sound Rating	28 STC	40 STC	40 STC
Better Impact Resistance	26	82	82

Build With Safety and Silence

Build a SAFER, SOUNDER and QUIETER wall with gypsum wallboard as a substrate. The addition of gypsum wallboard underlayment to the construction of the walls for your den, rec. room or spare bedroom will be the soundest investment you can make. Gypsum wallboard can be purchased in the same convenient sizes as the predecorated panels. This inexpensive, easily installed building material will provide you with a STRONGER wall, a QUIETER room and a SAFER home.

Tests results dramatically show the ADDED FIRE PROTECTION that gypsum wallboard underlayment will give your family. Equally dramatic is the gypsum wallboard's ability to provide INCREASED SOUND CONTROL, which will be greatly appreciated by those in the adjoining rooms. And last but not least is the substantial INCREASE IN STRENGTH that will be achieved with the addition of gypsum wallboard as a substrate. This increased strength will mean a SOUNDER, SAFER and LONGER LASTING wall.

---- When the job is worth doing it is worth doing right ---- use gypsum wallboard as a substrate and provide your family with

"BUILT-IN-INSURANCE"

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Information Bulletin

RECOMMENDATIONS FOR THE PROPER STORAGE AND HANDLING PROCEDURES OF GYPSUM WALLBOARD

One of the many problems involved in the handling of gypsum wallboard involves proper size and placement of supports in storage. This is particularly important in those instances where the warehouse handling is mechanized and the majority of the board is transported with a fork-lift truck. Therefore, the Gypsum Association Materials Handling Committee presents the following recommendations relative to storage and handling of gypsum wallboard.

Diagram No. 2 shows the recommended number of supports for the various lengths of board, regardless of thickness. With slow moving items that require prolonged storage, the wavy edged board problem can be solved by reducing the span between risers to 28 inches or less. Materials used for supports should be 4 inches in width. Great care should be exercised in placing the risers and, as the units are tiered, the risers must be aligned from bottom to top so that each tier rests on solid bearing.

Diagram No. 1 shows the correct method of placing supports where the wallboard is tiered several units high. It also shows what can occur if the placing of risers is not done in accordance with the recommendations.

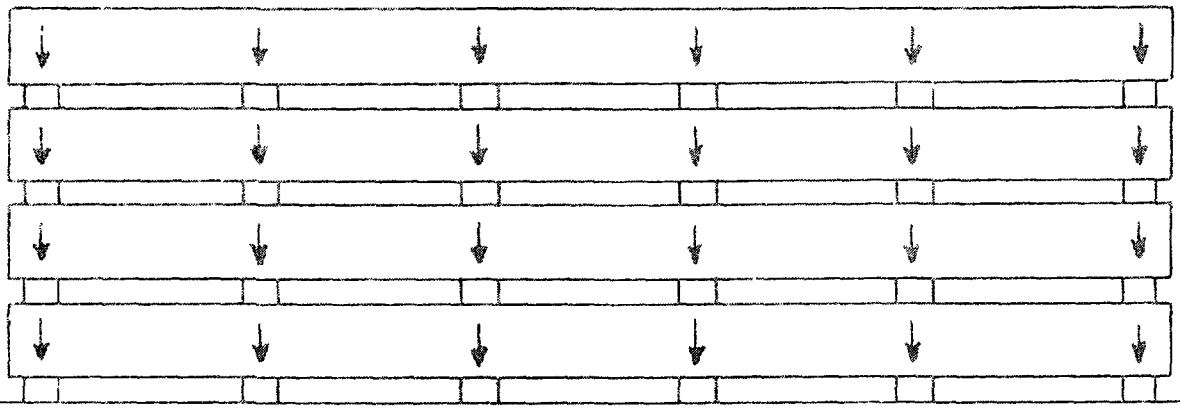
Dry storage is essential and weather protection should be provided for all storage of gypsum products.

When board is handled manually from delivery truck to the building where it is hung, the bundles should be carried on edge. It is preferable to pile the board flat down at the destination. Care must be exercised in turning the board from vertical to horizontal as it is piled (diagram No. 3). The most satisfactory method is to stand the board on edge at the near side of the pile as close to the edge of the pile as possible. Tip the board from vertical toward the stack and let it drop on the top of the pile. The air cushion developed, as the board drops, will be sufficient to prevent cracking providing the board, as it falls in place, does not hang over the far edge more than an inch or two. A great portion of the board cracked on the job or after it is hung can be traced to improper stacking on the job site or in the dealer's warehouse.

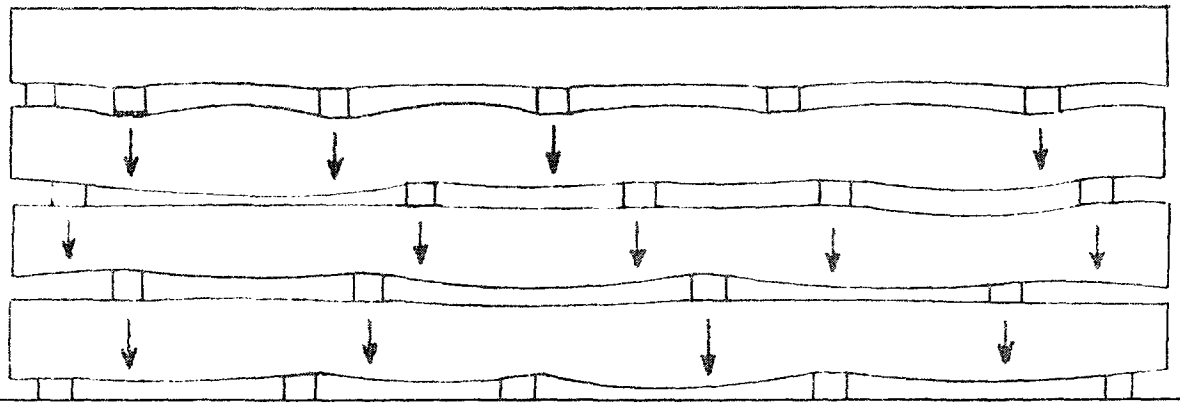
This information bulletin is released by the Gypsum Association Materials Handling Committee as part of its over-all program for recommending procedures that will reduce the possibility of damage to gypsum products from incorrect handling both in transit and after it has been delivered to the dealer's warehouse.

SGP 0025006

DIAGRAM NO. 1



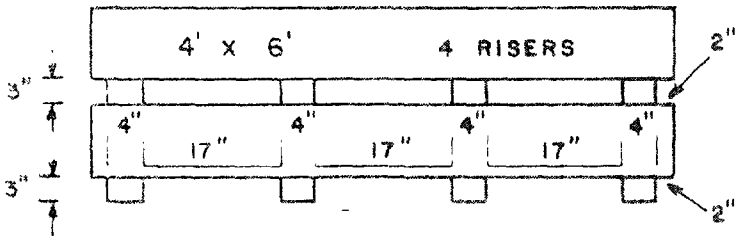
CORRECT METHOD OF PLACING RISERS
(ARROWS INDICATE PRESSURE)

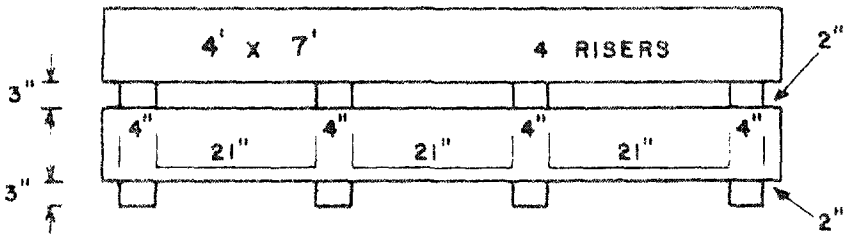


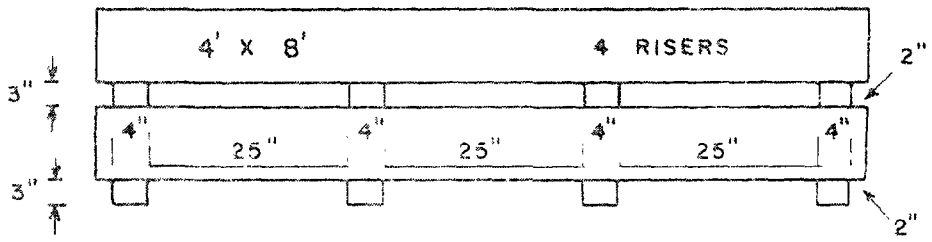
INCORRECT METHOD OF PLACING RISERS
(CUMULATIVE PRESSURE ON LOWER
UNITS CAUSES SAG OF WALLBOARD)

DIAGRAM NO. 2

RECOMMENDED PLACEMENT OF RISERS FOR WAREHOUSE STORAGE OF GYPSUM WALLBOARD

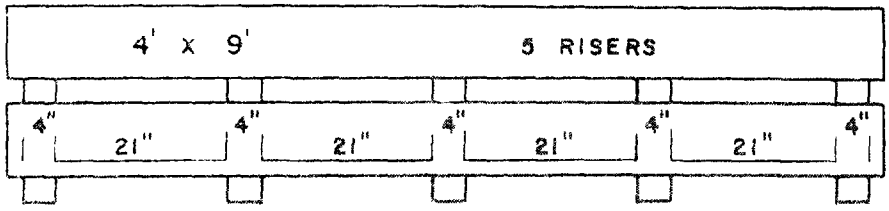


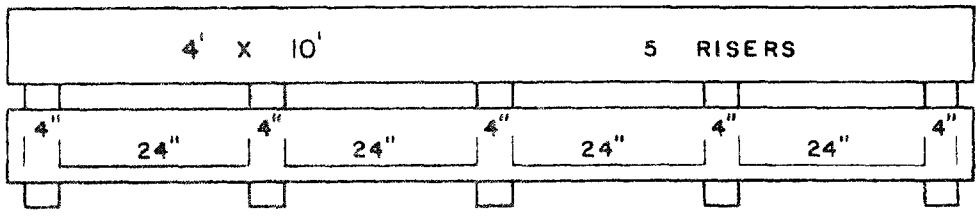


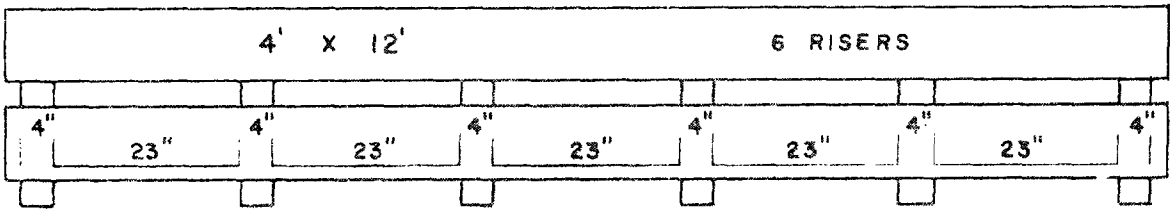


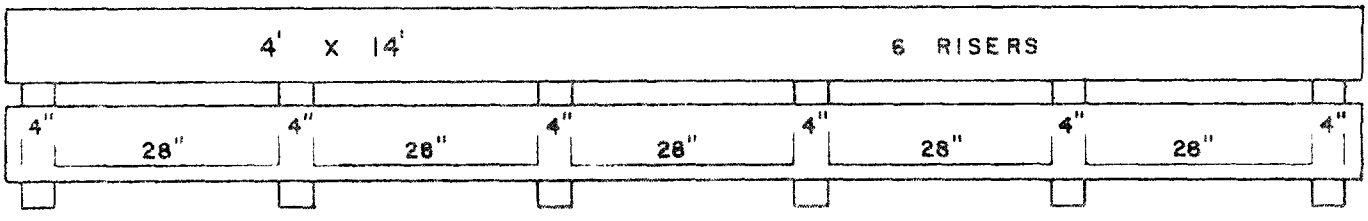
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DIAGRAM NO. 2 (CONTINUED)

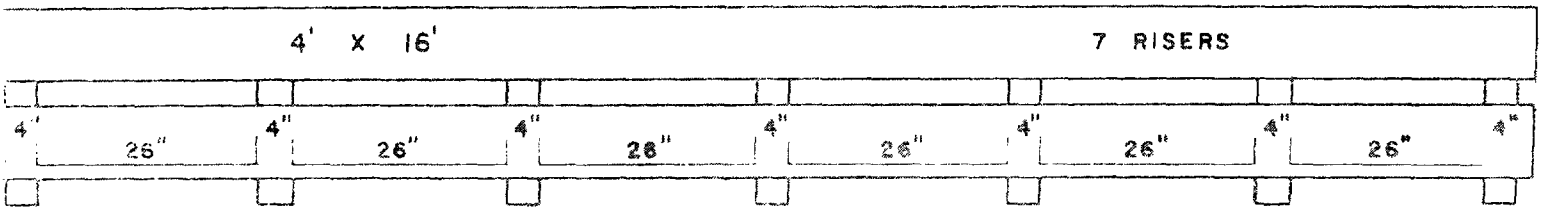








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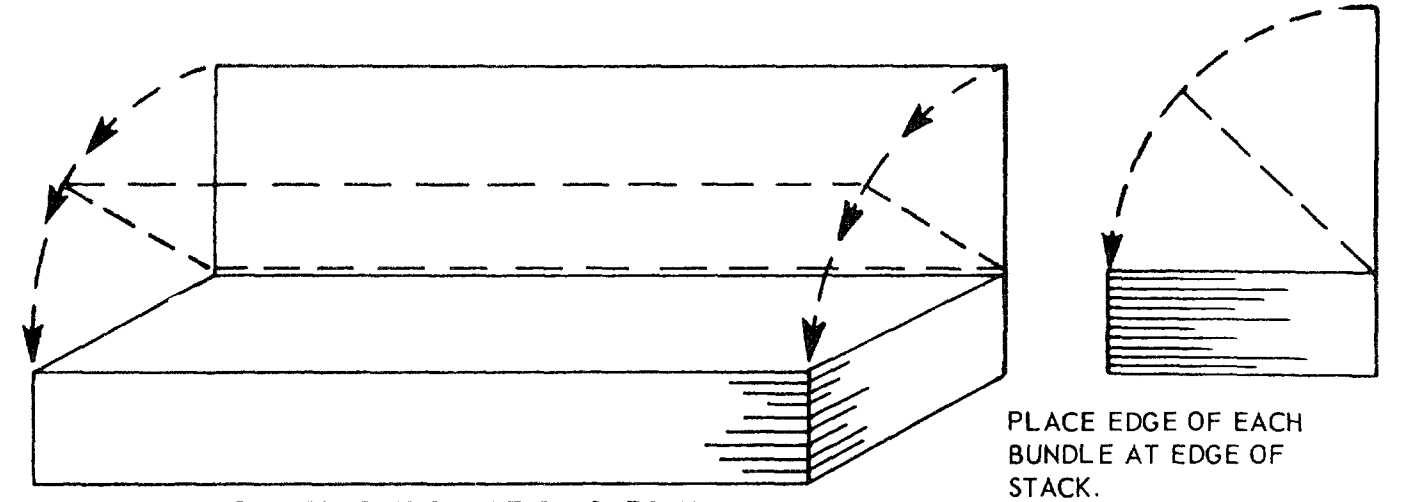


NOTE: 1) THE NUMBER OF RISERS RECOMMENDED APPLIES TO ALL THICKNESSES OF BOARD OF THAT SPECIFIC LENGTH.

2) MINOR ALTERATIONS IN LOCATION OF RISERS MAY BE REQUIRED TO ADAPT TO DIFFERENT FORK SPACING.

DIAGRAM NO. 3

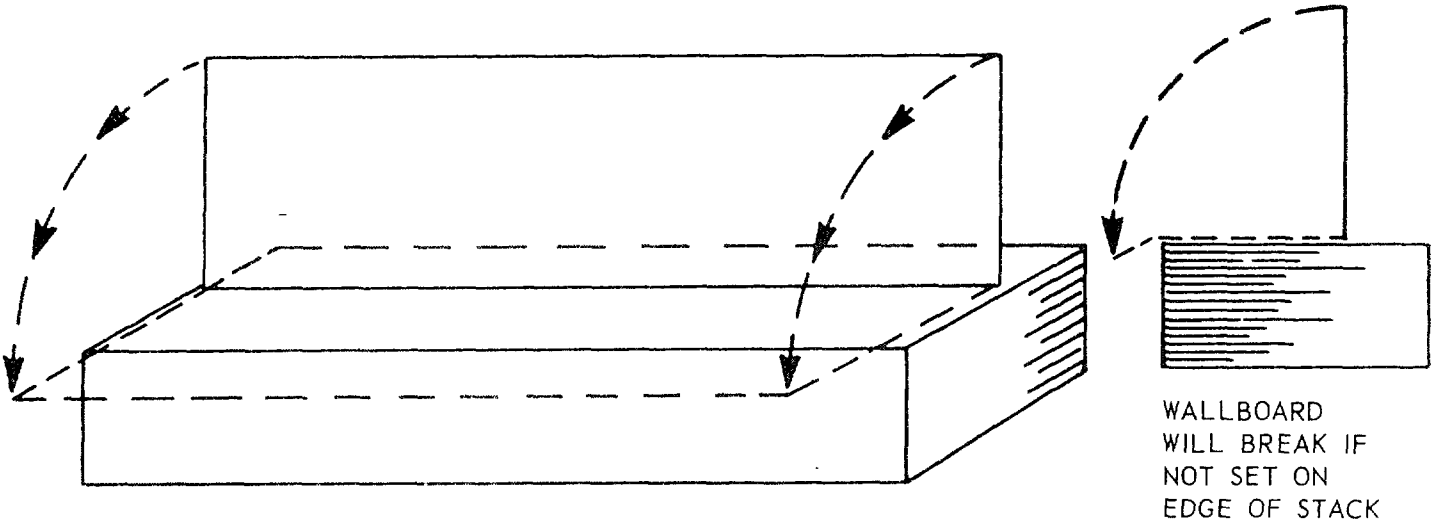
RECOMMENDED STACKING OF GYPSUM WALLBOARD
(MANUAL HANDLING)



PLACE EDGE OF EACH BUNDLE AT EDGE OF STACK.

CORRECT METHOD - FLAT STORAGE OF GYPSUM WALLBOARD HANDLED MANUALLY

INCORRECT - WALLBOARD WILL BREAK AT OVERHANG



WALLBOARD WILL BREAK IF NOT SET ON EDGE OF STACK

SGP 0025009

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201 N. Wells St., Chicago, Illinois 60606
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GYPSUM ASSOCIATION SPECIFICATIONS

COVERING EXISTING INTERIOR WALLS AND CEILINGS WITH GYPSUMBOARD PRODUCTS

GA-650-71

GEORGIA-PACIFIC
THE GROWTH COMPANY

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SGP 0024998

SPECIFICATIONS FOR COVERING EXISTING INTERIOR WALLS AND CEILINGS WITH GYPSUMBOARD PRODUCTS

I. Introduction

This specification is intended to provide methods for covering interior wall and ceiling surfaces which have been decorated with lead-based paints Prior to World War II lead-based paints were commonly used for interior decoration

The purpose of covering these surfaces is to minimize the potential lead poisoning hazard to children who eat paint from wood trim, such as window sills, and paint peeling from walls and ceilings

In addition to walls and ceilings, all lead-based paint on the following surfaces shall be removed or made inaccessible

a All trim and moldings including base shoe, base, casings, chair rail, wainscot, doors, door jambs, window sills, sash and trim

b All kitchen cabinets, pantry cabinets and shelving, fireplaces, sinks and bathtubs.

c All electrical cable, conduit, fixtures, wall plates, receptacles and switches

d All exposed gas and water piping

e Any other surfaces, such as floors

If the paint on the above cannot be removed or covered, then these items shall be removed

II. Covering Lead-Base Painted Surfaces.

Section II describes two methods of covering wall and ceiling surfaces, i.e., (1) direct attachment, and (2) furring attachment. Suspended ceiling systems are described in Section III

Characteristics, properties or performance of materials or systems herein described are based on data obtained under controlled test conditions The Gypsum Association makes no warranties or other representations as to their characteristics, properties or performance under any variation from such conditions in actual construction Test condition details will be furnished by the Gypsum Association on request

A. Material.

Any of the following gypsumboard products, with appropriate accessories, may be used for accomplishing the work described in this specification:

Board Type	Finish
1. Regular tapered edge or special bead resistant edge.	Joints taped and finished.
2. Regular bevel edged or square edged.	Edges butted and painted or covered with battens and painted. (Board applied vertically)
3. Predecorated bevel edged or square edged.	Edges butted or edges butted and covered with matching or contrasting batten. (Board applied vertically)
4 Veneer plaster base.	Edges butted and finished with tape and gypsum veneer plaster.
5. Water resistant gypsum backing board.	Edges and corners butted and treated to provide a water resistant base for wall tile in wet areas
6. Gypsum lay-in ceiling panels	Solid (plain or predecorated)

1/4" thick gypsumboard is recommended only for direct application where the base wall is sound, without holes or void spaces, and is flat and level

3/8" thick gypsumboard requires support not exceeding 16" o.c.

1/2" or 5/8" thick gypsumboard requires support not exceeding 24" o c.

B. Preparation for Application — Direct Attachment.

1. When gypsumboard products are applied directly over existing walls, all loose plaster and wallpaper shall be removed. When wall surfaces are extremely uneven or unsound, it may be necessary to remove entire wall surfaces.

2 Void areas, resulting from removal of loose plaster, shall be shimmed with material of the same thickness as the plaster in order to provide uniform backing support to the gypsumboard. *See Figure 1.*

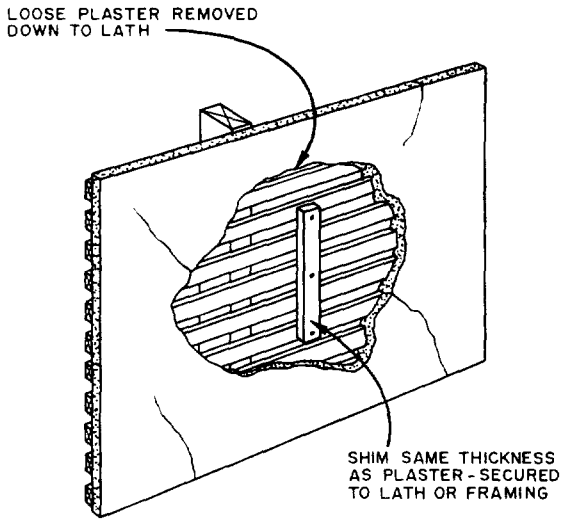


Figure 1 — Treatment of Large Voids in Plaster.

Note: To maintain fire resistive characteristics of walls between adjacent living units or public corridors, void areas shall be treated as follows:

(1) When 3/8" thick gypsumboard is being used, voids not exceeding 16" shall be filled with plaster or other suitable noncombustible material.

(2) When voids exceed 16", 1/2" or 5/8" gypsumboard shall be used and shimmed as illustrated.

3 Minimum width of wood shims shall be 1-1/2". Minimum width of gypsumboard shims shall be 2". Care must be taken to make the strips equal in thickness to the surrounding plaster. Shims shall be applied to the exposed framing or wood lath with nails or screws spaced no more than 6" on center *See Figure 1.*

4 Shims may also be secured to wood lath or masonry with adhesives or masonry nails. If the base is gypsum lath or metal lath, toggle bolts or other approved fasteners can be used

C. Direct Attachment of Gypsumboard Products to Existing Walls and Ceilings.

Gypsumboard products used over the existing wall and ceiling surfaces shall be applied with mechanical fasteners, such as nails or screws into framing, or with adhesives in combination with nails or screws. *See Figure 2.*

1 Attachment by Nailing or Screws

Gypsum wallboard may be attached directly over sound wall and ceiling surfaces by nailing or power driven screw application. Framing members must be sound, rigid and aligned, and shall not exceed 16" o.c. for 3/8" thick board or 24" o.c. for 1/2" and 5/8" board. Drywall nails shall be of sufficient length to penetrate into framing 7/8" plus the thickness of the wallboard and plaster or shims. Power driven drywall screws must penetrate into framing at least 5/8". Fastener spacing shall be 8" o.c. maximum for walls and 7" o.c. maximum for ceilings and not less than 3/8" from board edges and ends.

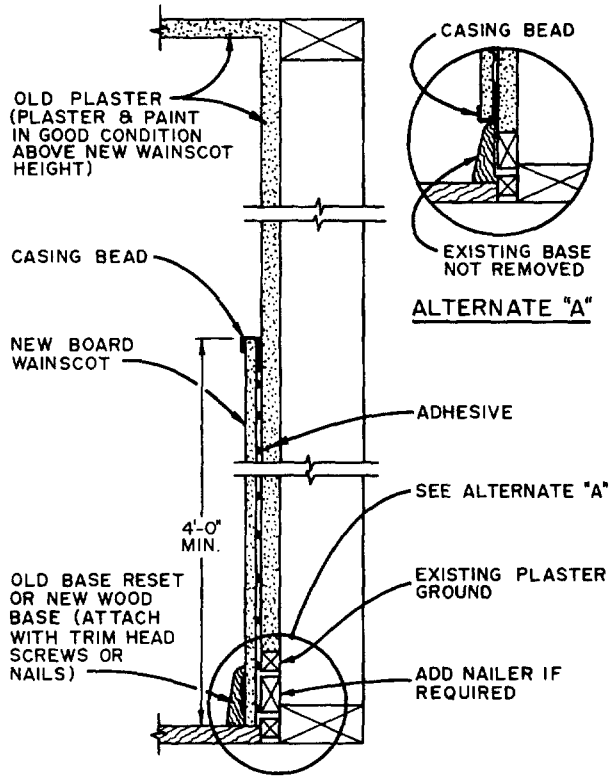


Figure 2 — Wainscot Detail, Direct Attachment Only.

Note: For furred attachment apply new gypsumboard to full wall height.

2 Attachment Using Adhesives

a Testing for strength

When an adhesive is to be used, a test should be made to insure that bond to the wall surface will be adequate. Loose paint or wallpaper must be removed from the plaster so that the adhesive can be applied directly to a sound surface. Apply a single 3/8" by 3" long bead of drywall adhesive to an 8" square sample of gypsum wallboard and press the sample to the wall. Repeat this in several widely separated areas.

Allow sufficient setting time, according to the manufacturer's directions. Adhesive bond is tested by pulling the sample away from the wall. Bond is adequate if the gypsum wallboard paper surface is torn from the wallboard sample

b. Application.

When it has been determined that bond strength is adequate, wallboard application can proceed as follows:

Board Product	Adhesive Nail-On Application	Modified Contact Adhesive Application
Regular tapered edge or special bead resistant edge	**R-1**	**R-1**
Water resistant gypsum backing board	**R-1**	**3**
Prefinished (vinyl faced)*	**R-2**	**3**
Prefinished (paper faced)*	**R-2**	**R-2**

KEY:

R — 3/8" diameter drywall adhesive beads maximum 16" o.c. applied to back face of boards.

1 — Fasteners maximum 24" o.c. throughout (Type G or Type S drywall screws).

2 — Fasteners maximum 16" o.c. top and bottom edge (Type G or Type S drywall screws or nails to plates).

3 — Not recommended.

*** — Intended for walls only, but can be applied to ceilings, if desired.**

NOTE:

(a) Nails shall penetrate framing 7/8" minimum. Screws shall penetrate framing 5/8" minimum.

(b) Firm contact shall be maintained with fasteners, braces, or temporary fasteners until the adhesive sets. Wallboard edges are to be snugly butted and squarely aligned.

D. Furring Attachment of Gypsumboard Products Over Existing Walls and Ceilings

When walls and ceilings are not acceptable for direct application as described in II C, the use of furring is recommended

1 Trim need not be removed if it is not covered with lead-based paint, or if the walls are to be furred so that trim would be covered by the new surface finishing materials

2 Where furring strips cannot be pulled tight against the surface, because of bulging plaster, remove the bulges so the furring is level across the wall or ceiling

3 The minimum width of the face of the wood furring to which gypsumboard is attached shall be 1-1/2".

4 The minimum thickness of wood furring attached over other than solid surfaces shall be 1-1/2".

5 Steel furring channels are available and may be used if desired.

6 The use of furring strips or channels can eliminate the need for removal of painted woodwork. Wood trim can be utilized as nailer strips along floor and door and window openings Furring strips are fastened horizontally to base framing 16" or 24" o c. with drywall screws or common nails Furring fasteners must be long enough to penetrate into the framing members a minimum of 3/4" Use two nails at each framing intersection for wood furring. Screws through steel furring channels shall be applied alternately from top to bottom through flanges at each framing member intersection. Stop furring 6 inches short of any trim member. If trim and furring are not equally thick, shims can be used to level out differences Decorative moldings around doors and windows that project beyond face of the trim should be removed or cut back

7 Gypsumboard can be applied using adhesives when installed over wood furring. Apply 3/8" diameter beads full length on each furring strip. Supplemental fastening is required Adhesives are not recommended for installations over metal furring channels

8 Nail, screw and steel furring channel standards are listed in Section IV — References.

E. Corner and Edge Treatment.

1 Exterior Corners — When installations are treated with tape and joint compound, 1-1/8" by 1-1/8" steel corner beads shall be attached by nailing or by crimping the flanges into the gypsumboard at intervals not exceeding 12" Paper backed metal corner beads may be used with the paper flanges bedded in joint compound Predecorated wallboard joints should be covered with an appropriate wood batten or other suitable molding

2 Interior Corners — Interior corners may be finished with tape and joint compound or wood moldings. Moldings may be used for predecorated or bevel edged boards

3 Trim Edges — If gypsumboard edges are exposed around door and window openings, edges should be trimmed with a suitable drywall casing bead or wood molding to hide the cut edges Nail the

casing or molding into framing or abutting wood base or trim. Trim, routed out along the back edge to fit boards, may be used over plain or predecorated wallboard. If intersection gaps are 3/16" or less, a permanent type of resilient caulking compound can be used as filler. *See Figure 3*

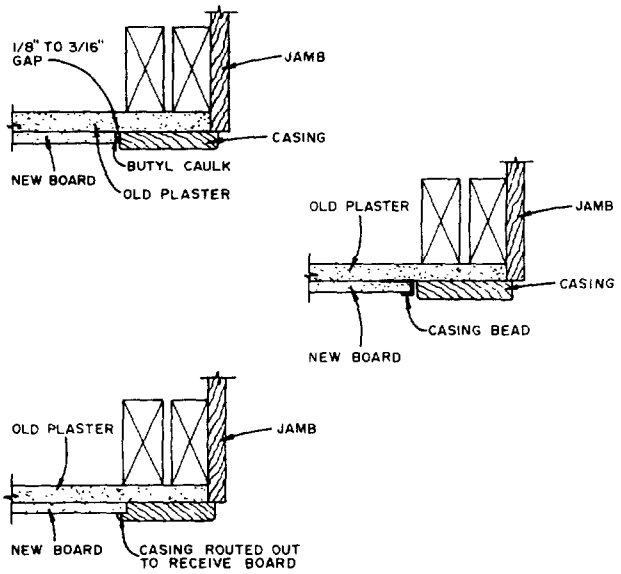


Figure 3 — Door Framing Details — Direct Lamination.

4 When trim is not removed, and is used instead as a nailing surface, the wall may be finished as shown in *Figures 4, 5 and 6*

III. Suspended Ceilings.

Older dwellings often have high ceilings, ten feet or more. If ceilings are high, and in poor condition, it can be advantageous to use a suspended system which will permit covering the old ceiling without removal of ceiling material. The suspension system can be planned so that the new ceiling is 7-1/2 to 8 feet high. Aside from avoiding the mess of tearing down an old ceiling, the decreased height can result in other advantages, such as reduced heating-costs and reduced sound transmission between floors. Four suspended ceiling systems are described.

A. Suspended Wood Furring

Suspend 2" x 4" wood furring members by hanger wire attached to the ceiling joists. Gypsum wallboard panels are applied across the 2 x 4's and attached with drywall screws spaced at 12" maximum.

B. Suspended Metal Channels

Suspend 1-1/2" carrying channels from hanger wires attached to screw eyes fastened into the sides of framing members. Steel screw furring channels are clipped or wire-tied to the 1-1/2" carrying channels on 16" or 24" centers. Gypsumboard is attached with 1" type S drywall screws at 12" maximum spacing.

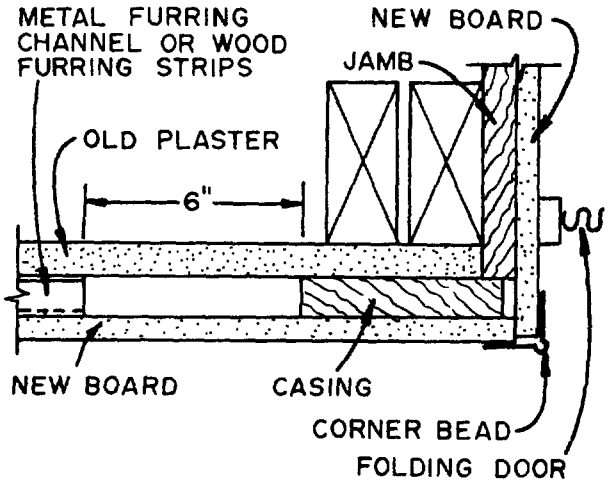


Figure 4 — Door Framing Detail with Corner Bead.

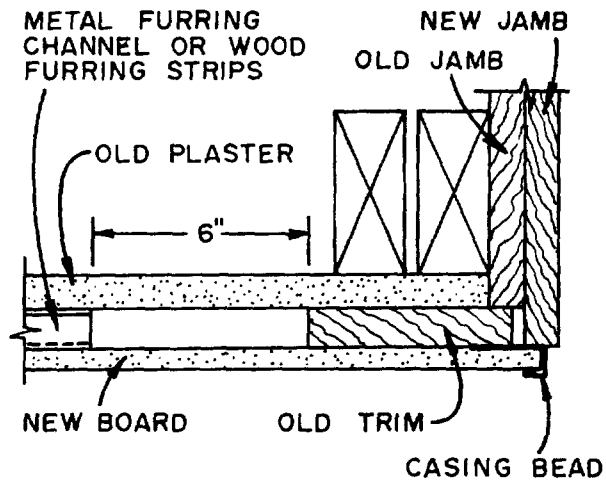


Figure 5 — Door Framing Detail with Casing Bead.

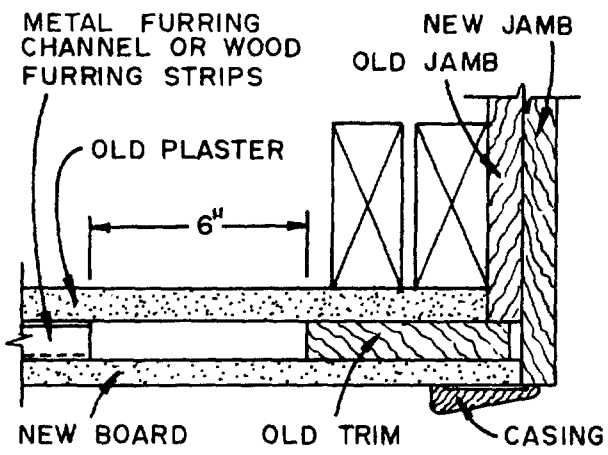


Figure 6 — Door Framing Detail with New Casing.

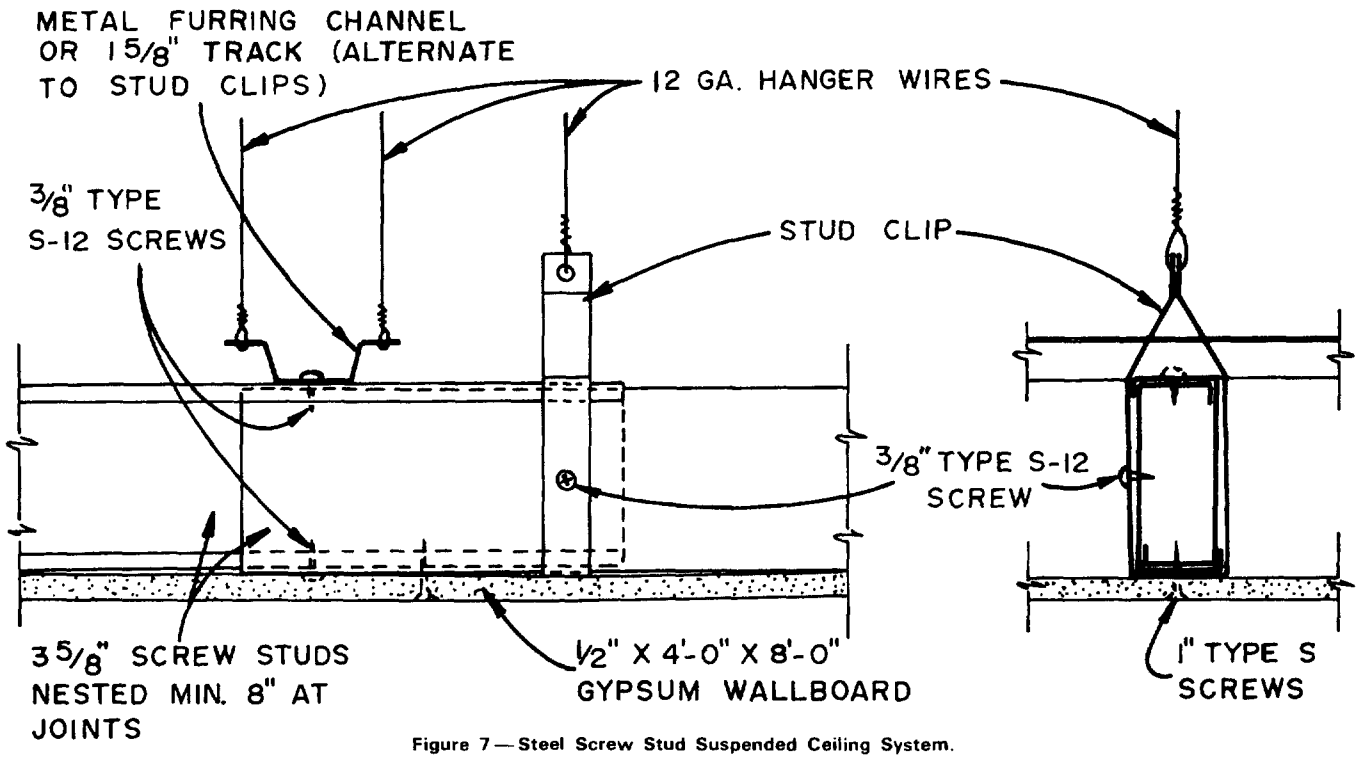


Figure 7 — Steel Screw Stud Suspended Ceiling System.

C. Suspended Steel Screw Studs

Suspend steel screw studs on 16" or 24" centers using stud clips suspended from hanger wires. Alternately the screw studs may be attached to 1-1/2" steel screw furring channels suspended by hanger wires attached to ceiling framing. For details *see Figure 7.*

D. Suspended Gypsumboard Grid Ceiling System

Lay-in panels in 24" square or 24" by 48" sizes are supported in a grid system suspended from the supporting framing by hanger wires. Lay-in panels are non perforated to prevent paint on old ceilings from falling through. Detailed installation instructions are normally available from the material supplier, manufacturer, or described in ASTM Standard C 636. Common to all the ceiling covering methods is the necessity to arrange for adjustment of ceiling electrical fixtures and heating or ventilating ducts, if present. Relocation or adjustment work should be accomplished prior to ceiling installation.

IV. References

1 American National Standard Institute Standard Specifications ANSI A97.1 for "The Application and Finishing of Wallboard"

2 American Society for Testing and Materials ASTM Designation C 636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels"

3 American Society for Testing and Materials ASTM Designation C 514, "Specifications for Nails for the Application of Gypsum Wallboard"

4 American Society for Testing and Materials ASTM Designation C 645, "Nonload-Bearing Steel Studs for Screw Application of Gypsum Wallboard, Runners and Rigid Furring Channels"

5 American Society for Testing and Materials ASTM Designation C 646, "Specifications for Steel Drill Screws for the Application of Gypsum Sheet Material to Light-Gage Steel Studs"

6. Gypsum Association Specifications, "Application of Gypsum Base for Gypsum Veneer Plasters and Application of Gypsum Veneer Plaster"

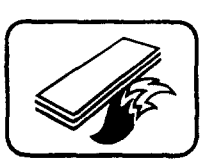
7 Gypsum Association Manual "Using Gypsumboard for Walls and Ceilings"

8 "Lead-Based Paint Poisoning Prevention Act" Public Law 91-695, 91st Congress, H.R. 19172, January 13, 1971

NOTES

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