

GYPSUM ASSOCIATION

201 North Wells Street

Chicago 6, Illinois

GYPSUM SHEATHING

RECOMMENDATIONS FOR NAILING AND STAPLING

Description of Fastener	Spacing
Nails — 11 gage, galvanized, 3/8" to 7/16" head, roofing nails, 1-1/2" long.	(A) Where wood siding or diagonal bracing is used, nails shall be spaced not to exceed 8". (B) Where wood siding or diagonal bracing is not used, nail spacing shall be 4". (C) Nails shall be spaced 3/8" from ends or edges.
Staples — Minimum recommended staple: 16 U.S. Standard gage flattened galvanized wire, 7/16" wide crown (outside measure), 1-1/2" long legs with divergent points.	(A) Spacing of Staples. a. In constructions where diagonal bracing is used, staples shall be spaced not to exceed 6" on centers (not less than 5 staples per 24" width of sheathing). b. In constructions where supplementary nailing is provided by the exterior finish, and where diagonal bracing is not used, staples shall be spaced not to exceed 4" on center (not less than 7 staples per 24" of sheathing). (B) Staples shall be driven with the crown paralleled to the long dimension of the framing member (at right angles to the paper bound edge of the sheathing), in such a manner that the crown bears tightly against the sheathing but does not cut into the face paper. The legs of the staples shall be no less than 3/8" from the ends and edges of the sheathing. SGP 0027287

PLAINTIFF'S
EXHIBIT

GP-645 JJ

May, 1959

AIA ILL NUMBER 17-U-3

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2-PLY wallboard application

2-PLY GYPSUM WALLBOARD is the ultimate in dry-wall construction. It is a modern, up-to-date way to have truly beautiful interiors, because joints between panels are effectively concealed. It is rugged and enduring because two sheets of gypsum wallboard are laminated together, each reinforcing the other. . . . Consider the principle of ply construction that has been proved by the six-ply automobile tire, the laminated tennis racket frame, shatterproof glass and scores of other products where the "ply" principle of construction is employed. These products take on new characteristics above and beyond the sum of the plies. . . . This is also true of 2-PLY GYPSUM WALLBOARD. When two sheets of gypsum wallboard are laminated, the resistance to bending or impact is more than twice that of a single ply.



Gypsum Association

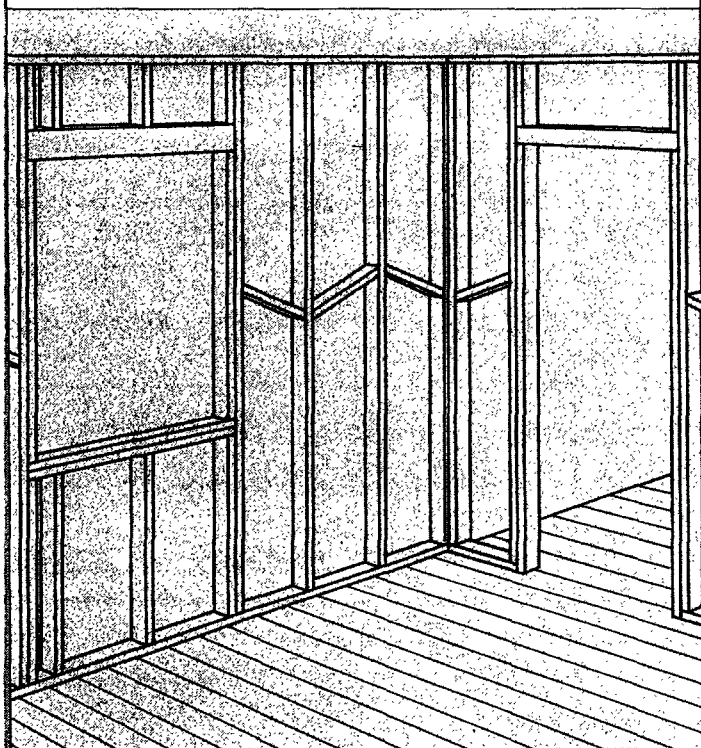
SGP 0027265

Framing:

The use of 2-PLY GYPSUM WALLBOARD does not require special framing. Headers at horizontal joints are unnecessary and only the usual provisions for corner nailing are required. Gypsum 2-Ply Wallboard is intended for use on building frames that comply with conventional standards and does not require premium framing materials or unusual workmanship. However, good walls and ceilings, regardless of the surfacing material, depend upon a good frame for lasting beauty. Flimsy constructions are inappropriate because they contribute to high maintenance and a short life for the buildings they support.

Good framing, its design and workmanship, should comply with the following recognized standards:

American Lumber Standards,
National Lumber Manufacturers Ass'n.
Minimum Property Requirements,
Federal Housing Administration
Technique of House Nailing,
Housing and Home Finance Agency



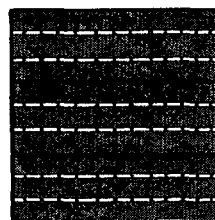
Layout Patterns:

To obtain the maximum that GYPSUM 2-PLY WALLBOARD offers, the following general principles are essential.

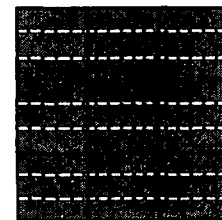
The finish panel should be applied at right angles to the direction of the first panel. Cross lamination gives maximum strength.

Gypsum wallboard is manufactured in a 4 ft. width and lengths up to 12 ft. Use the longest length the job will accommodate, particularly on the finish layer, to reduce end joints to a minimum, thereby reducing the amount of joint treatment.

The suggested layouts for the arrangement of first and second layers are suggested below.



1ST PLY



2ND PLY

Ceiling with neither dimension more than 12 ft.

The first layer is applied parallel to the joists to the full room dimension

The second layer is cross laminated to the first.

Note: That both layers extend from wall to wall without end joints.

LEGEND: Broken white lines indicate framing members. Broken black lines indicate the underlying ply. Solid black lines indicate the exposed ply.

Cutting and Scoring

Gypsum wallboard should be cut to measure by scoring rather than sawing because scoring is faster and more accurate. With the finish surface up, place a straight edge along the line to be cut, and with a sharp knife cut the surface paper only. Exception: In making circular cuts use a fine tooth key hole saw.

Breaking the core

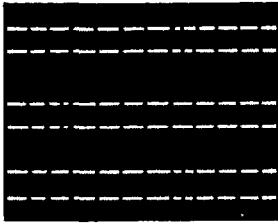
Slide the board along the pile until the score mark is over the end of the pile of boards. This gives a firm support under the score mark. Press down on the extending end of the board and the gypsum core will snap off straight and clean.

Cutting back paper

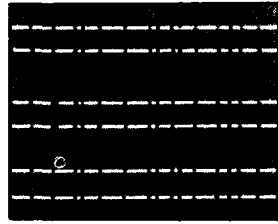
With the cut end extending downward, cut the back paper along the line of the break. By lifting the extended portion upward, the cut is complete. With coarse sandpaper smooth the cut edge and remove any loose paper. This minor precaution makes for snug fitting joints with ample nailing surface.

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CEILINGS



1ST PLY



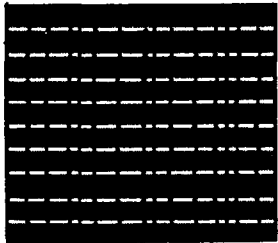
2ND PLY

Ceilings with one dimension 12 ft. or less

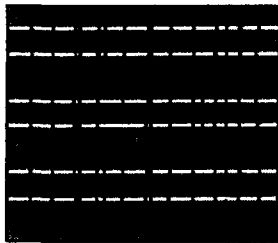
The first layer is parallel to the joists with as few end joints as possible.

The finish layer is cross laminated and extends from wall to wall without end joints.

Note: If the direction of the joists is reversed the same layout should be used. The end joints of the first layer then will be parallel to the joists, and in that event the end joint of this first layer should fall between joists, not over the joist.



1ST PLY



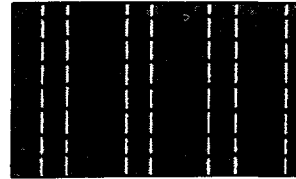
2ND PLY

Ceilings with both dimensions greater than 12 ft.

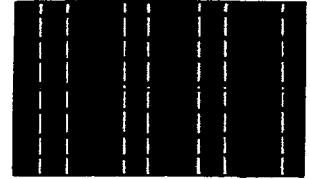
The first layer is erected across the joists with end joints falling between joist spaces. The second layer is cross laminated so that the edge falls under the joist. Use large size panels to reduce end joints. End joints should always be staggered.

Note: If the joist direction is reversed the same layout may be used. In that event the longitudinal edges of the first layer will be parallel to the joists. The longitudinal edges however, of the first layer should fall between joist spaces.

SIDEWALLS



1ST PLY

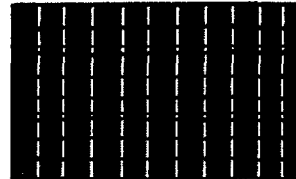


2ND PLY

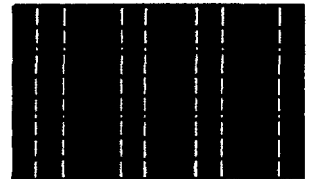
Height not over 8 ft. 3 in.

The first layer is erected vertically. The second layer is applied horizontally. If the wall is 12 ft. or less in length large size panels should be used to avoid all end joints.

If the wall length exceeds 12 ft. the end joints should fall between stud spacing and not over the stud.



1ST PLY

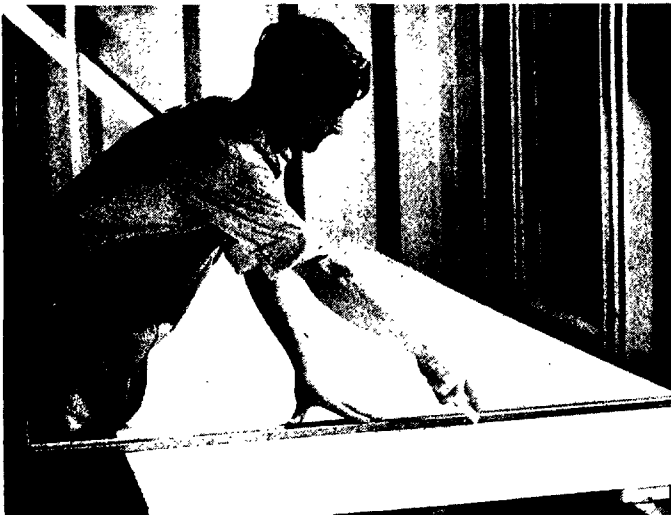


2ND PLY

Height over 8 ft. 3 in.

Vertical application of the second layer usually requires less joint treatment than when applied horizontally. Therefore, the first layer is erected horizontally with end joints (staggered) occurring in the stud space rather than on the stud.

If however, horizontal application is preferred for the second layer the same procedure as described for the walls less than 8 ft. 3 in. high should be observed. It should be noted that horizontal application on 12 ft. or less in length, even though unusually high, will result in less joint treatment.



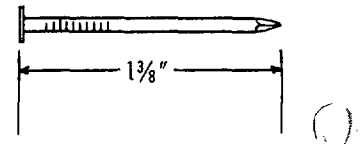
Application:

First select the pattern layout that will require the minimum of joint treatment of the second ply. The use of large panels usually reduces the amount of joint treatment. Early planning saves time and labor, assures maximum strength with minimum waste.

Start with the ceiling. Cut the board to size so it fits without forcing. Use 13 gauge, cooler-type, uncoated nails $1\frac{3}{8}$ " long, spacing them 6" on centers along the joists. Start nailing near center of board working outward toward the edges. This lays the board down flat against the framing without warping or buckling.

Nailing at edges should be at least $\frac{3}{8}$ " from the outer edge of the board. It is extremely important that the board be held tightly against the framing while

FIRST PLY



nailing. The nail cannot be expected to draw the board up tightly, so with the left hand, press the board hard against the framing while nails are being driven. The last hammer blow should set the nail flush with the surface without breaking the paper.

Having completed the first ply application to the ceiling start the side walls at one corner. Use the same technique and size of nails as described for ceilings except that the spacing of nails may be eight inches or less on centers. Dimpling is unnecessary, but nails should firmly hold the board against the framing with heads driven flush with the surface of the paper. Again, press the board tightly against the framing while driving nails.

SECOND PLY

Adhesive

The second ply of gypsum wallboard is laminated to the first with the same cement that is used for joint treatment because of its strong adhesive qualities. *Use only the joint cement or adhesive recommended by the gypsum wallboard manufacturer.*

To the back side of the second ply of gypsum wallboard, spread the adhesive with a notched trowel in an irregular pattern to an even distribution. The adhesive should extend to the extreme edges of the board. The trowel notches should be approximately $\frac{1}{4}$ " x $\frac{1}{4}$ " spaced not more than 2" on centers.

Erection

As soon as the adhesive has been applied to the back side, the second ply should be erected into place



Using a clean metal container, mix the adhesive according to the printed directions on the package. Always clean tools and mixing pails between batches. Do not retemper.

without delay, starting first with the ceiling and finishing with the side walls. If the side walls are applied horizontally the top course should be applied first, the lower course last.

The second ply should be pressed tightly against the first, but no attempt should be made to completely level out the ridges of the adhesive with undue pressure. Continuous and intimate contact between the two plies is unnecessary. At this point nailing is un-



SGP 0027268



necessary except as an expedient to hold the board in place until the cement sets or hardens—usually 24 hours. The following methods are recommended.

NAILING

Using the same nails as employed in the first ply, $1\frac{3}{8}$ " cooler type nail, secure the second ply by spacing nails approximately 12" on centers on ceilings, and approximately 16" on centers on side walls. After the adhesive has set hard, nails may be treated by one of the following methods:

At least 24 hours after the second ply has been erected drive the nails with a crown-headed hammer so the head rests slightly below the surface of the paper without breaking. This is called "dimpling," and the nail heads are subsequently concealed during the joint treatment operation.

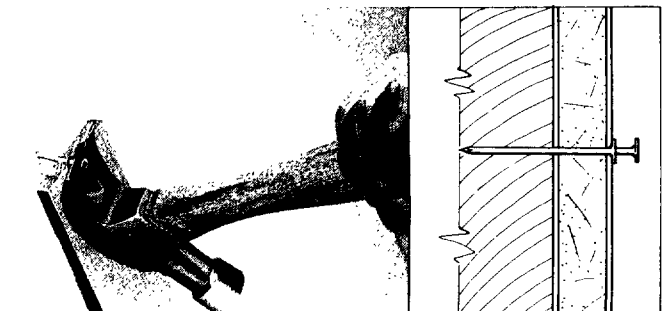
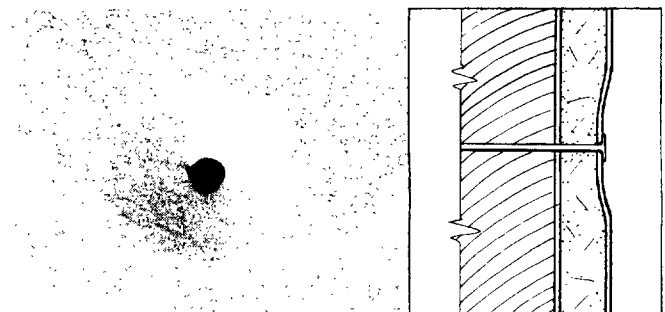
Instead of dimpling, the nails may be counter-sunk about $\frac{3}{8}$ " and the nail holes later filled and concealed when the joints are treated. This procedure minimizes the possibility of nail spots on exterior walls.

Temporary Nailing

Instead of the $1\frac{3}{8}$ " wallboard nail, double-headed or scaffolding nails may be used to temporarily hold the second ply in position while the cement is setting, spacing them 12" on centers on ceilings and 16" on centers on side walls. After the cement has set and hardened the double headed nails are removed and the holes filled and concealed with joint cement.

Shoring

In lieu of nailing, the second ply of gypsum wallboard may be held in position simply by shoring with props and headers to insure adequate pressure for proper bonding. The shore should be held in place until the cement has hardened.



Joint concealment

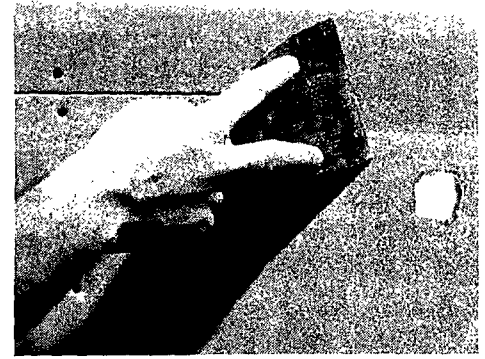
Gypsum wallboard, with its recessed edges and reinforcing tape and joint cement, provides a method for producing a smooth expanse of wall with concealed joints that is exclusive with gypsum wallboard. With this system it is easy to have smooth, beautiful walls by following this time-tested application sequence carefully.

Materials should be genuine gypsum wallboard with reinforcement and joint cement especially prepared for the purpose, as recommended by the wallboard manufacturer. Both are made to exacting and rigid requirements. Substitutes for any part of the system should be avoided. See "Application of Second Ply" for mixing directions.

First Coat Application

Using a broad knife, spread the cement into the channel formed by the recessed edges of adjoining boards, completely covering the channel to a thickness of about $\frac{1}{16}$ ".

Apply reinforcing tape to the full length of the wall, centering it over the joint. Use moderate pressure on the broad knife to embed tape in cement. A thin coating of adhesive then will separate the tape from the wallboard. The joint is wiped clean with the broad knife and the excess cement removed. It should be noted that the joint is slightly concave. Vertical joints are treated in the same manner.



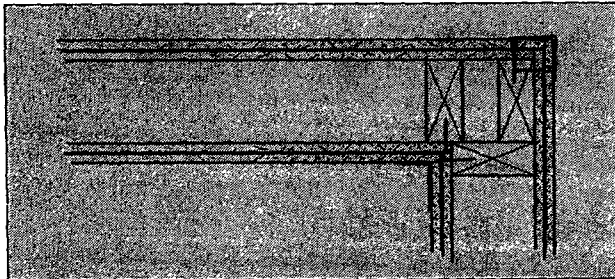
Second Coat Application

After the first coat has had sufficient time for drying, preferably 24 hours, a second coat of cement is applied to a width of approximately twice the width of the broad knife. This coat completely conceals the recess. Leave the surface as smooth as possible avoiding broad knife marks in the cement. Edges are feathered-out smooth. Give ample time for the drying, at least 24 hours, and longer if possible. If necessary, rough spots should be smoothed with fine sandpaper.

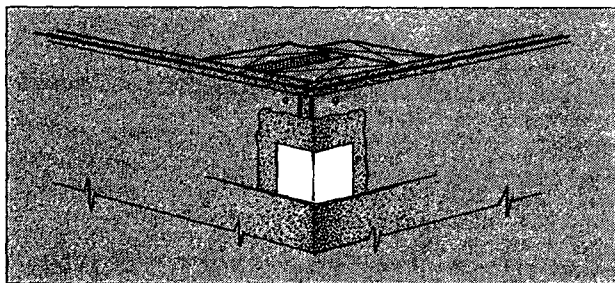
Third Coat Application

After the second coat has thoroughly dried and just before the trim is to

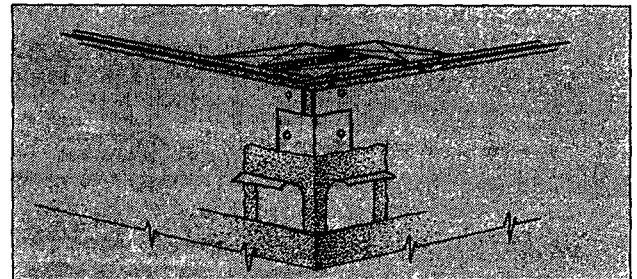
CONSTRUCTION DETAILS



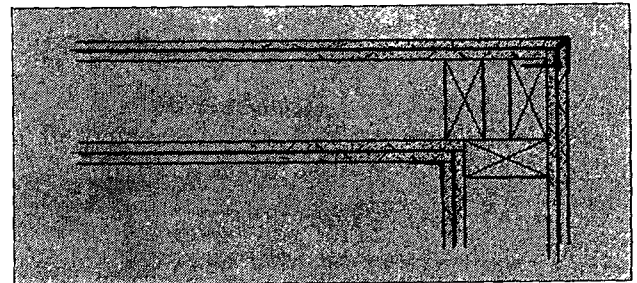
Reinforced Angles—Apply joint cement at the angle, extending about $1\frac{1}{2}$ " on adjacent walls. Fold the reinforcing tape down the middle and gently press the folded tape into position. With a broad knife embed the tape snugly into the cement to a true and straight line. Remove the excess cement and feather out edges. Apply second and third coats of cement as described under joint treatment.



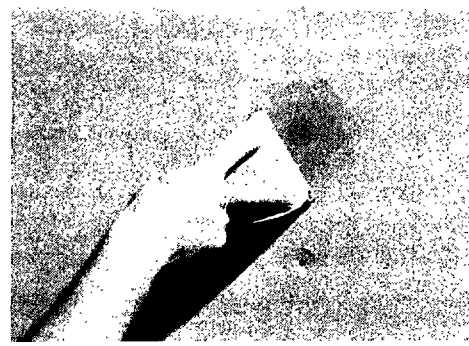
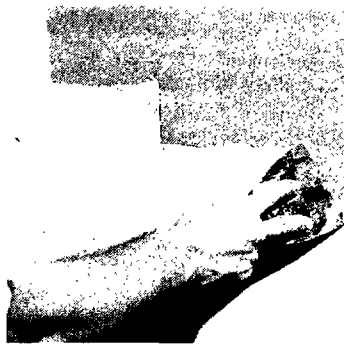
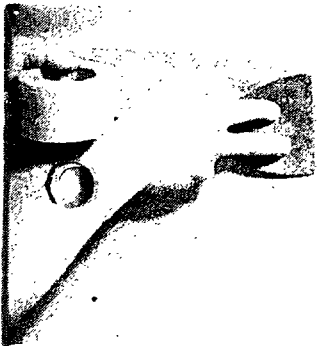
Corner Reinforcement—Angle reinforcements are available consisting, generally, of a small metal angle to which is secured a heavy fabric reinforcement. The exterior corner of the second ply of wallboard is buttered with joint cement and the approved angle reinforcement (shown diagrammatically in white) is embedded. Finish the corner with joint cement.



Metal Angle Bead—A metal corner angle is formed from a three inch strip of 26 gauge aluminum or galvanized iron by bending along the center line and folding to slightly less than a 90° angle so that it fits snugly on the corner. It is secured in position by nailing both wings at 8" intervals. Apply cement and reinforcing tape over both wings as shown. Finish with second and third coats of joint cement and sand the corner to slightly expose the metal.



Metal Corner Bead—After the first ply of gypsum wallboard has been applied, a pressed metal angle bead, as shown, is nailed at 8" intervals to framing. Care must be exercised in positioning the bead because the outer edge determines and forms the corner. The second ply of wallboard is fitted closely and the joint filled with adhesive. Finish the corner with tape and cement.



be installed a third very thin finishing coat is applied with the broad knife. The purpose of this coat is to fill in any irregularities or imperfections in the second coat. It covers an area 2 to 4 inches wider than the second coat and is feathered out neatly on the wallboard surface. The third coat should be left smooth enough to require a minimum of sanding. In fact sanding of the third coat is discouraged, unless necessary to attain a perfectly smooth surface for decoration. In that event, use fine sandpaper and a minimum of hand pressure. Do not sand the wallboard surface.

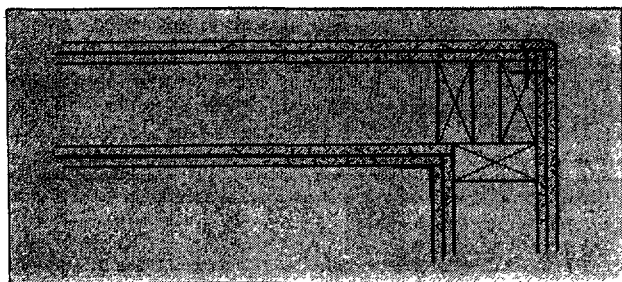
Nail Head Concealment

Having previously inspected the nailing to make certain that nail heads are dimpled below the surface, with cement on the broad knife blade com-

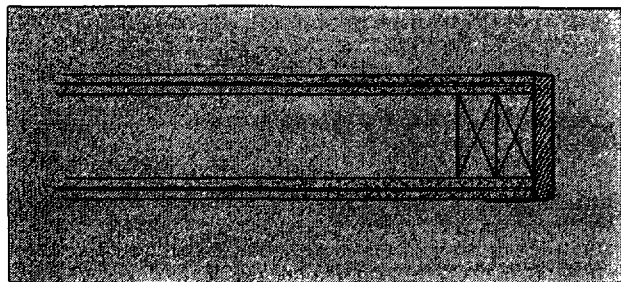
pletely fill the nail head depression. Then with the blade at about 45° draw the knife across the nail spot in the opposite direction to wipe the surface clean. This is accomplished very quickly with two fast hand movements.

After the spots are dry, a second coat of nail concealment is applied in the same manner as the first. With this coat, however, considerably less cement is used. Similarly a third coat should be given to the nail spots, using a small amount of cement to fill in any irregularities or depressions for a true even surface.

Sanding of the successive coats of nail concealment should be unnecessary and is not recommended because a free easy motion of the broad knife over the nail heads automatically feathers the cement at the edges and leaves a texture in the cement that resembles the wallboard surface.



Wooden Molding—The second ply of one face is held back from the corner and the space filled with a rounded molding held in position by cementing. Nail the molding to the framing. Apply cement and embed reinforcing tape. Smooth out with a broad knife and remove excess cement. Follow with second and third coats as described for joint treatment. The wood molding should be small enough to permit a 1/2" lap of the reinforcing tape over the wallboard. If larger moldings are used two ribbons of reinforcing tape may be necessary.



Untrimmed Openings—This procedure is recommended where openings are cased but left untrimmed. The facing trim should be secured to the wood framing with edges flush with the second ply of wallboard. Apply cement to the edges of the trim, extending it over the wallboard about 1 1/2". Press reinforcing tape into the cement and smooth out with a broad knife. Remove excess cement and feather out edges. Apply second and third coats of joint cement.

Electrical Outlets—Wall and ceiling finishes should be kept in intimate and continual contact with the nailing surface of the framing. The support for electrical boxes, outlets and all conduits, heating ducts, pipes, etc. must be recessed into the framing and kept back of the general plane of the nailing surface.

Curved Surfaces—By simply bending gypsum wallboard it will conform to moderately curved surfaces. For surfaces of greater curvature such as the soffits of arches, etc. gypsum wallboard is quickly made to conform by simply scoring the back paper of the board at intervals and breaking the core beneath each cut. Nail the board to the curved contour and treat the corners as elsewhere shown. If the curved corners are to be treated with reinforcing tape, the tape is first folded along its center and then snipped at intervals along one side. The snipped edges are applied to the flat side of the arch thus permitting the tape to conform to the curvature.

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SURFACE PREPARATION

FOR PAINTING

After the third coat of joint and nail concealment has been applied and sanded where necessary, first apply a coat of good primer-sealer. A lime locking cold water primer or a pigmented oil primer is recommended. For a good three coat job both are recommended and should be applied in the order mentioned, followed by the final or finished coat of paint. It is extremely important that the difference in absorption between the field of the wallboard and the joint cement be equalized to assure uniformity of

color and texture over the entire wall.

FOR WALLPAPER

For the application of wallpaper the use of a primer-sealer is advisable so that the wallpaper may be readily removed for subsequent redecoration. Wallpaper should never be applied to gypsum wallboard without priming the surface and varnish is recommended for the purpose, thinned to the manufacturer's recommendations. After drying, wallpaper is applied directly to the varnish size.

GYPSON 2-PLY WALLBOARD

Specifications

SCOPE:

All interior wall and ceiling areas shall be finished with two layers of $\frac{3}{8}$ " Gypsum Wallboard. The Gypsum Wallboard shall be laminated on the job in accordance with the following information. NOTE: Double layer is optional in closets; not considered necessary except on closet walls dividing occupancies.

MATERIALS:

(1) $\frac{3}{8}$ " Recessed Edge Gypsum Wallboard. (2) Adhesive Reinforcing Tape and Joint Cement as approved by the Wallboard Manufacturer. (3) 4D Cooler Type Nails, $1\frac{3}{8}$ " long.

FRAMING:

Framing members shall be straight and in alignment (check alignment before proceeding with first layer). Stud and joist spacing may be 16", 20" or 24" depending on structural requirements.

ERECTION:

1. The first layer shall be $\frac{3}{8}$ " recessed edge (or square edge) Gypsum Wallboard. As far as practical, the panels shall be in lengths corresponding to ceiling heights and room widths or lengths. All joints shall be loosely butted. Joints in first and face layers (other than corners and at ceiling) shall not underlie each other, but shall overlap at least 10".

2. The face layer shall be $\frac{3}{8}$ " recessed edge Gypsum Wallboard of sufficient length, up to 12', to span wall and ceiling areas from corner to corner. All joints shall be loosely butted. Where joints occur in both the first and face layers parallel to framing members, joints in one layer or the other must fall between supports. See layout diagrams for further details. After cutting the face layer to size, adhesive shall be spread over the back surface of the Gypsum Board with a spreader blade. The spreader shall be used in a manner to produce an irregular pattern with adhesive. The face layer shall then be placed in position on wall or ceiling and temporarily held in place with sufficient nails, applied in the field and on edges of the board to insure bond between the layers.

3. Fill all nail holes and deep gouges in the face layer, as well as any wide spaces that may occur between face layer panels, with Adhesive. All joints, corners, nicks and filled areas shall then be finished with Joint System applied according to manufacturer's directions.

NAIL SPECIFICATIONS:

TYPE REQUIRED	4D COOLER TYPE NAILS
Spacing—first layer ceilings.....	5"-7" o.c.
Spacing—first layer sidewalls.....	6"-8" o.c.
Spacing—face layer ceilings.....	12" o.c.
Spacing—face layer sidewalls.....	16"-24" o.c.

CERTAIN-TEED PRODUCTS CORPORATION

Manufacturers of Quality Building Products
General Offices: Ardmore, Pennsylvania
Sales Offices in Principal Cities


Reg. U.S. Pat. Off.
A97.1-1958
UDC 691.31

STANDARD SPECIFICATIONS

for

GYPSUM WALLBOARD FINISHES

Approved as
AMERICAN STANDARD
by The American Standards Association
October 29, 1958

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A97.1-1958

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SGP 0027274

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SPECIFICATIONS FOR GYPSUM WALLBOARD FINISHES**

ASA Project A97

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ASA No. A97.1-1958: UDC 691.31

October 29, 1958

AMERICAN STANDARD SPECIFICATIONS for GYPSUM WALLBOARD FINISHES

NOTE:—These specifications are intended to describe minimum requirements for application over wood nailing members. See Appendix for general information and recommendations pertaining to related work.

1.00 GENERAL PROVISIONS

- 1.10 The work includes all labor, materials, services, equipment, scaffolding and all operations required to complete the gypsum wallboard finishes in accordance with the drawings and these specifications.
- 1.20 Scaffolding shall be constructed and maintained in strict conformity with applicable laws and ordinances, and so as to avoid interfering with the work of others.
- 1.30 The work shall be properly coordinated with the work of other trades.
- 1.40 Whenever joint treatment adhesive is being mixed or used for applying tape or for laminating one layer of board to another, the temperature in the building shall be maintained at not less than 45 degrees Fahrenheit.

2.00 DEFINITIONS

- 2.10 **Gypsum Wallboard:** Where the term "Gypsum Wallboard" is used it refers to gypsum wallboard as defined in A.S.T.M. Specification C11-58.
- 2.12 **Type "X" (Special Fire Retardant) Gypsum Wallboard:** Wallboard which provides greater fire resistance as defined in A.S.T.M. Specification C36-58.
- 2.14 **Insulating Gypsum Wallboard:** Either Regular or Type "X" Gypsum Wallboard, with foil laminated to the back surface, as defined in A.S.T.M. Specification C36-58.
- 2.20 **Edges:** Where the term "edges" is used, it refers only to the paper-bound edges, usually the long dimension of the gypsum wallboard.
- 2.30 **Ends:** Where the term "ends" is used, it refers to the mill-cut or field-cut ends. At such cuts, the gypsum core is left exposed.
- 2.40 **Nailing Members:** Where the term "nailing members" is used, it refers to those portions of the framing, furring, blocking, etc., which serve as a nailing base to receive the gypsum wallboard. Unless otherwise specified herein, the nailing surface shall be not less than 2 inch nominal width. (See also Section A1.00 of Appendix)

2.50 **Horizontal Application:** Where the term "horizontal application" is used, it refers to gypsum wallboard application where the paper-bound edges are applied at right angles to the nailing members.

2.60 **Vertical Application:** Where the term "vertical application" is used, it refers to gypsum wallboard application where the paper-bound edges are applied parallel to the nailing members.

2.70 **Treated Joints:** Where the term "treated joints" is used, it refers to joints between gypsum wallboards which are reinforced and concealed with joint treatment.

2.80 **Untreated Joints:** Where the term "untreated joints" is used, it refers to joints which are left exposed in the finished work, or which may be covered by strips or mouldings.

2.90 **Joint Treatment Adhesive:** Where the term "adhesive" is used, in conjunction with joint treatment, it refers to "joint cement, an adhesive."

3.00 MATERIALS

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

- 3.10 **Gypsum Wallboard:** A.S.T.M. Designation C36-58.
- 3.20 **Joint Treatment:** Joint reinforcing and adhesive materials shall be as recommended by the manufacturer of the gypsum wallboard.
- 3.30 **Laminating Adhesive:** Laminating adhesive material shall be as recommended by the manufacturer of the gypsum wallboard.
- 3.40 **Water:** Shall be clean, fresh and suitable for domestic consumption.
- 3.50 **Steel Nails:**
 - 3.52 **GWB-54 (Gypsum Wallboard):** Annular ringed nails complying with the requirements of A.S.T.M. Specification C380-58T.
 - 3.54 4d 14 gage, 1-3/8 in. long, 7/32 in. flat head, diamond point.
 - 5d 13-1/2 gage, 1-5/8 in. long, 15/64 in. flat head, diamond point.
 - 6d 13 gage, 1-7/8 in. long, 1/4 in. flat head, diamond point.

3.60 Nails for single layer application:

Gypsum Wallboard (Thickness)	Nails (To framing or furring of 2 in. or greater nominal thickness)	Nails (To 1 in. nominal thick furring over concrete or masonry)
1/4 in. (for application over existing surfaces)	Flat head, diamond point nail of such length as to give not less than 1 in. penetration into the nailing members.	
3/8 in. Regular or Insulating	1-1/8 in. or 1-1/4 in. GWB-54 or 4d	1-1/8 in. GWB-54 or 4d
1/2 in. Regular or Insulating	1-1/4 in. GWB-54 or 5d	1-1/4 in. GWB-54 or 4d
5/8 in. Regular or Insulating	1-3/8 in. GWB-54 or 6d	1-3/8 in. GWB-54 or 5d
1/2 in. Type "X" and Insulating Type "X"	5d	
5/8 in. Type "X" and Insulating Type "X"	6d	

3.70 Nails for Multiple Layer Installation: (See Section 5.40)

4.00 DELIVERY, HANDLING AND STORAGE

- 4.10 All materials shall be delivered in the original packages, container or bundles bearing the brand name and the name of the manufacturer or the supplier for whom the product is manufactured.
- 4.20 All materials shall be kept dry, preferably by being stored inside the building under roof. Where necessary to store gypsum wallboard outside, it shall be stacked off the ground, properly supported on a strong level platform and fully protected from the weather.
- 4.30 Gypsum wallboard shall be neatly stacked (flat), with care taken to avoid damage to edges, ends and surfaces.

5.00 APPLICATION OF GYPSUM WALLBOARD

- 5.10 General: Note: For framing requirements see Appendix, Section A1.00.
- 5.11 Gypsum wallboard shall be cut by scoring and breaking or by sawing, working from the face side. When cutting by scoring, the face paper shall be cut with a knife or other suitable tool. The gypsum wallboard shall then be snapped back away from the cut face. The back paper can be broken by snapping the gypsum wallboard in the reverse direction or the back paper can be cut. All cut edges and ends of the gypsum wallboard shall be sandpapered, where necessary, in order to obtain neat jointing when the wallboard is erected. Cut-outs for pipes,

fixtures, or other small openings shall be scored in outline before knocking out or shall be cut out with a saw or other suitable tool. Where gypsum wallboard meets projecting surfaces, it shall be scribed neatly.

- 5.13 In single layer installations, all ends and edges of all gypsum wallboard shall occur over nailing members, except that this is not required for treated joints at right angles to framing members in horizontal applications.
- 5.15 Gypsum wallboard shall be applied first to the ceiling and then to the walls. Wallboards of maximum practical lengths shall be used to minimize number of end joints. Boards shall be brought into contact, but shall not be forced into place. Where ends or edges abut, they shall be neatly fitted.
- 5.16 Nails shall be spaced not less than 3/8 inch from edges and ends of wallboard. Nails shall be spaced and driven a maximum of 7 inches on centers on ceilings, and a maximum of 8 inches on centers on walls (See Figure No. 1a) except as shown for "Double Nailing" procedure in Figure No. 1b. Perimeter nailing at the top and bottom is not required. Nails shall not be staggered on adjoining edges or ends. While the nails are being driven, the wallboard shall be held in firm contact with the underlying support. Nailing preferably should proceed from central portion of the wallboard toward ends and edges. The tool used for driving nails shall have a crowned face. The nails shall be driven home with the heads slightly below the surface of the gypsum wallboard, in a dimple formed by the crowned face of the driving tool striking the last blow. A nail set shall not be used and care shall be taken to avoid breaking the paper face.

SINGLE NAILING

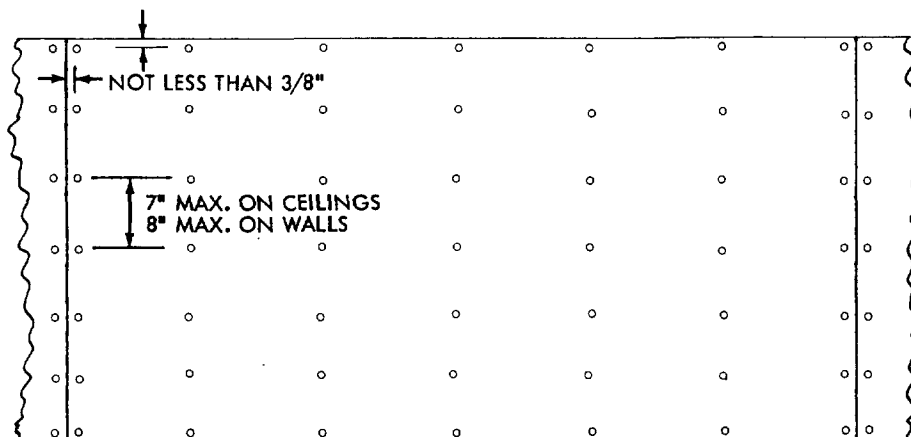


Fig. 1a

NAILS: Nails shall be in accordance with requirements of Paragraph 3.60.

"SINGLE NAILING" SYSTEM PROCEDURE: The wallboard shall be held in firm contact with the nailing member while the nails are being driven. Nailing preferably should proceed from the central portion of each piece of wallboard towards ends and edges. Nails shall not be staggered on adjoining edges or ends. Perimeter nailing at the top and bottom is not required.

DOUBLE NAILING

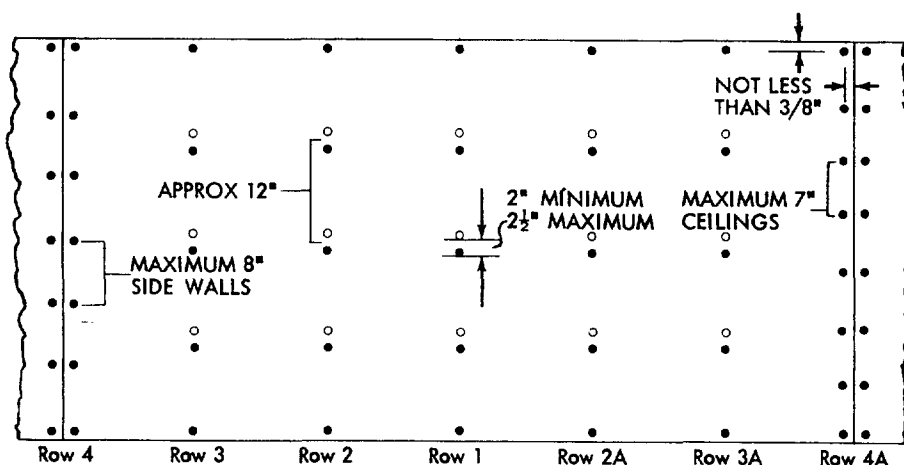


Fig. 1b

NAILS: Nails shall be in accordance with requirements of Paragraph 3.60.

"DOUBLE NAILING" SYSTEM PROCEDURE:

1. Two men are required to nail one ceiling board — one man nails rows 1, 2, 3 and 4; the other nails rows 2A, 3A and 4A.
2. Starting at center of board, nails shown by dot ● are applied in row 1, then rows 2 and 2A, 3 and 3A, 4 and 4A, etc., always nailing from center to edges of sheet.
3. Apply "double" nails shown by circle ○ in the same manner as first nails, also starting at row 1.
4. As alternate procedure, "double" nails may be applied immediately after nailing of first nails in each row is completed according to step "2" above.
5. Use single nails on perimeter of board.

IMPORTANT: All three field (first) nails in each row should be applied before the "double" (second) nails are applied. It may be necessary to "hit" the first nails in each row after the second nail is applied.

- 5.17 The maximum spacings for nailing members to receive gypsum wallboard constructions shall not exceed those shown in the following tables:

NAILING ONLY

Wallboard Construction	Use	Application	Maximum Spacing Nailing Members
3/8" (Single or two-ply)	Ceilings	Horizontal	16" o.c.
	Sidewalls	Horizontal or vertical	16" o.c.
1/2" single	Ceilings	Vertical	16" o.c.
1/2" single	Ceilings	Horizontal	24" o.c.
1/2" single	Sidewalls	Vertical or horizontal	24" o.c.
1/2" two-ply	Ceilings	Horizontal	24" o.c.
1/2" two-ply	Sidewalls	Vertical or horizontal	24" o.c.
5/8" single	Ceilings	Vertical	16" o.c.
5/8" single	Ceilings	Horizontal	24" o.c.
5/8" single	Sidewalls	Vertical or horizontal	24" o.c.
5/8" two-ply	Ceilings	Horizontal	24" o.c.
5/8" two-ply	Sidewalls	Vertical or horizontal	24" o.c.

TWO-PLY NAILING WITH ADHESIVE BETWEEN LAYERS

Wallboard Construction	Use	Application	Maximum Spacing Nailing Members
Two-ply (3/8")	Ceilings	Base layer horizontal	16" o.c.
Two-ply 1/2" base layer	Ceilings	Horizontal	24" o.c.
3/8" face layer	Ceilings	Vertical or horizontal	24" o.c.
Two-ply 1/2" or 5/8"	Ceilings	Base layer horizontal	24" o.c.
Two-ply 3/8", 1/2" or 5/8"	Sidewalls	Horizontal or vertical	24" o.c.

- 5.20 Application direct to framing members or furring strips:

5.22 Joints Treated:

- 5.222 End joints shall be staggered and joints on opposite sides of a partition shall be arranged to occur on different studs.

5.24 Joints Untreated:

- 5.242 Unless otherwise specified, square edge, beveled edge and predecorated gypsum wallboard shall be applied vertically. Where the nail heads are to be treated, they shall be driven as specified in Paragraph 5.16. Where they are to be left with no further treatment, they shall be driven flush with the face of the wallboard surface without breaking the paper.
- 5.244 Wood grained and other predecorated gypsum wallboards shall be applied using a nail with a suitably colored head. These nails shall be driven with a hard rubber mallet or plastic head hammer.

- 5.26 Ceiling application over wood furring construction:

When gypsum wallboard is nailed to wood cross furring on ceilings these members shall have a minimum cross section of 2" x 2" (nominal) and be spaced in accordance with the requirements of Paragraph 5.17.

- 5.30 Application over existing plaster or gypsum wallboard surfaces:

- 5.32 Where gypsum wallboard is used over uneven existing plaster or gypsum wallboard surfaces and joints are to be treated, the wallboard shall be nailed to furring strips as specified in Paragraph 3.60.

- 5.34 Where existing plaster or gypsum wallboard surfaces are in suitably sound condition and of such nature as to permit proper nailing, the gypsum wallboard may be applied direct. Nails shall be so located and of such length as to penetrate into framing members not less than one inch. They shall be spaced and driven as specified in Paragraph 5.16.

5.40 Two-Ply Gypsum Wallboard Application:

5.42 Adhesive Used Between Layers:

5.422 The two layers may be applied in opposite directions or in parallel direction. Joints in the exposed layer need not occur over supports. If the face layer is to be permanently held in place by adhesive only, the first layer shall be applied as specified for single layer application, except that the nails shall be driven so that their top faces are flush with the surrounding wallboard surface. The adhesive to be used between the two layers of gypsum wallboard shall be spread evenly over the back surface of the face layer of the wallboard before it is erected, using a spreader of design approved by the manufacturer of the gypsum wallboard. Immediately after the adhesive has been spread, the wallboard shall be placed in position and nailed with a sufficient number of nails to hold the wallboard in place until the adhesive develops adequate bond. In lieu of nailing, the second ply of gypsum wallboard may be held in position by shoring with props and headers or other temporary supports to insure adequate pressure for bonding.

5.424 When adequate bond has developed between the wallboards, the temporary supports shall be removed, or, if temporary nailing is used, such nails shall either be: (a) driven home so that their heads are below the surrounding surface of the gypsum wallboard, in a dimple formed by the final blow of the driving tool, or (b) removed, or (c) driven with a nail set so that heads of the nail are well below the surface of the exposed face of the gypsum wallboard. The resulting holes shall be filled flush with joint adhesive.

5.44 No Adhesive Used Between Layers:

Nails for the first layer shall be spaced a maximum of 14" on centers, and shall be of the size and type required for the particular thickness of board when used in single layer application. The face layer shall be nailed with the number of nails required for normal single layer application. Nails used for the face layer shall be long enough to penetrate at least 1-1/8 inches into nailing members. The two layers may be applied in opposite directions or in parallel directions. The nails in the first layer shall be driven home so that their heads are below the surrounding surface of the gypsum wallboard. Nails for the face layer shall be driven as specified in Paragraph 5.16.

5.50 Insulating Gypsum Wallboard:

5.51 The application of insulating gypsum wallboard shall conform to the foregoing specifications for the application of gypsum wallboard. The reflective surface shall be placed against the inside face of the nailing members.

5.52 Insulating gypsum wallboard shall not be used as the backing material in shower stalls or tub enclos-

ures to receive ceramic, plastic, or metal tile, or plastic finished wall panels.

NOTE: To obtain full efficiency as an insulating material, a minimum of 3/4 inch air space shall be provided next to the foil.

6.00 JOINT TREATMENT FOR FIELD JOINTS AND CORNERS

6.20 Treatment for field joints and corners shall be applied in strict accordance with the printed instructions of the manufacturer of the gypsum wallboard. Ample drying time shall be allowed between coats of adhesive and between finish coats and decoration. Before joint treatment is applied the installation shall be inspected to insure that (1) gypsum wallboard is properly nailed and is held tight against the nailing members, and (2) nail heads in the field of the board are slightly below the surrounding surface in dimples formed by the driving tool.

6.30 **External Corners:** External corners shall be protected and finished with reinforcing joint tape and adhesive or with an approved metal or other type corner protection.

6.40 **Arches:** Where gypsum wallboard is to be applied to the soffit of arches it shall be carefully bent into place. If necessary, it first shall either be dampened or be kerfed approximately one-inch on centers on the back side. In the latter case, after the core has been broken at each cut, the wallboard shall be applied to the curved contour and nailed in place. At the arrises of the arch, joint adhesive and reinforcing shall be applied in the manner specified for corners, except that the tape shall be snipped at intervals along one side to permit it to conform to the curved contour. Approved metal or other corner protection may be used at these locations.

7.00 STUDLESS SOLID GYPSUM WALLBOARD PARTITIONS

7.10 Solid gypsum wallboard partitions consisting of multiple layers of gypsum wallboard shall be erected in accordance with the printed directions of the manufacturer of the gypsum wallboard.

8.00 TOUCHING UP PRIOR TO DECORATION

8.10 After trim has been applied, and prior to decoration, surface damage and defects shall be corrected (See Appendix, Section A2.00).

9.00 VENTILATION ABOVE GYPSUM WALLBOARD CEILINGS

9.10 Proper ventilation shall be provided (See Appendix, Section A4.00).

APPENDIX A

A0.00 APPENDIX

This Appendix gives general information and also suggestions for inclusion to be made elsewhere by specifier. It is not part of these specifications.

A1.00 FRAMING REQUIREMENTS

The work of framing and furring is not part of these specifications. However, certain requirements covering framing, nailing members, spacing, etc., are essential to provide a proper base to receive the gypsum wallboard. The following requirements should be included in the project specifications for wood framing and furring.

- A1.10** All nailing members should be straight and true and spaced not to exceed the maximum spacings shown in Paragraph 5.17. Framing and bridging members should be adequate to carry the design or code loading. The deflection of horizontal members supporting gypsum wallboard shall not exceed $1/360$ of the span. The nailing surface of any framing or furring member should not vary more than $1/8$ inch from the plane of the faces of adjacent framing or furring members. Headers should be provided as necessary for the support of fixtures. Nailing surfaces shall have a minimum width of $1-1/8$ inches.
- A1.30** Headers are not required to receive joints at right angles to supports in horizontal application that are to be treated with a joint reinforcing system.
- A1.50** All concrete or masonry surfaces that are to receive gypsum wallboard finish should be furred with at least $1" \times 2"$ nominal nailing members.
- A1.70** Nailing flanges of insulating materials should not be attached to the face of the nailing member.

A2.00 DECORATION

- A2.10** It is extremely important that the difference in absorption between the field of the gypsum wallboard and the adhesive over joints or nailheads be equalized to assure uniformity of color and texture over the entire wall. After the gypsum wallboard application has been completed, the surfaces should be sealed and primed as required for subsequent finish.
- A2.20** **Wallpaper and similar materials applied adhesively:** Wallpaper, or similar materials adhesively applied, should never be applied to gypsum wallboard without first sealing the surface. Sealing provides protection where wetting of the gypsum wallboard may occur. In general, latex or oleo-resinous type sealers, recommended by the gypsum wallboard manufacturer, can be used. Use of a sealer provides protection for the wallboard when removal of the wallpaper becomes necessary.

A3.00 SPECIFICATIONS FOR APPLICATION OF GYPSUM WALLBOARD TO RECEIVE CERAMIC, PLASTIC, METAL TILE, AND PLASTIC FINISHED WALL PANELS BY ADHESIVE APPLICATION

- A3.10** **General:** The work to be done in application of gypsum wallboard under this specification shall be performed in accordance with the requirements of American Standards Association, Standard Specification for Gypsum Wallboard Finishes A97.1, except as otherwise specified herein.

A3.20 Framing: (See figures A1, A2, and A3)

- A3.21** Framing members shall be plumb and true.

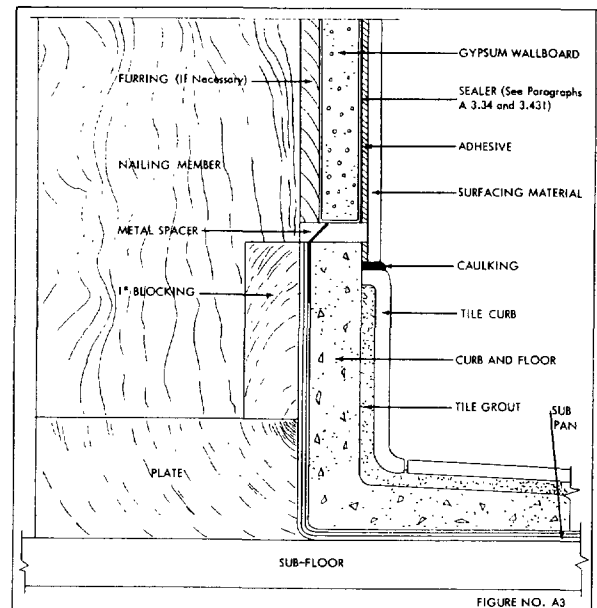
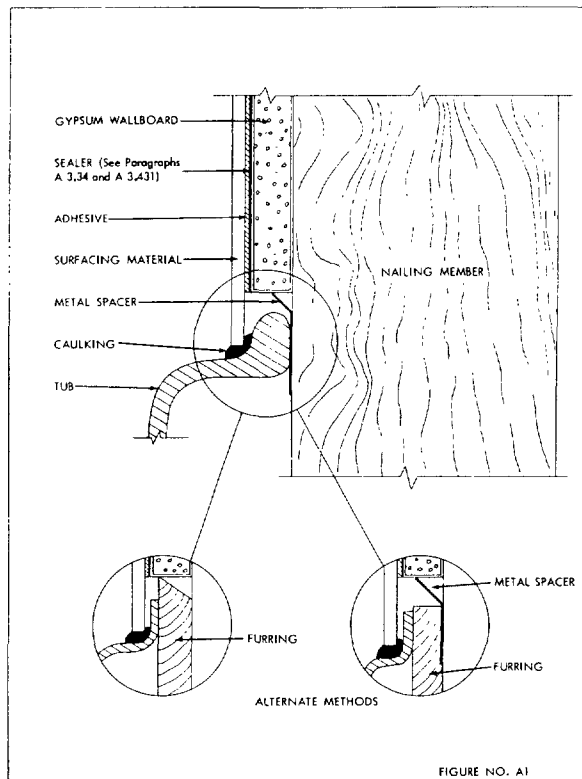
- A3.22** All framing around tub enclosures and shower stalls shall allow sufficient room so that the inside lip of the tub, prefabricated receptor or hot mopped sub-pan shall be even with the face of the gypsum wallboard. This will necessitate furring out from the studs the thickness of the gypsum wallboard to be used ($3/8"$, $1/2"$, $5/8"$) less the thickness of the lip, on each wall abutting a tub, receptor or sub-pan.

- A3.23** Furring of the proper thickness shall be applied as required parallel to the lip of receptor, pan or tub. The top of square cut furring, or if beveled, the start of bevel shall be flush with the upper edge of receptor, sub-pan or tub. (See Figures A1, A2 and A3).

- A3.24** A continuous metal spacer strip as specified under Paragraph A3.33 shall be applied with the $3/4"$ leg behind the furring with the apex of the angle abutting the top surface of the furring and the $3/8"$ leg protruding away from the stud face. If a metal spacer strip is not used, the wood furring must be beveled. (See Figures A1, A2, and A3).

- A3.25** For walls to be surfaced with ceramic tiles over $1/4"$ thick: When $3/8"$ gypsum wallboard is to be used on studs spaced $16"$ o.c. or $1/2"$ or $5/8"$ gypsum wallboard on studs spaced more than $16"$ o.c., suitable blocking shall be installed between all studs. One row of blocking shall be located approximately $1"$ above the top of the tub or receptor and another row at the mid point between the tub and ceiling. Blocking is not required for $3/8"$ gypsum wallboard on studs spaced $12"$ o.c. or less, or for $1/2"$ or $5/8"$ gypsum wallboard on studs spaced $16"$ o.c. or less.

- A3.26** Appropriate blocking, headers or supports shall be provided to support tub, other plumbing fixtures, and to receive soap dishes, grab bars, towel racks and similar items as may be required.



A3.30 Materials:

A3.31 Gypsum wallboard shall be 3/8", 1/2" or 5/8" in thickness and shall comply with the requirements of ASTM Designation C36 for Gypsum Wallboard.

NOTE: Insulating (foil-backed) gypsum wallboard shall not be used as a backing material in shower stalls or tub enclosures.

A3.32 Materials for treating joints and concealing nail-heads shall be as recommended by the manufacturer of the gypsum wallboard.

A3.33 The metal spacer strip shall be fabricated of 16 gage galvanized steel, with one leg 3/4" wide and one leg 3/8" wide bent at a 45° angle.

A3.34 The surface sealer shall be either a water resistant adhesive recommended by the manufacturer of the surfacing material or a water resistant sealer as recommended by the manufacturer of the gypsum wallboard. The sealer shall not be applied until after the joints are treated. Shellac shall not be used.

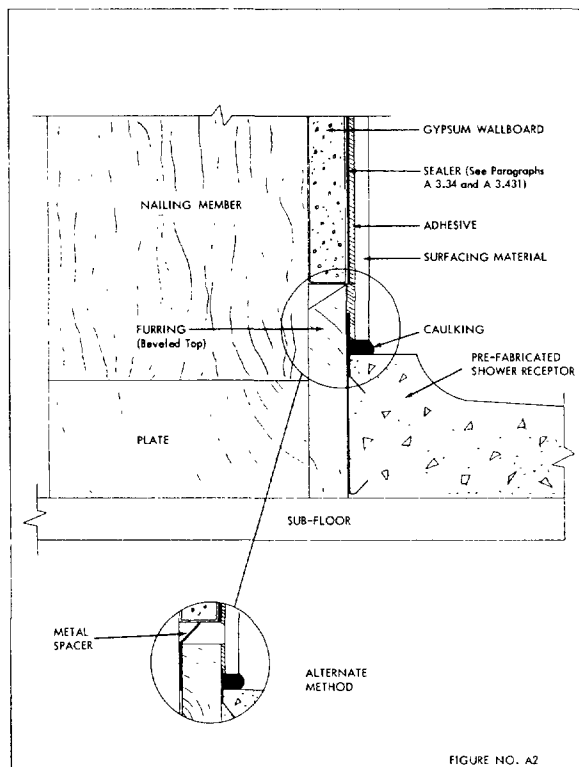
A3.35 The adhesive used for application of the surfacing material shall be approved by the manufacturer of the surfacing material for use over gypsum wallboard.

A3.36 The surfacing material shall provide a durable surface and prevent the passage of free water to the backing material; also, it shall prevent the passage of water vapor which may lead to condensation within or on the surface of the backing material or framing members.

A3.37 Waterproof receptors, pans or sub-pans shall have an upstanding lip or flange which shall be a minimum of 1" higher than the water dam or threshold contained in the entry way to the shower.

A3.40 Application:

A3.41 Shower pans, receptors or tubs shall be installed prior to the erection of the gypsum wallboard. They shall be properly furred away from the framing members as specified in Paragraph A3.22, and installed so that the inside surface of the lip or



upstanding leg of the receptor or pan shall be in alignment with the surface of the gypsum wallboard.

A3.42 Gypsum Wallboard:

A3.421 Gypsum wallboard, 3/8", 1/2", or 5/8" shall be applied horizontally with the factory edge (paper bound) abutting the top edge of the metal spacer strip or beveled furring, which shall allow a minimum of 1/4" space between the lip of the receptor, tub or sub-pan and the gypsum wallboard.

A3.422 Gypsum wallboard shall be nailed as required in the foregoing specification. Where gypsum wallboard is to receive ceramic tile over 1/4" thick, the nails used to attach the gypsum wallboard shall be spaced a maximum of 4" o.c.

A3.423 All joints between adjoining pieces of wallboard, including those at all angle intersections, shall be treated. (See Paragraph 2.70).

A3.43 Application of surfacing material:

A3.431 Prior to the erection of surfacing materials, the approved type of sealer shall be applied to all gypsum wallboard areas including treated joints and angles which are to receive such surfacing materials. When the adhesive is used as a sealer, it shall be applied as a separate operation, independently of the application used to adhere the surfacing material, spreading it in a continuous coating approximately 1/16" thick. All edges of cut-outs made in the gypsum wallboard for pipes, fixtures, etc., shall be sealed in a like manner.

A3.432 Prior to the erection of surfacing materials, all openings around pipes, fixtures, etc., shall be caulked flush with waterproof, non-hardening caulking compound.

A3.433 The surfacing material shall then be applied down to the top surface or edge of the finished shower floor, return, or tub and installed so as to overlap the top lip of receptor, sub-pan or tub.

A3.434 The surfacing material shall be applied so as to completely cover the following areas:

- (a) over tubs without shower heads—6" above the rim of the tub.
- (b) over tubs where showers occur—a minimum of 5 feet above the rim or 6" above the height of the shower head, whichever is higher.
- (c) Shower stalls—a minimum of 6 feet above the shower dam or 6" above the shower head, whichever is higher.
- (d) All jambs in shower stalls shall be covered to a like height.
- (e) The surfacing material shall be carried to the full specified height for a distance of at least 4" beyond the external face of the tub or receptor. Areas beyond an exterior corner are excluded.

A3.435 Where plastic finished wall panels are used as a surfacing material, the following precautions shall be taken:

- (a) Only the type and shape of mouldings recommended by the manufacturer of the surfacing material shall be used. All interior and exterior angles shall be treated with mouldings containing a flange projecting behind the surfacing material on each leg of the angle. Only recommended tub mouldings shall be used at the base where the surfacing materials abut the tub, shower floor, or curb. Such mouldings shall be set in caulking compound.
- (b) A bead of caulking compound shall be applied at the angle formed by the gypsum wallboard backing and the moulding used around the top edge of the surfacing material to prevent leakage of water behind the moulding.

A3.436 Where other types of surfacing materials are used, the following precautions shall be taken:

- (a) All joints shall be filled in such manner as to leave no voids for water penetration.
- (b) Nonsetting caulking compound shall be applied between the wall surfacing materials and the floor of the shower or rim of the tub.
- (c) The angle between the edge and the surfacing material shall likewise be caulked.

A4.00 VENTILATION ABOVE GYPSUM WALLBOARD CEILINGS

A4.10 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. Net ventilating area for each separate space shall be not less than:

A4.20 Roofs with slope 2 in 12 or greater:

A4.21 1/300 of the horizontal projection of the roof area over each space, provided that at least 1/2 of the required ventilating area is in the upper part of the ventilated space, as near the high point of roof as practicable.

A4.22 1/150 of the horizontal projection of the roof area over each space if not in compliance with Paragraph 4.21.

A4.30 Roofs with slope less than 2 in 12:

A4.31 1/300 of the horizontal projection of the roof area if a completely continuous vapor-barrier is provided.

A4.32 1/150 of the horizontal projection of the roof area if such a vapor-barrier is not provided.

NOTE: A vapor-barrier is a material having a vapor permeability not exceeding one (1) perm.



FIRESTOP BESTWALL® GYPSUM WALLBOARD

GYPSUM WALLBOARD

GYPSUM SHEATHING

GYPSUM BACKER

GYPSUM ROOF DECKS

JOINT SYSTEM

BEDDING COMPOUND

TOPPING COMPOUND

CERTEX TEXTURE

JOINT TAPE

SPACKLING COMPOUND

PATCHING PLASTER

and OTHER GYPSUM PRODUCTS

BESTWALL GYPSUM COMPANY

Ardmore, Pennsylvania

Offices and Plants in Principal Cities throughout the United States

SGP 0027284