GYPSUM ASSOCIATION
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Special Recommendations

AIA FILE NUMBER 23-

FOR RADIANT HEATING with Gypsum Wallboard

PLAINTIFF'S EXHIBIT
GP-795

GENERAL

The purpose of these recommendations is to explain the proper use of gypsum wallboard when used with radiant heating. Gypsum wallboard or backing board can be satisfactorily used in conjunction with radiant heating installations, however, certain precautions must be taken to minimize the possibility of such things as cracking due to thermal shock, shadowing under the heating system due to unequal initial drying rates, or calcination of the gypsum wallboard due to over-heating. These recommendations are intended to provide information which should help avoid such difficulties.

TYPES OF RADIANT HEATING SYSTEMS

Electrical systems where cables are located between two layers of gypsum wallboard.

Hot water systems in which the heat conducting mediums, such as pipes, are located between two layers of gypsum wallboard.

Systems in which the heating elements are located behind the gypsum wallboard.

SPECIFICATIONS

Gypsum wallboard shall be applied in accordance with the requirements of ASA A97.1, "Standard Specifications for Gypsum Wallboard Finishes" except as herein modified.

Systems Using Two Layers of Gypsum Wallboard

The first layer of gypsum wallboard or backing board shall be applied horizontally to nailing members using nails as specified below. Nails shall be spaced a maximum of 14" o.c. for the first layer and 7" o.c. for the face layer.* Nails shall be driven flush with surrounding wallboard surfaces for application of the first ply.

*For exception see "Note", Electric Heating Systems.

Nails:

Gypsum Wallboard (Thickness)	Recommended Nails
First Ply	
3/8"	1-1/8" or 1-1/4" GWB-54 or 4d, 14 gage, 1-3/8" long, 7/32" flat head, diamond point, bright finish cooler.
1/2"	1-1/4" GWB-54 or 5d, 13-1/2 gage, 1-5/8" long, 15/64" flat head, diamond point, bright finish cooler.
5/8"	1-3/8" GWB-54 or 6d, 13 gage, 1-7/8" long, 1/4" flat head, diamond point, bright finish cooler.
Second Ply	
GWB-54 Type nails providing 3/4" penetration or "Cooler" nails providing 1" penetration.	

Staples:

The *first ply only* of two-ply construction may be attached by power driven staples. When staples are used, the following recommendations should be employed.

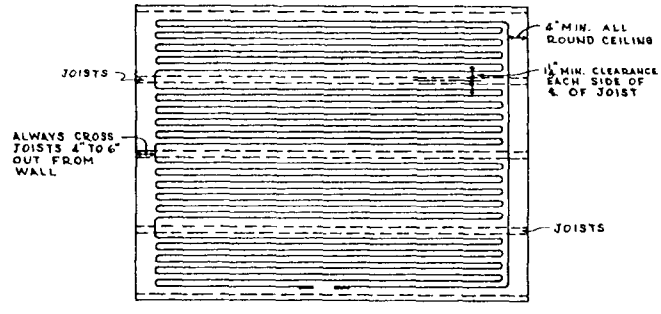
The staples shall meet the following minimum requirements: 16 U.S. Standard gage flattened galvanized wire, 7/16" wide crown, 1" long legs for 3/8" thick board, 1-1/8" long for 1/2" thick board and 1-1/4" long for 5/8" thick board, with divergent points.

The spacing of staples shall not exceed 7" on center on ceilings.

Staples shall be driven with the crown at right angles to the paper bound edges of the gypsum wallboard, except where the paper bound edges fall on 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 wallboard, 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 gypsum wallboard.

ELECTRIC HEATING SYSTEMS:

Electric heating cables shall be securely attached to the base or first layer of gypsum wallboard in accordance with cable manufacturer's recommendations, with cables parallel to and between nailing members. Cable shall be positioned at least 1-1/4" from center of nailing member on each side so that at least a 2-1/2" unobstructed channel is provided under each nailing member. This is necessary to prevent nails, used to subsequently attach the face layer of gypsum wallboard, from being driven into the cable. Cables shall cross nailing members only at ends of ceiling 4" to 6" from wall. There shall be at least a 4" space completely around the perimeter of each ceiling, which is clear of cables. Cables shall be kept at least 8" clear of all openings.



TYPICAL CEILING LAYOUT PATTERN

All inspections and testing of the heating system shall be completed before application of face layer of gypsum wallboard.

Heating cable spacing between joists shall be as re-

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commended by the heating cable manufacturer. *Under no operating conditions shall the gypsum board core exceed a temperature of 125°F.*

Complete embedding of the heating elements is necessary. The area between the heating elements shall be filled with a filler which shall be level so there is complete contact between the face layer and the back layer of gypsum wallboard. (Note: Where the filler serves as an adhesive to hold the face layer, nail spacing may be 7" o.c. for the first layer and 16" o.c. for the face layer.) When required to produce a uniform thickness of the filler and to provide a firm base for nailing, furring strips of a thickness equal to that of the layer of the filler, may be attached over the base layer to the ceiling joist at parallel relationship. The face layer shall be erected immediately after the filler has been spread. The last nails around the perimeter of the ceiling shall be spaced 8" to 10" away from the adjoining wall to prevent them from striking the electric cables where they cross the framing members.

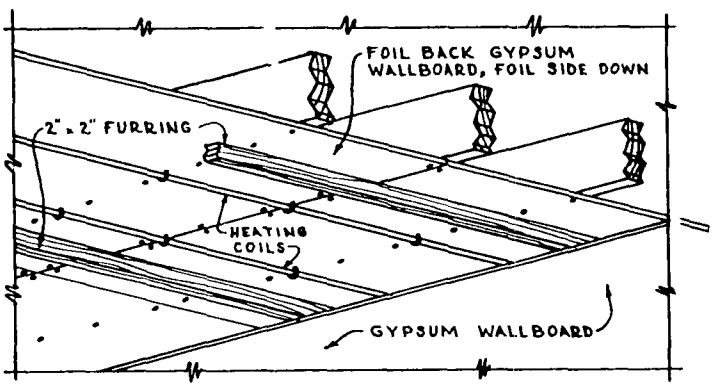
All joints and nail heads shall be finished according to the wallboard manufacturer's recommendations. *Allow a minimum of one week with good drying conditions and two weeks in the cold season before turning on the heating system.*

HOT WATER HEATING SYSTEMS:

Apply insulating gypsum wallboard for the first layer parallel to the joist with the aluminum foil facing downward to act as a reflector behind the heating elements. Nails shall be spaced not more than 8" o.c. They shall be driven flush with surrounding wallboard surfaces.

Nail 2" × 2" furring strips 16" o.c. over the insulating gypsum wallboard and at right angles to the joists.

The heating elements shall be suspended from and supported by the framing members and not from the gypsum wallboard.



TYPICAL HOT WATER SYSTEM

All inspections and testing of the heating system shall be completed before application of the face layer.

Under no operating conditions shall the gypsum board core exceed a temperature of 125°F.

Apply the final or face layer in the normal manner, at right angles to the furring strips. Nails shall be as specified for the first ply and shall be spaced not more than 7" o.c. Do not use insulating or foilback wallboard for face layer.

All joints and nail heads shall be finished according to the wallboard manufacturer's recommendations. *Allow a minimum of one week with good drying conditions and two weeks in the cold season before turning on the heating system.*

OTHER SYSTEMS:

Where the heating system is located behind the gypsum wallboard, the recommendations for the applicable system shall be complied with.

Under no operating conditions shall the gypsum board core exceed a temperature of 125°F.

All joints and nail heads shall be finished according to wallboard manufacturer's specifications. *Allow a minimum of one week good drying conditions and two weeks in the cold season before turning on the heating system.*

DESIGN DATA

It is the responsibility of the architect to prepare and correlate complete plans and specifications. The limitations and characteristics of the materials used for the structure shall be taken into consideration. It is the responsibility of the heating engineer to properly design the radiant heating system to work effectively with these materials.

Be certain to follow the job specifications. *Substitutions in materials might change the rate of heat flow, which in turn might give results that would make the entire installation unsatisfactory.*

The following design data is recommended for use in calculating the heat transmission coefficients (U) for gypsum wallboard.

Thermal Conductivity Values:

Material	Conductance "C" (Thickness as stated)	Resistance "R" (1/C)
3/8" gypsum wallboard	3.73	0.27
1/2" gypsum wallboard	2.76	0.36
5/8" gypsum wallboard	2.42	0.41

DECORATION

Decoration of the finished work including sizing or sealing shall not proceed until the heating system has been test operated for a minimum of 24 hours. The system should then be turned off and decorating of the gypsum wallboard performed. Do not decorate the wallboard while the heating system is being tested, or is in operation. It is also recommended that where texture finishes are used, such finishes be allowed to thoroughly set or dry prior to the operation of the heating system.