New 1-hr Rated Exterior Wall Assembly Includes Allowances for Various Insulation Options and Much Wider Maximum Girt Spacing

Under the auspices of the MBMA Committee on Fire Protection and Related Insurance Matters, a new rated wall assembly was successfully developed and tested at Underwriters Laboratories, Inc. (UL) in 2010. This new assembly, known as UL W404 contains several prominent attributes and increases the total number of fire resistive assemblies sponsored by MBMA to 13.

UL W404 preserves the most common and efficient metal building system construction practices of the industry in this new 1-hr non-loadbearing exterior wall system. Moreover, it provides for much needed allowances in additional thermal insulation, as required in the forthcoming energy codes and building sustainability guidelines. The new design also allows a substantially larger maximum girt spacing of up to 90 inches o.c. for support of the exterior siding. This is important because most metal building projects incorporate the larger girt spacing for the first wall girt up from grade level to accommodate door framing.

By testing and achieving the listing with this larger allowable spacing, the industry is even better positioned to accommodate existing building retrofits, and new construction projects will not require special framing details or field modification to incorporate a fire wall, even if the requirement is identified in the later stages of the project design or construction.

The new assembly was conceived by MBMA as the most practical and current follow-up to the counterpart UL V421 assembly, which has been in use over the last decade. The common metal building design for fire resistive exterior wall construction uses light-gage steel framing to support an exposed metal panel skin on the exterior in combination with gypsum board on the interior. However, the existing UL V421 assembly was considered to be limiting in its applications due to the listing restrictions on maximum girt spacing of 48 inches o.c., the required location and layering of gypsum board, and with limited allowance for additional thermal insulation to be included within the wall cavity.

The new UL W404 assembly was intended by MBMA to resolve all these issues. Because of the asymmetry of this exterior wall construction, two separate 1-hour fire endurance tests were conducted at UL, thereby subjecting each side (gypsum board interior and exterior metal wall panels) to the standard fire exposure followed by a hose stream application. Both full-scale test assemblies passed all the standard acceptance criteria of the 1-hour fire resistive rating for fire exposure on either side (exterior and interior).

The ability of an exterior wall assembly to meet the current and future energy requirements is deemed to be critical, since energy and green building codes have become a primary focus for today's designers. However, the addition of rigid foam and other continuous insulation to a building's exterior envelope can affect the

applicable fire resistive ratings of the construction. Many of the listed assemblies in the UL *Fire Resistance Directory* and other sources were developed well prior to these more recent energy code developments, when requirements for roof and wall thermal insulation levels were much lower.

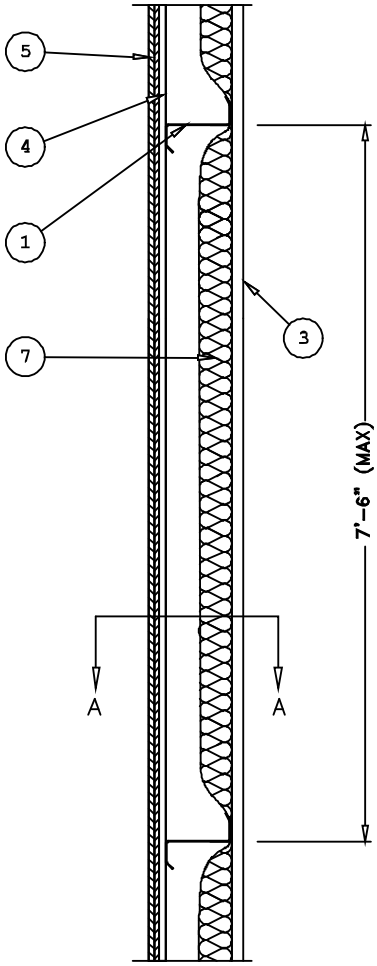
In recent years, the energy codes have become more stringent in requiring much thicker continuous insulation to be installed on a building exterior in order to better control the wasteful thermal transfers between the controlled temperatures of the building interior and the ambient outside environment. However, the use of extra insulation in certain types of fire-resistive assemblies has already been shown to reduce their fire resistance ratings, and thus, cannot generally be done without direct evaluation of their effects on fire resistance. Moreover, the continuous insulation can often be a foam plastic material that brings with it a myriad of special concerns about fire performance and safety, such as the extra fuel source, smoke and the fire propagation potential from these types of combustible materials.

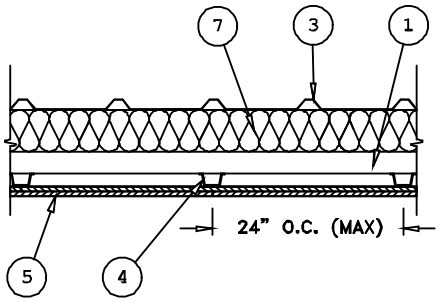
Therefore, a major accomplishment reflected in UL W404 is the capability to effectively comply with even the most demanding energy codes by inclusion of a broad range of insulation options for glass fiber blanket and/or rigid board (listing specifies the Dow Chemical Co. Thermax™ product line), while maintaining the 1-hour fire resistive wall assembly rating. The interior (finished) wall side is to consist of a minimum two layers of 5/8 inch thick Type X gypsum board of any manufacturer that is UL Classified. Up to a 4 inch total thickness of Dow Thermax™ rigid foam board, using minimum 1 inch thick layers, is now explicitly allowed within UL W404 as an option with fiber glass cavity insulation. This assembly also provides the desirable flexibility in the placement of the Thermax™ insulation board on either or both sides of the interior wall cavity, provided the foam board always remains within the outer steel panel (or the acceptable alternative of brick or masonry veneer) and the interior gypsum board layers.

The unique thermal insulation and energy conservation provisions of UL W404 developed by MBMA, together with its broad and efficient range of design options, are expected to greatly help expand the uses for metal building systems in commercial and institutional markets wherein conditioned (heated or cooled) occupant spaces are a prerequisite.

The full assembly listing of UL W404, as of mid-2011, is reproduced in the following for quick reference. Since changes in approved materials, installation details, design limits, and the like may occur over time, practitioners, contractors, and regulatory authorities are always encouraged to use the most current and official UL design listing, which may be found in the UL Online Certifications Directory.

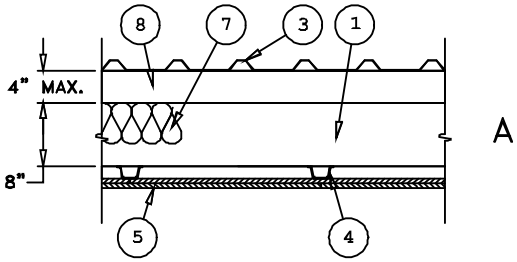
Design No. W404
December 07, 2010
Non Load Bearing Wall Rating — 1 Hr.

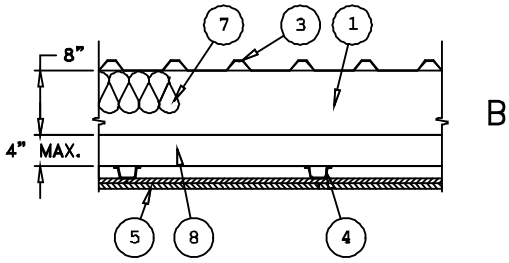


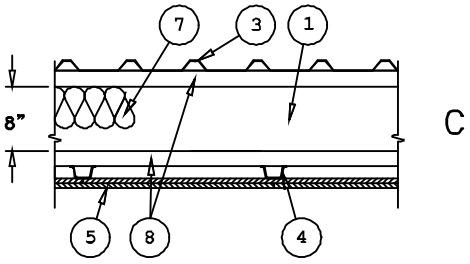


SECTION A–A

OPTIONAL DETAILS FOR THERMAX







1. Girts — "Z" or "C" shaped girts, minimum 0.056 inch thick steel, minimum 8 inches deep, with minimum 2 inch wide flanges. Girts placed horizontally (with flanges up or down) and spaced maximum 90 inches o.c. Girts are secured to columns with girt clips, Item 2, or bolted to the column through the girt flange.

2. Girt Clips — (optional, not shown) - Steel clips secured to column by welds or bolts.

3. Steel Wall Panels — Minimum No. 26 MSG, minimum $1^1/_8$ inch depth, minimum 36 inch wide coated steel panels. Vertical raised rib profiles of adjacent panels are overlapped and attached to each other with self-drilling or self-tapping screws spaced 30 inch o.c. (max.) along the lap. Metal panel attachment to steel girt using self-drilling or self-tapping screws spaced 12" o.c. (max) along girt.

A. Brick or Masonry Veneer — (optional, not shown) - Brick or masonry veneer meeting the requirements of local code agencies may be installed over additional furring channels (not shown), Item 4, on exterior of wall in place of steel wall panels. Brick or masonry veneer attached to furring channels with corrugated metal wall ties attached to each furring channel with steel screws, not more than each sixth course of brick. When a minimum 3¾ inch thick brick or masonry veneer facing is used, the fire resistance rating applies from either side of the wall.

4. Furring Channels — Hat shaped, minimum 20 MSG galvanized steel, nominally 3 inches wide, $1^1/_2$ inches deep, spaced maximum 24 inches o.c. perpendicular to girts. Channels are secured to each girt with $^3/_8$ inch (minimum) long self-drilling sheet steel type screws. Two screws are used at each fastening location, one through each leg of the furring channel.

A. (optional) — In place of the furring channels, the following standard steel framing for rated gypsum board walls may be used:

Steel framing (steel studs, runners and their attachment) for support of the gypsum board wall shall be constructed of the materials and in the manner specified in UL Design No. V497.

Lateral Support Members — (not shown) — Where required for lateral support of studs, support may be provided by means of steel straps, channels or other similar means as specified in the design of a particular steel stud wall system.

5. Wallboard, Gypsum* — Two layers on interior face of wall of any $^5/_8$ inch thick gypsum wallboard bearing the UL Classification Mark for Fire Resistance. Both layers applied horizontally or vertically. First layer attached to furring channels, Item 4, using 1 inch long Type S bugle head drywall screws spaced 24 inches o.c. maximum vertically and horizontally. Second layer attached to furring channels using $1^5/_8$ inch long Type S bugle head drywall screws spaced 12 inches o.c. maximum vertically and 24 inches o.c. maximum horizontally. The horizontal or vertical joints of the wallboard shall be offset 24 inches when 2 successive layers are applied in the same orientation. Wallboard joints finished dry or premixed joint compound applied in two coats to joints and screw heads of face layer of gypsum wallboard. Paper or glass fiber tape embedded in first layer of compound over all joints.

* See **Wallboard, Gypsum** (CKNX) category for names of manufacturers.

6. Column Protection — (not shown) - Horizontal wall girts, Item 1, are attached to vertical structural steel columns. See Column Design No. X524 or X530 if protected columns are required.

7. Batts and Blankets* — Minimum 3½ inch thick (R-10) glass fiber blankets placed in the cavities of exterior walls, and attached to the girts. As an alternate, 1" minimum Rigid Foam Board, Item 8, shall be permitted, in addition to the glass fiber blankets.

* See **Batts and Blankets** (BZJZ) categories for names of manufacturers.

8. Rigid Foam Board* — (optional) - Minimum 1 inch thick, maximum 4" thick rigid foam board. Applied horizontally or vertically within the wall cavity (between steel wall panels and/or gypsum wallboard), on exterior face only or on interior face only or on both faces. First layer

attached to furring channels, Item 4, or to girt, Item 1.

The following fastener diameter, length and spacing is required for each thickness when Thermax™ is attached on the metal panel side (see optional details A & C):

Thermax™ Thickness:	**Fastener Diameter and Spacing Required:**
1"	2" long, #12-14 self-drilling or self-tapping screws spaced 12" o.c. along girt
2"	3" long, #12-14 self-drilling or self-tapping screws spaced 12" o.c. along girt
3"	4" long, #1/4-14 self-drilling or self-tapping screws spaced 12" o.c. along girt
4"	5" long, #1/4-14 self-drilling or self-tapping screws spaced 12" o.c. along girt

The following fastener diameter, length and spacing is required for each thickness when Thermax™ is applied under furring channels on the interior side (see optional details B & C):

Thermax™ Thickness:	**Fastener Diameter and Spacing Required:**
1"	2" long, #12-14 self-drilling or self-tapping screws, (2) at each girt location through the furring channel legs
2"	3" long, #12-14 self-drilling or self-tapping screws, (2) at each girt location through the furring channel legs
3"	4" long, #1/4-14 self-drilling or self-tapping screws, (2) at each girt location through the furring channel legs
4"	5" long, #1/4-14 self-drilling or self-tapping screws, (2) at each girt location through the furring channel legs

See Optional Details A, B and C for allowable configurations.

*** THE DOW CHEMICAL CO** — Type Thermax™ Sheathing, Thermax™ Light Duty Insulation, Thermax™ Heavy Duty Insulation, Thermax™ Metal Building Board, Thermax™ White Finish Insulation, Thermax™ ci Exterior Insulation, Thermax™ IH Insulation, Thermax™ Plus Liner Panel and Thermax™ Heavy Duty Plus (HDP)