

# MATERIAL CAPABILITIES

## 5 Things to Know About Metal Buildings & Fire Ratings



By Dan Walker, P.E.

*"Use my product. Pick this material. My solution is better than theirs."*

*This might sound familiar to architects who are inundated with product literature or lunch and learn seminars or webinars that clamor for their attention. How do you make an informed decision? Your best bet is to fully understand the capabilities of the materials and the testing that proves each product's strengths.*

*Here are five concepts about fire ratings and how metal building systems can demonstrate proven performance.*

**1. Non-combustible.** *Unlike wood-framed buildings, which are made of combustible materials, metal buildings are constructed almost entirely out of steel. The International Building Code recognizes that steel construction is non-combustible. While this designation does not mean that metal buildings are exempt from all fire protection requirements, the code does recognize significant advantages for using non-combustible construction compared to wood framed construction.*

**2. Allowable Building Height and Area.** *The primary advantage metal buildings have over wood framed construction is with regard to the allowable height and area of buildings. In many building categories, such as retail, office and education, the allowable area of unprotected (non-fire rated) metal buildings is permitted to be much larger than for unprotected wood framed buildings - in many cases 50% or more. This recognition of the non-combustible nature of metal buildings gives them a significant advantage because of the higher cost of providing fire protection for combustible wood construction. Metal buildings of even larger sizes compared to similarly protected wood framed construction can be achieved if fire rated designs are used in metal buildings.*

**3. Fire protection.** *The requirements for fire protection that affect all buildings are driven by the intended end use, occupancy and site location of a building. For site location, the IBC has fire protection requirements for buildings based on how close they are to adjacent*

buildings or property lines. The risk of fire spreading from building to building decreases as the distance between buildings increases. Likewise, the fire-resistance rating requirements go down with this lower risk, with the strictest requirements applying to combustible construction such as wood. Additional stipulations are set for fire ratings based on the intended use of the building, or occupancy type, and the construction type, such as wood, steel, or concrete.

**4. UL ratings = proven performance.** The Metal Building Manufacturers Association designed and tested myriad fire rated assemblies for roofs, walls, columns, and joints at Underwriter's Laboratory. The newest of these listings are UL Design Nos. W404 and W413, which are 1- and 2-hour exterior wall fire ratings, respectively. The new exterior wall assemblies consist of non-combustible metal building wall framing, steel furring, gypsum board, and exterior metal wall panels as well as several insulation options. The assemblies were arranged to maximize the span of the girts (horizontal metal wall framing) that can be spaced as far apart as 90 inches on center (vertical spacing). 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.

Another important reason for these tests was to ensure metal buildings could continue to meet ever-changing energy code requirements. The codes have become more stringent by requiring thicker insulation for roofs and walls, sometimes requiring the specification of exterior rigid board insulation. The code changes were made to reduce thermal transfers between the controlled temperatures of a building interior and the ambient outside environment, thus saving energy. However, fire resistance ratings are impacted by the types of insulation used. In addition, using foam plastic insulation can bring additional concerns about fire performance and safety, including a potential extra fuel source and smoke and fire propagation potential. The new MBMA/UL W404 and W413 assemblies address these issues, allowing for energy code compliance using both fiberglass and rigid board insulation while maintaining the achieved fire resistive wall assembly ratings.

Underwriter's Laboratory conducted full-scale fire endurance tests that adhered to the requirements of ASTM E119, "Standard Test Methods for Fire Tests of Building Construction and Materials". Both

assemblies passed the tests and are now known as UL Design Nos. W404 (1-hour rated fire wall) and W413 (2-hour rated fire wall). Both designs allow for new and retrofit metal building use and provide the flexibility to meet future energy code requirements for higher insulation levels.

**5. Fire rating materials.** The most common fire rating material used in metal buildings is gypsum wallboard. Other materials can be used, including concrete masonry for walls, and spray-applied fire resistive materials. All the MBMA fire-rated designs utilize the generic 5/8-inch "Type X" gypsum wallboard as a minimum, so any gypsum supplier's Type X board will comply. Each design is specific and will detail the thickness and number of required gypsum layers, supports, screw spacing and any other details necessary to achieve the rating.

For joints and penetrations, there are other UL ratings that call for special details that can involve items like intumescent fire caulks that can expand in a fire to help seal any gaps or cracks that occur, preventing the passage of smoke and flames. For instance, MBMA developed UL Design Nos. CJ-D-0005, CJ-D-0006 and CJ-D-0007 that are wall continuity joint systems that maintain the joint between a fire-rated interior partition wall and a non-rated metal roof. Other details exist for rated interior walls that terminate against fire-rated metal building roofs. They are HW-D-0488, HW-D-0489 and HW-D-0490.

The Fire Resistance Design Guide for Metal Building Systems, published by MBMA, is the complete source for fire protection information.

Metal building construction makes up at least 40 percent of non-residential, 1- and 2-story building construction in the United States. Chances are you have worked with a metal building in the past, but if not, consider the strength and flexibility of a metal building system to meet your clients' needs.

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