

Differences in DRYWALL

There Are More Than Only Two Kinds of Drywall— and Fire Resistance Makes a Big Difference

It's commonly thought that there are two kinds of gypsum wallboard—regular and fire-rated (or Type X as it's come to be called).

A major characteristic of gypsum drywall is its ability to resist fire. It does this through its chemical composition. Gypsum (calcium sulfate) contains chemically combined water—about 50% by volume.

When exposed to fire, the water, as a result of heat, partially converts to steam, which effectively resists fire. The opposite side of the gypsum board wall remains cool until all water in the gypsum core has been converted to steam, or until the gypsum board itself is breached by the flames.

(Editor's Note: This outstanding treatise on gypsum drywall differences is reprinted by permission from Techniques and Comments, the international newsletter published by John J. Bucholtz, P.E. The newsletter is available at \$100 per year from: John J. Bucholtz, 5131 Moorpark Avenue, San Jose, CA 95129.)

Regular gypsum board, after water is driven off by heat from a fire, reduces in volume, develops large cracks in the board, and eventually fails. A 5/8 inch regular gypsum wallboard panel exposed to 1850°F., will fail in 10 to 15 minutes. By extrapolation, a 1/2-inch board would probably fail in 10 to 12 minutes.

Type X has a glass fiber reinforced gypsum core. The fibers reduce the extent and severity of cracks in the board when exposed to flame and heat, thus increasing the time it performs without failure. Tests show that Type X board, exposed to the same 1850° heat will remain effectively in place for 45 minutes. It, too, ultimately fails.

There is a third type of gypsum board today. A good example is U.S. Gypsum's "Firecode C." This board is similar in composition to Type X, except that it has more glass fibers, and, it has another ingredient in the gypsum core. This ingredient is a shrinkage-compensating additive, a form of vermiculite. When exposed to high heat, the gypsum core shrinks

but the shrinkage-compensating element expands at about the same rate as shrinkage occurs in the water-depleted gypsum.

The gypsum core then is more stable in a fire and remains in place even after the combined water in the gypsum has been driven off.

Test Results

A test program at U.S. Gypsum's research facility included 5/8-inch thicknesses of regular gypsum board, Type X board and Firecode C board. Each sample was 13 x 13 inches, and each was weighted at the top with a 12 lb. 9 oz. weight to pinpoint failure.

Gas-fired burners generated a temperature of 1850°F., and after 12 minutes the regular 5/8-inch board failed. Heat from the fire caused sufficient water loss to make the panel crack severely and lose its ability to support the applied loading.

Type X fire-rated board fared better, thanks to glass fibers in the core. The fibers imparted enough strength

A FEW FIRE-RATED ASSEMBLIES WITH FIRECODE 'C' GYPSUM BOARD

EXTERIOR WALL T-4851-OSU 2 HOUR FIRE RATING

20lb/sq. ft. System: USG Curtain Wall utilizes 358ST10 USG Steel Studs, 16 in. o.c., with 3-in. Thermafiber Metal-Stud Blankets in stud cavity, 5/8-in. Foil-Back Sheetrock Board Firecode 'C' Gypsum Panels on interior side of studs and 1/2-in. USG Gypsum Sheathing on exterior side; 3.4 lb. galvanized self-furring metal lath is applied over sheathing, followed by 1-in. portland cement-lime stucco.

PARTITION—U.L. Design No. U-412 2—HOUR FIRE RATING

54 STC Sound Rating 10 lb./sq. ft. System: 1/2-in. double-layer Sheetrock Brand Firecode 'C' Gypsum Panels on each side of 3-5/8-in. steel studs, 24-in. o.c., 1 1/2-in. Thermafiber Sound Attenuation Blankets in stud cavity (required for sound rating only).

SHAFTWALL U. of C. 5-24-74 4 HOUR FIRE RATING

16 lb/sq. ft. System: USG C-H Steel Studs, 24.in. o.c., with 1-in. USG Shaft Wall Liner Panels installed within the 'C' flanges. On room side of studs 1 in. USG Shaft Wall Liner Panels and 5/8-in. Sheetrock Brand Firecode 'C' Gypsum Panels are screw-applied followed by USG Metal Furring Channels, 24-in. o.c. and double-layer 5/8-in. Sheetrock Brand Firecode 'C' panels.

to allow it to survive for 57 minutes, at which time it developed a large crack and began to fail.

Type C Firecode board was exposed to fire for two hours and two minutes, at which time the test was terminated. There was no sign of failure at the core of the board. Type

C had successfully resisted failure twice as long as Type X, 10 times longer than regular 5/8-inch board.

The test program proved that dimensional stability created by the vermiculite-type shrinkage-compensating additive, and strength developed from glass fibers results in

a gypsum wallboard panel vastly superior to Type X fire-rated boards. Independent testing also shows that Firecode C provide fire-resistance ratings superior to other gypsum drywall board.

Advantages

Where a lesser thickness of fire-rated board can be used to furnish the same fire ratings as provided by a thicker assembly, significant amounts of dead weight can be saved in design and construction of a high-rise building.

The thinner board has benefits for the contractor in that they are more easily handled than thicker boards. Architects can specify ceiling and partition assemblies by test number leaving no doubt about what specific materials the drywall contractor needs to erect them. It also makes bidding the job easier.

Cost Data

Most regular gypsum boards are the same in price. The Type X boards are also competitively priced. Type C boards are slightly higher in cost thickness for thickness.

Before beginning installation of a fire-rated system, it is good policy to verify that the planned application complies with requirements of whatever test has been cited in the specification. Use of the wrong board could be a big problem.