

FIRE ENDURANCE TEST ON INTERIOR SURFACE OF EXTERIOR WALL

On January 31, 1990, Warnock Hersey International, Inc. conducted a fire endurance and hose stream test on the interior surface of an exterior wall designed by National Frame Builders Association. The purpose of this test was to establish a one hour fire rating from the interior of the exterior wall system.

The wall was tested to the following standards:

American Society for Testing and materials (ASTM) Standard Methods of FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS< E-119-88;

National Standard of Canada, CAN4-S101-M82, STANDARD METHODS OF FIRE ENDURANCE TESTS OF BUILDING CONSTRUCTION AND MATERIALS;

Uniform Building Code Standard No. 43-1, FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS.

The construction of the test assembly is briefly described below:

A wall system was built in a 10' x 10' fire test frame. The glue-laminated column centerline was located 1' from the southern end of the frame, and the nail-laminated column centered 8' away. Girts were nailed to columns, spaced horizontally 2' on center, using 2 16d nails at each intersection. The girts were fastened with S-12 screws to nominal 2 x 6 end blocks. The nail-laminated column (north) had fire-stop blocking. Both 2 x 6 blocks were blocked.

Metal cladding was vertically applied using 1/4" hex head screw, 12" on center, into girts and perimeter. 3" thick mineral woolboard was attached to the interior of the exterior girts with 3" square cap nails 1/2" into them. The mineral wool board provided a continuous surface between column, and column and test assembly end blocks.

5/8" thick Gold Bond Fire-Shield G Type X wallboard was horizontally applied to other face. Horizontal joints over girts and vertical joints over north column.

The test assembly was:

- support members: Nominal 6 x 6 glue-laminated column, base with preservative-treated wood and 3 member (nominal 2 x 6) nail-laminated column
- girt: Nominal 2 x 4 girts, 2 feet o.c.
- interior face: one layer 5/8" thick Gold Bond Fire-Shield G Type X gypsum wallboard, horizontally nailed to girts
- exterior face: Metal cladding vertically screwed to girts, 3 inch thick mineral fiber insulation nailed to interior of exterior girts
- load: 10,402 pounds per column; 50% of the glue-laminated, and 49% of the nail-laminated allowable column loads.

The materials used in the test are as follows:

Framing

Glue-Laminated Column:

Rigidply, actual 4.06" x 5.25" x 9'-11 3/4" three-ply nominal 2 x 6 with finger joints (minimum lamina length between joints was 10"), bottom preservative treated, 5.04 pounds per lineal foot, average

Nail-Laminated Column:

Three layers of nominal 2 x 6, KD-19, #2 Southern Pine, actual 4.5" x 5.5" x 9'-11 3/4", average weight 5.0 pounds per foot (Two 6d common nails/foot each face). Grade marked.

Girts:

nominal 2 x 4, KD-19, #2 Southern Pine KD-19

actual 1 12/ x 3 1/2

average weight 1.35 pounds per foot, grade marked.

Interior wall material (wallboard)

Manufacturer's designation: 5/8" thick Gold Bond Fire-Shield G Type X gypsum wallboard

Dimensions: 4' wide x 0.624" average caliper

Weight: 2.53 pounds per square foot, avg.

Certification: Factory Mutual Type FSW-G

Exterior Wall Material (steel cladding)

Manufacturer: National Steel Corporation
Granite City Building Products

Manufacturer's Designation: Strongpanel

Dimension: 38" wide x 10' long x 0.017" average caliper

Width: 0.764 pounds per square foot

Insulation, Mineral Wood Fiber

Manufacturer's Designation: Fibrex FBX 850 BD

Dimensions: 3" x 24" x 48"

Density: 5.8 pounds per cubic foot

Fasteners

16d common girts to columns, fire blocking to column, and for the nail-laminated column

3" long square cap nails, WH Maze #863, insulation to girts

1/4" hex head screws with neoprene and steel washers, 1 1/2" long; Deniston; steel cladding to girts

6d cement-coated nails; 1 7/8" long, .0915 dia. shank, 1/4" dia. head; gypsum wallboard to girts and perimeter

S-12 screws, 3" long; girts to 2 x 6 test assembly edge block

Test Procedure

The wall had a fire exposure of 60 minutes and then the exposed surface of the partition was subject to the impact and cooling of a hose stream for 60 seconds. Throughout the test, a load of 10,402 pounds per column was applied.

Results

The wall system, during the 60 minute fire exposure and 60 second hose stream tests, sustained the applied load without passage of flame or gases hot enough to ignite cotton waste or to allow penetration of water through the assembly during the hose stream. The average temperature of the unexposed surface did not rise more than 250 degrees Fahrenheit above its initial temperature. The high single temperature of the unexposed surface did not rise more than 325 degrees Fahrenheit above its initial temperature.

This loading bearing unsymmetrical assembly, tested from the interior surface, met the criteria of ASTM E-119-88, CAN4-s101-M82 and UBC 43-1 for a 1 hour rating.

Conclusions

The exterior wall described above:

- a) Withstood 1 hour fire endurance test, without passage of flames or gases hot enough to ignite cotton waster.
- b) Resisted heat transmission through the wall during the fore endurance test such that the heat transmitted did not raise the temperature on the unexposed surface more then 250 degrees F above its initial temperature or any individual thermocouple more than 325 degrees F above its initial temperature.
- c) Withstood hose stream test without permitting a projection of water beyond the unexposed surface.

The system designed by the national Frame Builders Association thus meets the requirements for a 1 hour fire rating. This report does not imply system certification. The layer of gypsum wall board as the face of the exterior wall system, provided a 19 minute protection to the interior face girts.

This is just a brief summary of the test report. If you would like a copy of the entire report please contact the Engineering Department at Sentrigard.