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REPORT

on

UNITS, PARTITION PANELS

Under The

CLASSIFICATION PROGRAM

WON-DOOR CORPORATION
Salt Lake City, UT

D E S C R I P T I O N

MATERIALS:

The following is a description of the materials used in the test assembly. For clarity, they are separated into the wall opening assembly and the single sliding partition panel.

WALL OPENING ASSEMBLY

Studs - The studs used to support the gypsum wallboard were fabricated in two sizes, one having a 4 in. web with 1-1/8 in. flanges and 5/16 in. returns and a thickness of 0.032 in. No. 22 MSG, and the other having a 6 in. web with 1-5/16 in. flanges and 5/16 in. returns and a thickness of 0.020 in. (No. 26 MSG). Both types were fabricated from galvanized steel and supplied in 12 ft lengths.

Runners - The runners used at the ends of the studs were fabricated in two sizes, one having a 4 in. web and 1 in. flanges and a thickness of 0.025 in. and the other having a 6 in. web with 2 in. flanges and a thickness of 0.022 in. Both types were fabricated from galvanized steel and supplied in 10 ft lengths.

Wallboard, Gypsum - The wallboard was 1/2 in. thick, Type C, and supplied in 4 ft by 12 ft sheets. The wallboard is Classified in the Fire Resistance Directory and is under the Follow-Up Service of Underwriters Laboratories Inc.

Cornerbead - The cornerbead used at the outside corners of the gypsum wallboard had 1-1/4 in. legs and was fabricated from No. 26 MSG galvanized steel.

Joint System - The joint compound was a dry powder, field mixed. The tape was a perforated paper type.

Wallboard Screws - The screws used to fasten the wallboard to the studs were Type "S" double lead Phillips bugle head, fabricated from case hardened steel. The length was 1 in. for the first (base) layer and 1-5/8 in. for the second (exposed) layer.

Plywood - Plywood used to form the support for the wall header was 23/32 in. (nominal 3/4 in.) thick, rated APA Sturdi 1, floor type, supplied in 4 by 8 ft sheets.

Adhesive - Adhesive used to bond the layers of plywood together was a construction type identified as Formula 38 drywall construction adhesive.

Header Screws - Screws used in conjunction with the construction adhesive were Type "G", 1-1/2 in. long steel.

Hangers - Hangers used to support the plywood header were 1/2 in. diameter steel threaded rods 24 in. long used with steel washers and steel nuts.

SINGLE SLIDING PARTITION PANEL

The partition panel was produced and was eligible for Classification as a Fire Door described as a horizontal-single sliding accordian-type. The Fire Door was tested with the corresponding frame assembly and hardware.

The partition panel assembly consisted of a track and trolley system, floating jamb, striker jamb, folding panels, and an automated closing system.

The partition panel was designed to fit into an opening of 135 in. in width and 108 in. in height.

The folding curtains of the wall assembly consisted of painted steel sections having thermal insulation secured to the back by means of spring clips. The individual folding curtains were connected together by means of steel hinges inserted into grooves located along the vertical edges of the individual panels. The curtains (front and back) were then mechanically fastened together at their side locations by means of channels at the floating jamb and by means of the lead post to form the completed wall assembly.

CONSTRUCTION OF TEST ASSEMBLY:

Wall Component - The opening into which the partition panel was installed was constructed as follows:

To assure that proper support was attained, at the header, 1/2 in. thick by 30 in. wide steel plates were welded to the underside of the test frame by means of 2 in. by 2 in. steel angles which in turn had been welded to the test frame at the corresponding spacing to receive the plates. Steel threaded rods were welded to the plates with steel nuts as a temporary attachment. The rods were spaced 18 in. OC in the field and 12 in. OC at the stacking location (at the floating jamb) and were in two rows spaced 15 in. OC. A wood header was fabricated on the ground from three layers of 3/4 in. plywood with the layers bonded together using construction adhesive and Type "G" screws. Steel nuts were threaded onto the rods for leveling the header. After proper curing of the adhesive, approximately 24 h, the wood header was placed in the assembly and suspended from the threaded rods using steel nuts and steel washers as required. The header was leveled as necessary using the steel nuts and washers above and below the header.

The wallboard was attached to the plywood in two layers using 1 in. Type "S" screws for the first layer and 1-5/8 in. Type "S" screws for the second layer.

Steel runners, 6 in. wide, were fastened to the wood header and sill at the striker jamb using masonry anchors at the sill and Type "S" screws at the header. The 6 in. wide steel studs were fastened to the runners and the masonry wall using masonry anchors at the wall and Type "S" screws at the runners. The studs were spaced to allow a pocket to accept the striker jamb.

Steel runners, 4 in. wide, were fastened to the header and sill in the same manner as at the striker jamb at a width allowing insertion of the floating jamb assembly of the fire door. The wall area above the header was erected using 4 in. wide studs and runners. At the fire side of the wall the upper runner was welded to the 1/2 in. steel plates and the studs were fastened, with screw to the runner at a spacing of 24 in. OC. The lower runner was then attached to the studs with the same type screws. Wallboard was attached to the section in two layers with 1 in. long screws used for the first layer and 1-5/8 in. long screws used for the top layer. Wallboard extended below the plywood header. The lower runner was then fastened to the plywood header through its flange. The unexposed wall was fabricated on the ground using the runners and studs cut to the correct height and with a length allowing an opening for installation of the firewall motor. The two layers forming the interior of the wall were fastened to the studs on the ground and the assembly was lifted into place and held temporarily while the upper runner was welded to the steel plates and the lower runner was fastened to the plywood header using Type "S" screws. An opening to allow access to the fire door motor was constructed at the floating jamb side completing the unexposed wall above the firewall assembly.

The wallboard was fastened to the remaining areas in two layers installed on each side of the assembly. The taping system was applied to the exposed surfaces with corner beads used at all outside corners. A second coat of compound was applied approximately 24 h after the first coat was applied. An access door was fabricated from two layers of wallboard to enclose the opening for the motor.

The finish opening was 12 ft, 0 in. wide and 9 ft, 0 in. high to the bottom of the header. The depth from the bottom of the soffit to the bottom of the header was 3-1/4 in. The pocket at the striker jamb measured 4-1/16 in. wide and 4-3/16 in. deep while the pocket at the floating jamb was 18 in. wide and 8 in. deep. The wall opening under construction is shown in ILLS. 2 to 8.

INSTALLATION OF FIREWALL ASSEMBLY:

The test assembly was built into the gypsum wallboard wall constructed as described above. The track system was installed in the header in two parallel tracks using 1/4 in. diameter steel toggle bolts inserted into holes drilled through the track, wallboard, and plywood header. Steel washers were used with the toggle bolts. During installation of the track system, a hole for the motor drive unit was drilled into the header.

The stabilizing bar was placed in the track and the installation of the track was completed.

The motor drive unit was located in the chase area above the plywood and attached to the plywood using wood screws. The drive shaft engaged the drive gear located in the track.

The chain was installed in the assembly engaging the stabilizer bar, idler gear and motor.

The striker jamb was installed using No. 10 by 2-1/2 in. screws at the end away from the motor. The lead post was installed in the track and connected to the stabilizer bar followed by installation at the lower half of the stabilizer bar. The panel sections were placed in the track and the floating jamb was also placed in the track.

The various electrical wires were installed or adjusted as necessary.

The splice hinges, used to connect panel segments were installed creating a single folding panel on each track.

The floating jamb was connected to the frame using the 2-1/2 in. self-drilling screws spaced 18 in. OC driven through the studs. The north end of the panels was fastened to the floating jamb using the 2-1/2 in. self-drilling screws spaced 18 in. OC. The panels were fastened at the south end to the lead post using No. 8 by 3/4 in. self-tapping screws spaced 16 in. OC.

A soffit section was inserted on both sides of the track using No. 8 by 3-1/2 in. screws 36 in. OC, 4 in. from the butt ends. The control box was surface mounted approximately 5 ft from floor level at the floating jamb side. Electrical connections were made and the wall was tested for correct operation. The installation of the firewall assembly is shown in ILLS. 9 to 17. The exposed and unexposed surfaces of the assembly before test are shown in ILLS. 18 and 19, respectively.

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T E S T R E C O R D N O. 1

FIRE ENDURANCE TEST:

SAMPLES

The test assembly measured 11 ft, 4 in. wide by 9 ft, 0 in. high and was erected in the test frame as previously described.

METHOD

The fire test was conducted in accordance with the Standard Fire Tests of Building Construction and Materials, ANSI/UL 263 (ASTM E119, NFPA No. 251).

The furnace temperatures were measured with 12 thermocouples symmetrically located in the furnace chamber positioned 6 in. from the exposed face of the assembly. The location of these thermocouples is shown in App. A, ILL. 1.

Temperatures of the unexposed surface were measured by twelve thermocouples, each covered with a 6 by 6 in. ceramic fiber pad. The location of these thermocouples is shown in Appendix A.

Temperatures of the inner wall of the assembly are shown, for general information purpose, in Appendix A, ILL. 2.

Temperatures of the header were measured by three thermocouples located as shown in App. A, ILL. 2.

Temperatures of the motor shaft were measured as shown in Appendix A for general information purposes.

Throughout the test observations were made to note the character of the fire and its control, the condition of the exposed and unexposed surfaces of the wall, and all developments pertinent to the performance of the assembly as a fire retardant with reference to stability, heat insulation, passage of flame, and generation of smoke.

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RESULTS

Character and Distribution of Fire - The fire was luminous and well distributed, and the temperatures developed followed the Standard Time-Temperature curve, as shown in App. A, ILL. 1 and as specified in the Standard.

Observations of the Exposed and Unexposed Surface - The following observations were made during the fire test. All references to dimensions are approximate.

Time:min	Observations
1	The exposed surface was bowed inward at the edges and also at the fire side in the central area.
4	The exposed surface was flaming with the greatest amount of flaming observed at the lower area of the assembly.
5	No changes were observed in the unexposed surface of the assembly.
7	The corner beads at the exposed surface were buckling from the heat. Flaming appeared throughout the exposed surface of the assembly. The exposed surface was also bowed about the same as noted previously.
10	No changes were observed in the condition of the assembly from previous notations.
11	The exposed painted surface was charred and there was no flaming emanating from the assembly.
15	No changes were observed in either the unexposed or exposed surfaces.

Time:min	Observations
17	Smoke began to emanate from the upper surface of the exposed side of the assembly at the approximate center area at the header. The assembly felt cool to the touch at the upper one-third of the assembly.
20	Smoke was emitted from the top of the unexposed surface at the right hand side. There were no other changes on the unexposed surface. However, smoke was emitting from the top of the wallboard area at the edge of the framed portion of the assembly. This location was not part of the fire wall assembly area.
25	The smoke continued to emit from the upper area of the wallboard.
26	The exposed surface was about the same as noted previously.
26:30	There was flaming in the exposed surface of the assembly at the center. This flaming appeared to be caused by the lower sweep beginning to burn.
31	The flaming of the sweep had ceased.
33	Smoke was emitting once again at the header in the center and in the right hand portion. The smoke at this time was white. There was some cracking sounds heard coming from the furnace. There were no changes in the exposed surface. The upper area of the assembly was about the same as observed earlier but with more charred areas and a deeper char present in the assembly.

Time:min	Observations
37	Smoke continued to emanate from the header at the right corner. The surface of the unexposed surface was hot to a point where it was very uncomfortable to the touch. The lower 3 ft was still cool to the touch.
43	There were no flames either emanating outward from the assembly or through the assembly. The wallboard components were buckling slightly throughout the assembly.
47	There was flaming in the upper header as observed from the exposed surface. This flaming was at the right hand side of the assembly when facing the assembly from the unexposed surface. The upper sweep was burned away in some areas in the unexposed surface. The smoke continued to emanate from the assembly at the header. There were some areas where smoke discoloration had occurred. These areas were at the approximate center of the assembly.
50	Two thermocouples on the unexposed surface, Nos. 11 and 16, malfunctioned. This was corrected by switching to alternate channels.
51	The flaming on the exposed upper header had ceased. The unexposed upper header was about the same with the upper sweep continuing to soften. At intervals, parts of the upper sweep dropped from the assembly. The smoking in the header appeared to increase slightly at the right hand side of the assembly.
55	At intervals, cracking or popping sounds were heard emanating from the assembly.

Time:min	Observations
59	The assembly was in about the same condition as observed earlier. Smoke continued to emanate and the upper sweep continued to melt with the material dropping at intervals. There was smoke at the right corner.
90	The smoking coming from underneath the lintel continued. There was scorching of the gypsum board in the immediate corner in the upper south side of the wall.
91	The sweep at the top of the door had begun to drip and fall from the top. Some had collected on the wall itself and some had fallen to the bottom sill area.
130	Gas off.

Temperature of the Unexposed Surface - The limiting average temperature is reached when heat transmission through the assembly is sufficient to raise the average temperature 250°F above the ambient temperature or when the temperature at an individual point rises 325°F above the ambient temperature. In this test, the initial temperature was 79°F. Therefore, the average limiting temperature was 329°F and the individual limiting temperature was 404°F. Neither the average limiting temperature or the individual temperature were reached at 120 min. At that time, the average temperature was 307.6°F and the maximum individual temperature was 394°F.

HOSE STREAM TEST:

The hose stream was applied to the exposed surface of a test assembly identical in construction details and materials to that described in this Report but which had a lesser thickness of thermal blanket. The assembly had been subjected to a 2 h fire exposure.

METHOD

The hose stream test was conducted in accordance with the Standard ANSI/UL 263. The assembly was subjected to the action of a 30 psi hose stream applied for a duration of 2-1/2 min to the exposed area. The hose stream was applied with a 1-1/8 in. diameter nozzle at a perpendicular distance of 20 ft from the center of the test assembly. The area of the assembly measured 9 ft by 11 ft, 4 in.

RESULTS

Projection of water was not noted beyond the unexposed surface of the test assembly. During the test, the assembly bowed outward but the header and jambs did not tear away from the brick walls. The wall did not release from the jambs. The wall remained in the tracks on both the exposed and unexposed sides.

The appearance of the unexposed surface of the assembly after the hose stream test is shown in ILLS. 20 and 21.

The appearance of the exposed surface of the assembly after the hose stream test is shown in ILLS. 22 and 23.

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OBSERVATIONS AFTER THE FIRE TEST:

The unexposed surface of the assembly was basically unchanged from the start of the test. The vinyl sweep at the top of the panels was melted away in most areas and had fallen to the floor. The lower sweep had little damage. The upper corner of the assembly at the strike jamb had a discolored area from smoke.

The gypsum wallboard was unaffected by the fire except for some smoke discoloration. The interior surface of the ceramic blanket protection was discolored in some areas, especially at the header and sill locations.

The exposed surface of the wall panels was blackened and brittle with the individual hinges having restricted movement because of charring and buckling. The vinyl sweeps at the top and bottom of the panels were burned away. The gypsum wallboard was in place with slight cracks. Both layers were brittle and crumbled when tested for strength. When the plywood header was examined charring was found but the header was still structurally sound. The jambs were in place and the header track of the wall unit was still in place fastened to the plywood header. The fire insulation material was discolored but remained in place fastened to the two walls. The roller assemblies were in place in the track and the lead post was locked into the lead post jamb.

STUDY FOR CLASSIFICATION:

As part of the evaluation of this assembly, temperatures were monitored on the unexposed side of the header lintel which consisted of plywood protected by two layers of 1/2 in. thick gypsum wallboard. At the locations monitored the maximum individual limiting temperature rise of 325°F above ambient was recorded at 88 min (401°F). The maximum temperature recorded at 120 min was 444°F. To compensate for this temperature rise a third layer of the 1/2 in. thick gypsum wallboard will be specified. Experience with multiple layer gypsum wallboard protection does indicate that within the applicable temperature limits experienced under this fire test that the third layer of 1/2 in. gypsum wallboard would adequately reduce the maximum recorded unexposed surface temperatures.

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C O N C L U S I O N

The following conclusions represent the judgement of Underwriters Laboratories Inc. based upon the results of the examination and tests presented in this Report as they relate to established principles and previously recorded data.

FIRE RESISTANCE PROPERTIES:

It is judged that single sliding wall and partition assembly constructed as described herein will afford 2 h protection against the passage of flame and dangerous transmission of heat when exposed to the fire on liner side only.

No passage of flame, smoke, or hot gases through the wall assembly occurred during the fire exposure period. The transmission of heat through the assembly did not raise the average temperature of the unexposed surface over the allowable 250°F or over 325°F for any single temperature reading during the 2 h classification period as specified in the test standard.

The assembly in summarized form, as shown on the individual design and illustration included in this Report will be described in the building materials list as wall and partition Design No. U520.

PRACTICABILITY:

The assembly described herein is practical for its intended use and can be erected without undue difficulty.

CONFORMITY:

This construction was tested in accordance with the Standard of Underwriters Laboratories Inc. for Fire Tests of Building Construction and Materials, ANSI/UL 263 (ASTM E119, NFPA 251).

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FOLLOW-UP PROGRAM:

The single sliding Partition Panel Unit as described herein, is judged to be eligible for Classification and Follow-Up Service of Underwriters Laboratories Inc. Under the Service, the manufacturer is authorized to use Underwriters Laboratories Inc. Classification Marking on those products which comply with the Follow-Up Service Procedure, and any other applicable requirements of Underwriters Laboratories Inc. Only those products which properly bear Underwriters Laboratories Classification Marking are considered as Classified by Underwriters Laboratories Inc.

The Classification Marking to be used on the Partition Panel Unit and Framing Assembly is illustrated below.

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CLASSIFIED
UNITS, PARTITION PANEL
FIRE RESISTANCE CLASSIFICATION
DESIGN NO. U520
SEE UL FIRE RESISTANCE DIRECTORY

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