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File R6799-2
Project 97NK30045

November 20, 1997

REPORT

on

SPECIAL PURPOSE TYPE FIRE DOOR for

Won Door Corporation
Salt Lake City, UT

DW/HJG:tjm
NKDLS

GENERAL

The object of this investigation was to establish a fire resistance Classification for the single sliding door assembly, erected and constructed of materials conforming in quality and physical properties to those described herein, by means of the fire endurance and hose stream tests conducted in accordance with the Standard for Fire Tests of Door Assemblies, UL 10B (NFPA 252, CAN 4-S-104).

The subject of this Report is a fire test conducted on an assembly consisting of a single sliding special purpose type fire door (front and back) panels connected at their sides. The fire *door consisted of a track support system, jambs, parallel folding curtains, and automated closing system. The fire test assembly was installed in a manner wherein the track system was secured to a plywood header protected by gypsum wallboard. The *plywood was attached to the lintel with steel threaded rods. The sides of the track system were then enclosed with wallboard in a typical wall construction to prevent the passage of flames *through the air space created by the studs. This represented *an installation in which the top of the door would be recessed *slightly above a ceiling.

Consideration was given to the natural tendency of the partition wall to rotate, or pivot around the track system thereby creating the possibility for the bottom edge to be pulled past the fire side edge of the test frame sill into the furnace. To prevent the above condition (which would not occur in an actual field installation due to the continuity of the floor) the test assembly was provided with a steel angle at the rear edge of *the test sill.

DESCRIPTION

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 accordion door assembly.

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 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 layer, and *2-1/4 in. for the third (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.

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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 used with steel washers and steel nuts.

* SINGLE SLIDING DOOR ASSEMBLY

*

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

*The door was designed to fit into an opening of 156 in. in width and 140-1/4 in. in height.

*The folding curtains of the door assembly consisted of painted steel sections. 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 door assembly.

CONSTRUCTION OF TEST ASSEMBLY:

* Wall Component - The opening into which the door 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 by 2 in. ,:eel 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, approx 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.

Wallboard (5/8 in. Type X) 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. Soffit formed of three layers of 1/2 by 3-5/8 in. wallboard was attached under the 5/8 in. wallboard out at both extreme edges of the header, creating a recessed cavity in which to install the tracks in the center of the header. The recessed cavity was 10-3/4 in. wide.

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 three layers with 1 in. long screws used for the first layer and 1-5/8 in. long screws used for the middle layer and 2-1/4 in. long screws 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. The three 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.

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The wallboard was fastened to the remaining areas in three 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.

The finish opening was 13 ft, 3/8 in. wide and 11 ft, 8-1/4 in. high to the bottom of the drywall. The depth from the ceiling line 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 14 in. ceiling line deep.

INSTALLATION OF FIRE DOOR ASSEMBLY:

The test assembly was built into the gypsum wallboard wall constructed as described above. Two steel tracks were installed parallel in the header between an aluminum center track using 3-1/2 in. No. 10 bugle head drywall screws.

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

The motor drive unit was located in the pocket area below the plywood and attached to the plywood using wood screws. The drive shaft engaged the drive gear located in the center 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 floating jamb was placed in the track followed by the panel sections.

The various electrical wires were installed or adjusted as necessary.

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The sections on each side were jointed together by forcing the hinge bead into the panel groove at the section joints, creating a single folding curtain on each track.

The 6 in. long floating jamb stops were connected to the frame approx 54 in. above the floor on the inside pocket walls back 5 in. from the pocket opening using 2-1/2 in. self-drilling screws staggered 1-1/2 in. apart and driven through the studs. The north trailing end of the panels was fastened to the floating jamb using 7/16 in. self-drilling screws spaced 18 in. OC. The panels were fastened at the leading end to the lead post panels by forcing the bead of the lead post panels into the panel grooves. The leading edge switch actuator assemblies were riveted to one side of the lead post panels with the actuator extended out of the leading edge of the post being formed. The diagonal bar of the stabilizer assembly was then bolted to the drive trolley and the bottom foot of the bar was riveted to one side of the lead post panels. The appropriate wires were connected. The lead post parts were overlapped and attached to the stabilizer trolley with 5/16 in. bolts. The post assembly was completed by riveting with 1/8 in. steel pop rivets the remaining lead post panel to the actuator brackets and the bottom foot of the diagonal bar. The aluminum leading edge cap with integral PVC smoke seals on the sides was then hung from the top of the post and riveted in place at the bottom of the post with a steel pop rivet so that when pushed, the leading edge switches were activated.

The control box was surface mounted approx 5 ft from floor level at the floating jamb side. Electrical connections were *made and the door was tested for correct operation.

DESCRIPTION OF ILLUSTRATIONS

ILLUSTRATIONS	DESCRIPTION
ILL. 1 -	Exposed side of door assembly before fire test.
ILL. 2-	Unexposed side of door assembly before fire test.
ILL. 3 -	Furnace temperatures.
ILL. 3A -	Furnace Pressures.
ILL. 4 –	Exposed side immediately after fire test and before hose stream test.
ILL. 5 –	Reserved
*ILL. 6 –	Reserved
*ILL. 7 -	Reserved

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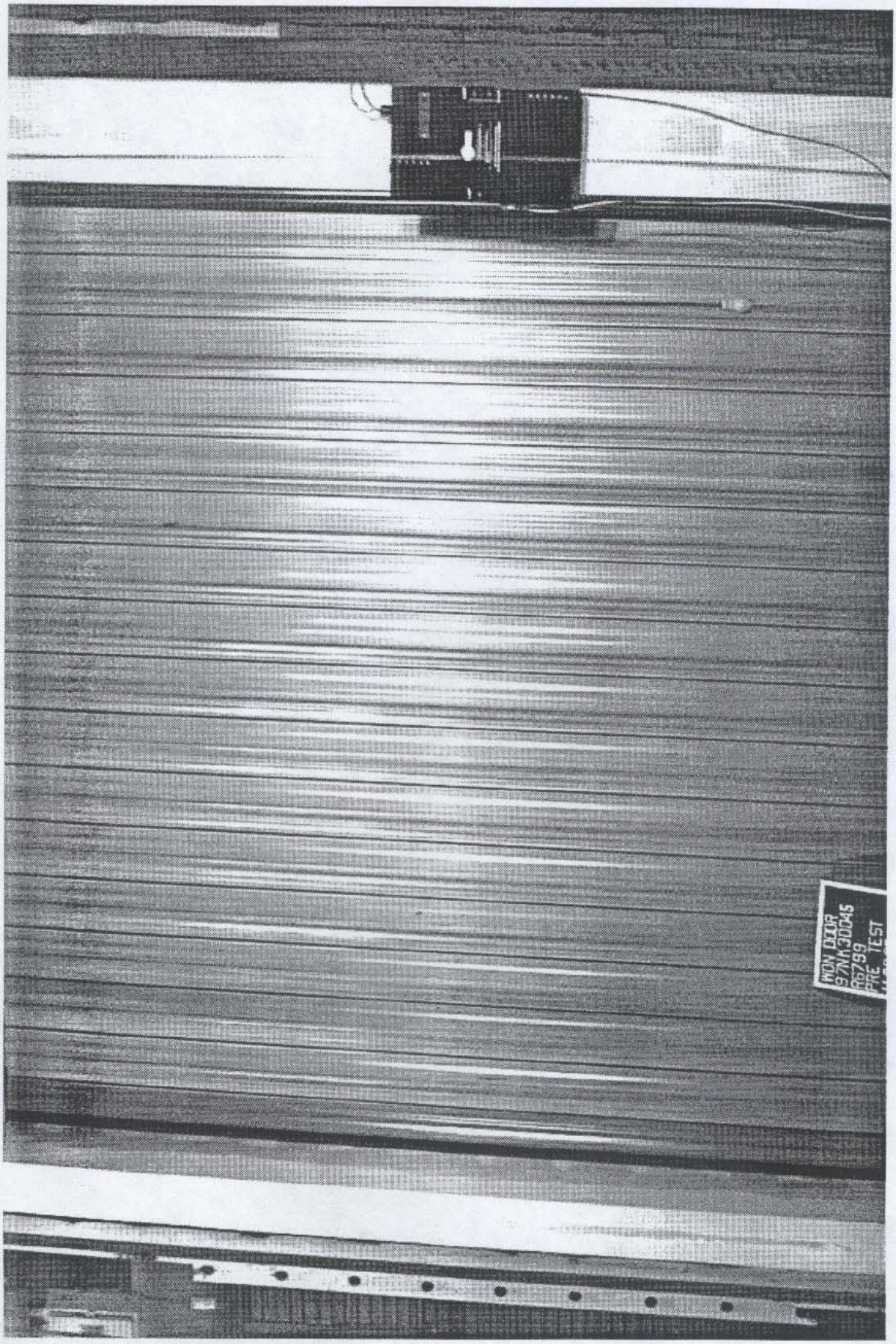
PRE TEST
11 20 97

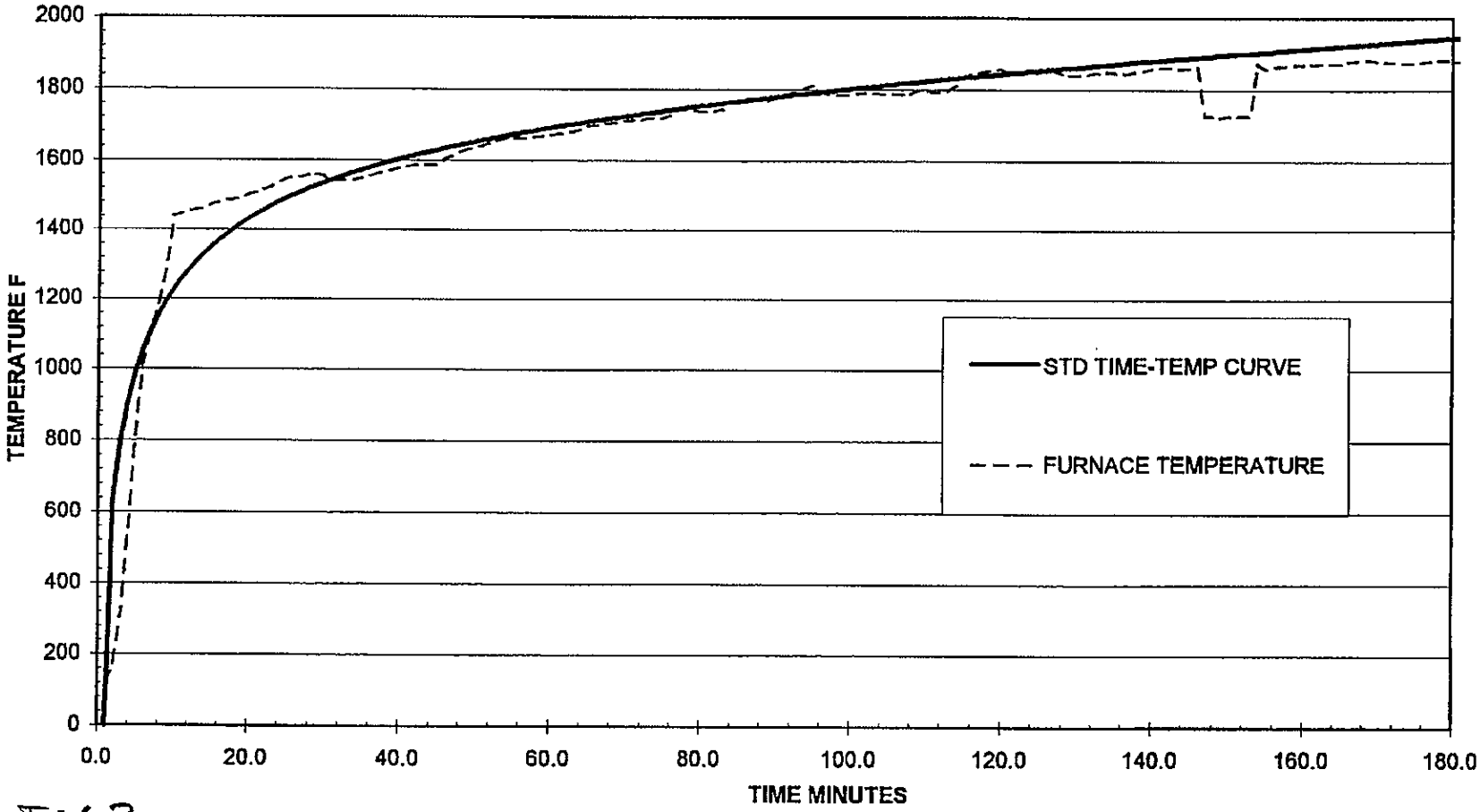


N98-08337

ILL-3

WON DOOR

FURNACE TEMPERATURE



ILL3

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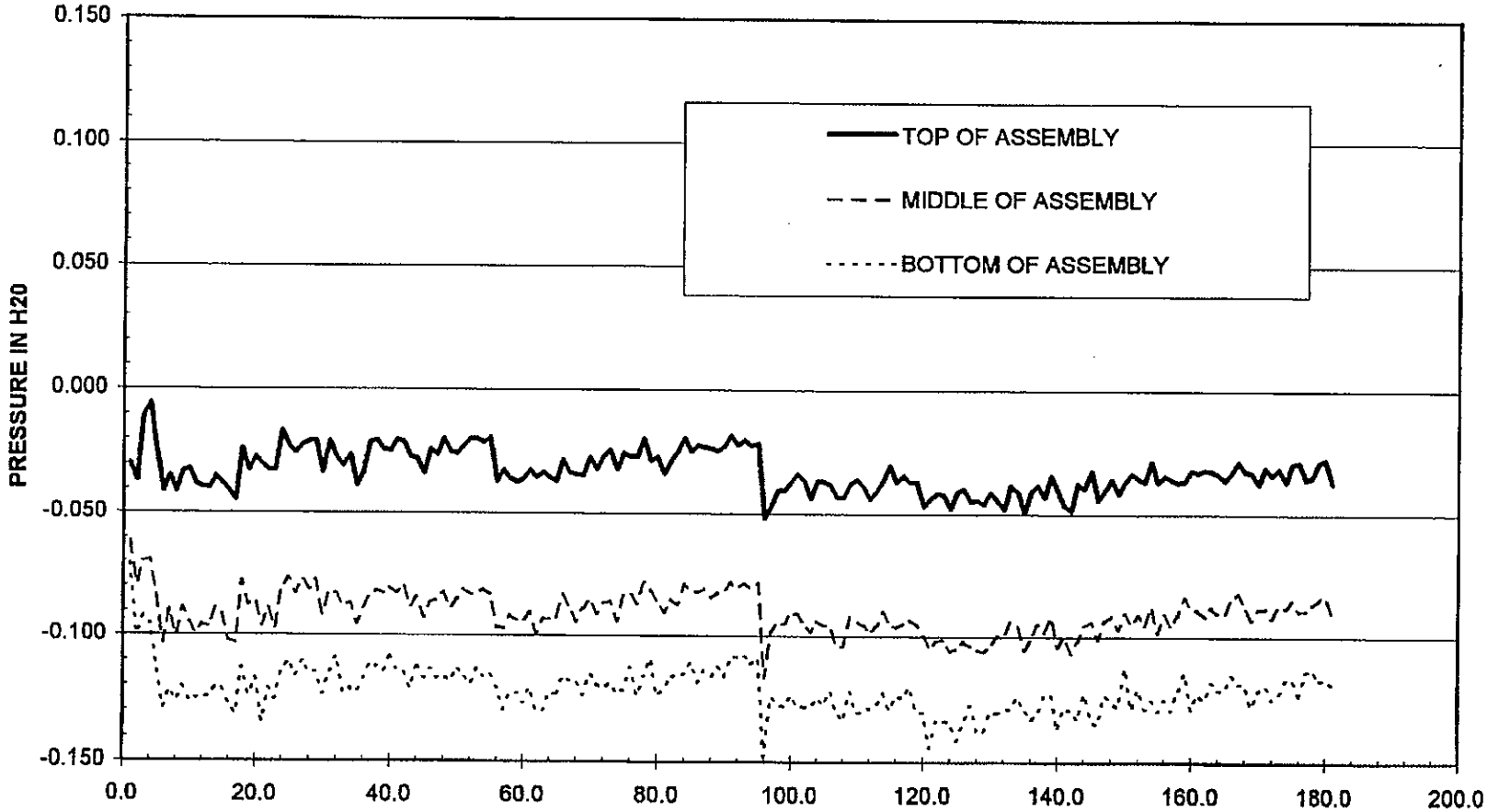
ILL-3A

WON DOOR

FURNACE PRESSURES



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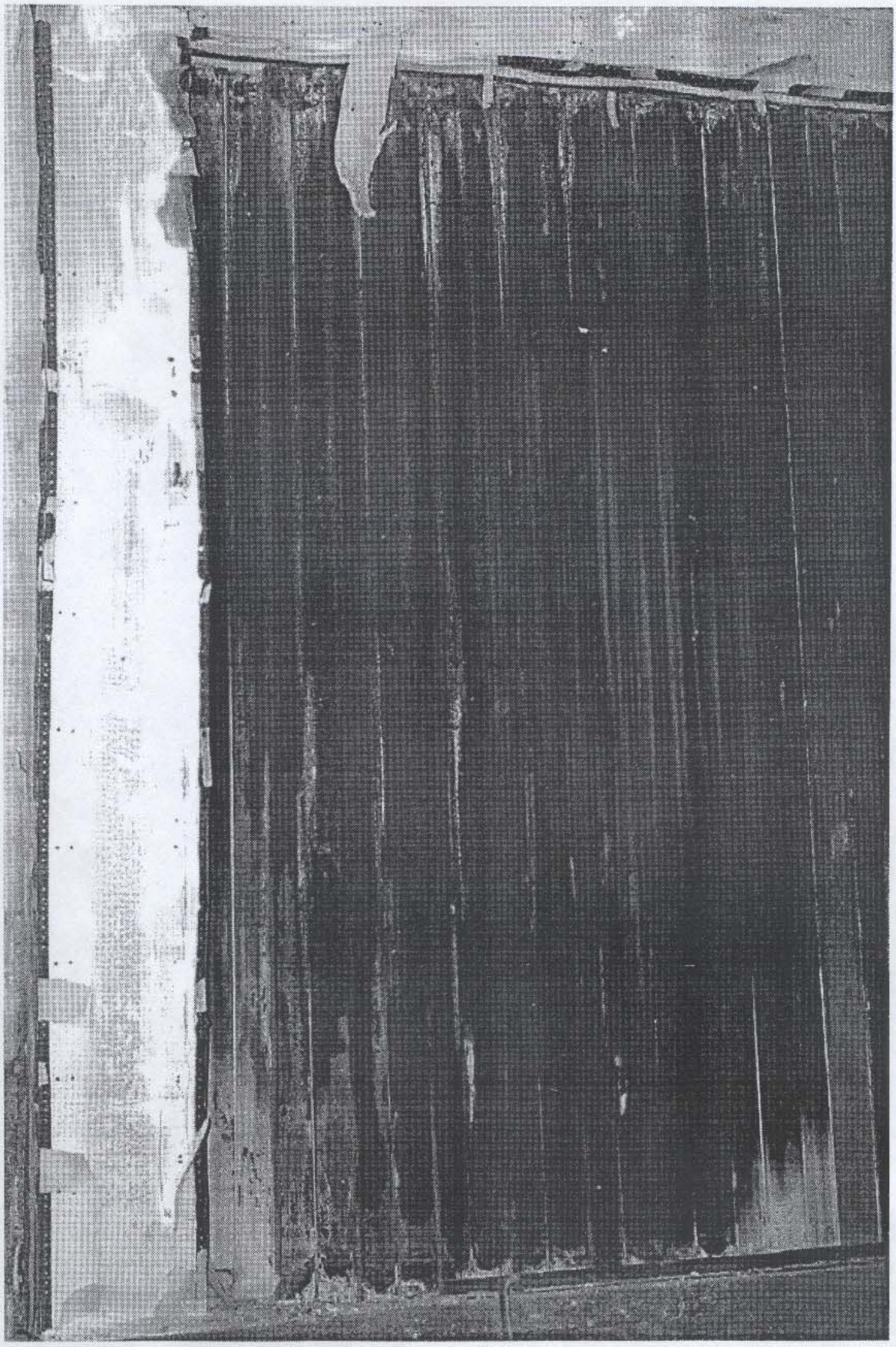

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TEST RECORD NO. 1

FIRE ENDURANCE TEST:

SAMPLES

The test assembly measured 13 ft, 3/8 in. wide by 11 ft, 8 in. high and was erected in the test frame as previously described.

METHOD

After the concrete sill had seasoned, the fire test was conducted in accordance with the Standard for Fire Tests of Door Assemblies, UL IOB.

Throughout the fire test, observations were made on the character of the fire, the condition of the exposed and unexposed faces and all developments pertinent to the performance of the doors as a fire retardant with special reference to stability and flame passage.

RESULTS

Observations of Exposed Face - The fire was luminous and well distributed during the fire test. The temperatures within the furnace chamber were controlled in accordance with the Standard Time-Temperature Curve as shown on ILL. 3 and on Page 6 of the Standard for Fire Tests of Door Assemblies, UL 10B.

The pressure in the furnace chamber was maintained as nearly equal to atmospheric pressure as possible. Measurements of the static pressure during the fire exposure test were made using two pressure taps, and located at the top of the door and one located 2/3 from the top of the door. See ILL. 3A.

Observations of the Exposed 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.
180	Gas off.

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Observation of Unexposed Side - The deflection of the door assembly was determined by measurements along the horizontal centerline of the door at the leading and trailing edges along with the center of the door assembly. The measurement reference line was a fine, taut steel wire spanning the width of the opening.

The deflections of the door and frame assembly towards the fire during the fire exposure were as indicated below:

	Total Deflection, in.		
Fire Exposure Time, min.	Lead	Center	Trail
15	0.5	1.5	0.125
30	0.5	1.0	0.250
45	0.5	1.5	0.250
60	0.5	1.5	0.250
90	0.5	1.5	0.250

Time:min	Unexposed Observations
1	Smoke from top of assembly.
60	No change.
120	No change.
180	Gas off.

At the completion of the fire exposure, no through openings were evident and the lead post remained securely in position for the entire duration of the test. There was no evidence of flaming on the unexposed side of the test assembly for the entire duration of the test.

The hardware did hold the door closed in accordance with the conditions of acceptance for an exposure of 3 h and the door remained in the guides. In addition, the guides did not loosen from their fastenings.

The seal materials on the top and bottom of the door assembly did not deteriorate sufficiently to result in through openings during the fire endurance test.

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HOSE STREAM TEST:

METHOD

Immediately after the 180 min fire exposure, the assembly was withdrawn from the furnace and subjected to the impact and cooling effects of the 30 psi hose stream for 7 min, 3 s, as specified in the Test Standard for a 180 min fire exposure.

RESULTS

Projection of the water was not 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 walls. The door did not release from the jambs. The door assembly remained in the tracks on both the exposed and unexposed sides.

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CONCLUSION

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

FIRE RETARDANT PROPERTIES:

There was no evidence of flaming on the unexposed surface of the door assembly throughout the entire duration of the test.

The hardware held the door closed in accordance with the conditions of acceptance for the entire fire exposure period and the door assembly remained securely within its guides. In addition, the guides did not loosen from their fastenings.

The test assembly withstood the fire endurance test without developing openings anywhere through the assembly.

The seal materials did not deteriorate sufficiently to result in through openings during the fire endurance test.

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The door mounted in the guides did not release from the guides and the guides did not loosen from their fastenings.

*There was no evidence of through openings in the assembly at the completion of the fire and hose stream test.

FOLLOW-UP PROGRAM:

The single sliding door 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.

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The Classification Marking to be used on the Special Purpose Fire Door, 3 h.

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