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WHI TEST REPORT #630-104800  
FIRE RATED DOORS

REPORT OF TEST OF GASKETING FOR RESISTANCE TO  
AIR FLOW AT ELEVATED TEMPERATURE  
TO DETERMINE EFFECTIVENESS AS A SMOKE  
CONTROL DOOR SEAL

FOR

SEALEZE CORPORATION  
RICHMOND, VIRGINIA

BY

WARNOCK HERSEY INTERNATIONAL, INC.  
8431 MURPHY DRIVE  
MIDDLETON, WISCONSIN 53562

TEST DATE: MAY 28, 1991  
REPORT DATE: JUNE 14, 1991

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## INTRODUCTION

Warnock Hersey International, Inc. conducted smoke leakage tests on Sealeze Corporation's Therm-L-Brush II product on May 28, 1991. The tests were conducted in accordance with UL standard UL 1784, First Edition, June 29, 1990. "Standard for Air Leakage Tests of Door Assemblies". A 1" long Therm-L-Brush II products was tested applied to a 3'0" x 7'0" hollow metal door mounted in a steel frame.

## DESCRIPTION

The Sealeze Corporation Therm-L-Brush II is a brush type gasketing consisting of a dense pile of fine proprietary nylon filaments. The brush is supplied on a metal spline, which slides into extruded aluminum mounting strips also manufactured by Sealeze Corporation.

The smoke control door assembly tested was a standard 3'0" x 7'0" hollow metal steel door mounted in a steel fire door frame with 5.8" high stops. The Therm-L-Brush assembly with 1" long bristles mounted in aluminum holders supplied by the manufacturer was applied to the frame stops with self-drilling screws. The screws were applied at 6" centers through slots prepared in the aluminum holders. The holders provide a 45° angle between the brush and door surface.

The gasket was adjusted following the written instructions supplied with the product by Sealeze Corporation.

## PROCEDURE

The doors were mounted in the frame and adjusted to obtain a 1/8" gap between the edges and top of the door and the frame. The frame used was a communicating type so that the doors used could be mounted in either an in-swing or out-swing position. The doors were mounted with standard 4" hinges at three locations and a single point cylindrical latch. The gasketing was applied to the frame stop and adjusted so that the brush material was deflected at 30° from straight when the door was closed.

The same mounting and test procedure was used for both the in-swing and out-swing test configurations with a new door and brush used for each test.

After installation of the door, frame and gasket, the door was cycled open and closed five times. The closing force was then measured following the procedure specified in the test standard.

Background leakage rates were measured at both ambient and elevated temperatures by sealing the door to the frame with aluminum foil tape. Air leakage measurement was made at pressure differentials of .05, .10, .20 and .30 inches of water column at both ambient and elevated temperatures. For all tests the threshold and bottom 2 inches of the door were sealed with aluminum tape.

## EQUIPMENT

The following equipment was used to conduct the test and measurements.

|   | <b>Measured Parameter</b> | <b>Instrument</b>                        | <b>Accuracy</b>  |
|---|---------------------------|--|------------------|
| 1 | Air Flow                  | Orifice Plate/Inclined Manometer         | $\pm 2\%$        |
| 2 | Chamber Pressure          | Inclined Manometer                       | $\pm .002"$ w.c. |
| 3 | Chamber Temperature       | Array of 12 Type K Thermocouples         | $\pm 1.5$ °F     |
| 4 | Make-up Air Temperature   | Type KJ Thermocouple and Digital Readout | $\pm 1$ °F       |
| 5 | Barometric Pressure       | Mercury in Glass Barometer               | $\pm .01"$ Hg.   |

The test chamber is constructed of structured steel and is sealed with RTV silicone at all joints. The frame/door assembly was mounted in a wood stud/gypsum wall assembly mounted to the face of the chamber. All joints within the wall assembly and between the wall and door frame were sealed with silicone caulk.

## RESULTS

The following air leakage rates were obtained.

### TEST 1.

Swing Direction: Out-Away from chamber  
 Hinge Side: Left  
 Closing Force: 6 lbf.

| TEST PRESSURE<br>(M.W.C.) | TEST TEMP.<br>(°F) | NET LEAKAGE<br>(SCFM) | LEAKAGE RATE<br>(SCFM/FT <sup>2</sup> ) | MAX. PER NEPA<br>105 REQ.<br>(SCFM/FT <sup>2</sup> )   |
|---------------------------|--------------------|-----------------------|---|--|
| 0.05                      | 81                 | 9.73                  | 0.46                                    | 3 (ELEVATOR LOBBY)<br>6 (ELEVATOR PRES. HOIST WAY)     |
| 0.10                      | 81                 | 15.81                 | 0.75                                    |  |
| 0.20                      | 82                 | 25.52                 | 1.22                                    | 11 (STAIR ENCLOSURE<br>PRESSURIZED)                    |
| 0.30                      | 82                 | 30.33                 | 1.44                                    |  |
| 0.05                      | 406                | 8.35                  | 0.40                                    | 1.5 (ROOM TO CORRIDOR- PRESS.)<br>1.0 (CROSS CORRIDOR) |
| 0.10                      | 402                | 16.49                 | 0.79                                    | 1.5 (ROOM TO CORRIDOR)                                 |
| 0.20                      | 408                | 19.13                 | 0.91                                    | 2 (AREA OF REFUGE)                                     |
| 0.30                      | 400                | 34.01                 | 1.62                                    |  |

### TEST 2.

Swing Direction: In=Into chamber  
 Hinges: Left  
 Closing Force: 5 lbf.

| TEST PRESSURE<br>(IN. W.C.) | TEST TEMP.<br>(°F) | NET LEAKAGE<br>(SCFM) | LEAKAGE RATE<br>(SCFM/FT <sup>2</sup> ) | MAX. PER NEPA<br>105 REQ.<br>(SCFM/FT <sup>2</sup> )     |
|-----------------------------|--------------------|-----------------------|---|--|
| 0.05                        | 83                 | 11.8                  | 0.56                                    | 3 (ELEVATOR LOBBY)<br>6 (ELEVATOR PRESE. HOIST<br>WAY)   |
| 0.1                         | 82                 | 18.04                 | 0.86                                    |  |
| 0.2                         | 83                 | 27.99                 | 1.33                                    | 11 (STAIR ENCLOSURE<br>PRESSURIZED)                      |
| 0.3                         | 83                 | 39.67                 | 1.84                                    |  |
| 0.05                        | 395                | 0.41                  | 0.02                                    | 1.5 (ROOM TO CORRIDOR-<br>PRES.)<br>1.0 (CROSS CORRIDOR) |
| 0.1                         | 406                | 5.06                  | 0.24                                    | 1.5 (ROOM TO CORRIDOR)                                   |
| 0.2                         | 402                | 12.81                 | 0.61                                    | 2 (AREA OF REFUGE)                                       |
| 0.3                         | 400                | 21.54                 | 1.03                                    |  |

## CONCLUSION

All leakage rates were below the maximum suggested in NFPA 105 (1989 Edition) when the door bottom was sealed.

Bottom seals were not evaluated in this project due to the wide range of floor covering materials which are likely to be encountered in the field and the fact that bottom seals are not usually required for smoke control purposes. Bottom seals when required should be specifically evaluated in combination with floor covering type and an appropriate leakage rate factor added to the measured leakage rate for the rest of the smoke control assembly.