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Subjects 10C (10, 10A, 10B)
 (In reply, refer to Subject 10C)

1655 Scott Blvd.
 Santa Clara, CA 95050
 October 4, 1996

TO: Fire Council of Underwriters Laboratories Inc.;
 Subscribers to UL's Standards Services for
 Fire Tests of Door Assemblies,
 Tin-Clad Fire Doors;
 Subscribers to UL's Classification Services for Fire Doors;
 Subscribers to UL's Listing Services for
 Bullet-Resisting Type Fire Doors (GSOX),
 Special Purpose Type Fire Doors (GSXZ),
 Swinging Type Fire Doors (GSYX),
 Door Closers, Holders, and Operators (GTBT),
 Door and Window Frames (GVTV),
 Miscellaneous Fire Door Accessories (GVUX),
 Cladding Materials for Doors and Frames (GVUY),
 Fire Door Coordinators (GVVR),
 Fire Door Glass Light Frames (GVVX),
 Gasketing Materials for Fire Doors (GVWZ),
 Fire Door Louvers (GVZS),
 Builders Hardware (GWTZ),
 Fire Door Viewers (HAAU),
 Glazing Materials (KCMZ)

SUBJECT: Request for Comments on the Second Draft of the Proposed First Edition of the
 Standard for Positive Pressure Fire Tests of Door Assemblies, UL 10C; PROPOSED
 EFFECTIVE DATE

SUMMARY OF TOPICS

This bulletin re-proposes the first edition of the Standard for Positive Pressure Fire Tests of Door Assemblies, UL 10C. Extensive comments from the industry necessitates revising and re-submitting the requirements to the industry for review and comment.

COMMENTS DUE: DECEMBER 2, 1996

Attached as Appendix A for your review and comment is a second draft of the proposed first edition of UL 10C. Questions regarding interpretation of requirements should be directed to the responsible UL Staff. Please see Appendix C of this bulletin regarding designated responsibility for the subject product category.

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Please note that proposed requirements are of a tentative and early nature and are for review and comment only. Current requirements are to be used to judge a product until these requirements are published in final form.

PROPOSED EFFECTIVE DATE

The proposed first edition of UL 10C will provide manufacturers with a positive pressure fire test with which to evaluate fire door assemblies. A review, retest, or modification of currently Listed products will not be necessary if the requirements are adopted; therefore, UL proposes that the new requirements become effective upon publication.

THE STANDARD FOR POSITIVE PRESSURE FIRE TESTS OF DOOR ASSEMBLIES, UL 10C

RATIONALE

The International Conference of Building Officials (ICBO) has indicated a desire to develop a positive pressure test method for swinging fire doors. Over the last several years the ICBO has reviewed numerous amendments to the test for fire doors. In an attempt to consolidate the proposed changes in a unified document, as well as to create a document that will be useful to other code bodies that are desirous of adopting a positive pressure test method, UL is proposing the development of a new test standard, Positive Pressure Fire Tests of Door Assemblies, UL 10C.

The proposed Standard for Positive Pressure Fire Tests of Door Assemblies, UL 10C, has been developed based on the work completed by the National Fire Protection Research Foundation (NFPRF) in its National Fire Door Fire Test Project. Additional information for the development of the standard was obtained from various international standards such as "Fire tests on building materials and structures", BS 476: Part 20, and additional test information and methodology available to Underwriters Laboratories and the test community.

Based on the comments received for the first draft of the proposed first edition of UL 10C, UL has decided to revise the proposals and re-submit this second draft to the industry for further review and comment.

The following is a list of the major changes from the first draft of UL 10C and the substantiations for the changes.

For convenience in review, the second draft of UL 10C is presented in Appendix A as a revised version of the first draft of UL 10C. UL 10C was originally proposed as a revised version of UL 10B, the Standard for Safety for Fire Tests of Door Assemblies; a summary of the changes made to UL 10B to generate the first draft of UL 10C is presented in Appendix B.

1. The neutral plane of the furnace was established at 40 inches above the sill. This change was included due to the overwhelming desire of the building code community to have a fixed location.
2. The cotton pad test for areas not exceeding a 250°F (140°C) temperature rise was incorporated as an additional means of checking for hot gases.
3. The movement of the edge of a door perpendicularly away from the stop of the frame was decreased from 1-1/2 times the door thickness to 1 times the door thickness for the second half of the fire exposure period. This change was made to increase safety by minimizing the possible passage of hot gas and flame between the door and the frame under fire conditions.
4. Exception No. 1 of paragraph 15.1 (flaming of 10 seconds or less) was retained for 20-minute rated doors. There were several comments suggesting that the exception be removed; however,

none of the comments were supported with (1) reasons to change from the requirements of the international standards from which they were based and (2) justification as to why there would be a greater hazard developed by permitting flaming for 10 seconds or less on 20-minute rated doors.

5. Based upon the comments received by UL, it appears that the fire community favors the use of post-mixed burners. Although there were some comments to support the use of only pre-mixed burners or the use of both post-mixed and pre-mixed burner types, most of the comments received in response to the first draft of UL 10C favored the use of a post-mixed burner furnace.

Theoretically, pre-mixed and post-mixed burners provide different furnace characteristics. In general, it is judged that while a furnace utilizing pre-mixed burners is easier to operate, a furnace fitted with post-mixed burners provides a more "realistic" fire exposure to door assemblies under test.

Several questions were raised with regard to the reliability of a post-mixed burner furnace. Post-mixed burner furnaces have been used throughout North America for over 90 years and have demonstrated reliable, repeatable, and accurate operation, without presenting any undo operational hazards.

Fire door furnace tests conducted during Phase 1 of the NFPRF project demonstrated that a furnace constructed with pre-mixed burners could easily be converted to a post-mix burner furnace. It is therefore anticipated that laboratories having pre-mixed burner furnaces should have little difficulty in converting them to post-mixed.

As the use of post-mixed versus pre-mixed burners continues to be a highly controversial issue, UL has decided to submit a second draft of UL 10C to the fire community for review and comment rather than adopt a revised version of the first draft.

IMPACT

Since the requirements proposed in UL 10C cover a new class of products and will not necessitate a review or additional testing of currently Listed products, UL proposes that the requirements become effective upon publication.

REQUEST FOR COMMENTS ON PROPOSALS

Please provide the following:

1. Your comments concerning the proposed requirements; and
2. Your comments concerning the proposed effective date, should the proposals be adopted.

Written comments should be sent to the attention of Michael Hieb at UL's Santa Clara office, 1655 Scott Blvd., Santa Clara, CA 95050-4169. Comments may be sent by mail or faxed to (408) 556-6045. Please reference all correspondence to Subject 10C.

All comments should be sent by December 2, 1996.

Subjects 10C (10, 10A, 10B)

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October 4, 1996

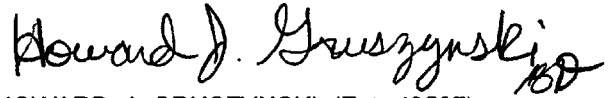
Unless specifically requested to do so, UL will not acknowledge comments indicating concurrence with these proposals.

UNDERWRITERS LABORATORIES INC.



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PROPOSED REQUIREMENTS ARE OF A TENTATIVE AND EARLY NATURE AND ARE FOR REVIEW AND COMMENT ONLY. CURRENT REQUIREMENTS ARE TO BE USED TO JUDGE A PRODUCT UNTIL THESE REQUIREMENTS ARE PUBLISHED IN FINAL FORM.

APPENDIX A

PROPOSED FIRST EDITION OF THE STANDARD FOR POSITIVE PRESSURE FIRE TESTS OF DOOR ASSEMBLIES, UL 10C

OCTOBER 1996 DRAFT

For convenience in review, the October 1996 (second) draft of UL 10C is presented in Appendix A as a revised version of the February 1996 (first) draft of UL 10C. Proposed additions to previous proposals are shown underlined and proposed deletions are shown ~~lined-out~~. Proposed additional requirements are identified by (NEW).

INTRODUCTION

1 Scope

1.1 These methods of fire tests are applicable to swinging door assemblies of various materials and types of construction for use in wall openings to retard the passage of fire.

1.2 Tests made in conformity with these test methods are intended to register performance during the test exposure; but such tests shall not be construed as determining suitability for use after exposure to fire.

1.3 It is the intent that tests made in conformity with these test methods allow for the development of data to enable regulatory bodies to determine the suitability of door assemblies for use in locations where fire resistance of a specified duration is required.

1.4 These methods are intended to evaluate the ability of a door assembly to remain in an opening during a predetermined test exposure.

1.5 The tests expose a specimen to a standard fire exposure controlled to achieve specified temperatures throughout a specified time period, followed by the application of a specified standard fire hose stream. The exposure, however, is not representative of all fire conditions, which vary with changes in the amount, nature, and distribution of fire loading, ventilation, compartment size and configuration, and heat sink characteristics of the compartment. It does, however, provide a relative measure of fire performance of door assemblies under these specified fire exposure conditions.

1.6 Any variation from the construction or conditions that are tested is capable of substantially changing the performance characteristics of the assembly.

1.7 The methods do not provide the following:

- a) Full information as to performance of all door assemblies in walls constructed of materials other than those tested.
- b) Evaluation of the degree by which the door assembly contributes to the risk of fire by generation of smoke, toxic gases, or other products of combustion.
- c) A temperature limit on the unexposed side of the door assembly.
- d) A limit on the number of openings allowed in glazed areas or of the number and size of lateral openings between the door and frame.
- e) Measurement of the degree of control or limitation of the passage of smoke or products of combustion through the door assembly. Note: See limitations for the passage of smoke detailed in the Recommended Practice for the Installation of Smoke-Control Door Assemblies, NFPA 105.

1.8 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this standard, and that involve a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements as determined necessary to maintain the acceptable level of safety as originally anticipated by the intent of this standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this standard cannot be judged to comply with this standard. Where considered appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this standard.

2 General

2.1 Units of measurement

2.1.1 When a value for measurement is followed by a value in other units in parentheses, the second value is only approximate. The first stated value is the requirement.

2.2 Undated references

2.2.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

CONTROL OF FIRE TESTS

3 Furnace Construction

3.1 Furnace size

3.1.1 The furnace shall be able to accommodate the full-sized sample. Small-scale size furnaces are capable of being used for testing small but full-sized samples or representative features. The furnace face shall be greater in area than the exposed face of the sample by at least 20 percent. The additional area between the sample and the furnace shall be filled by wall or partition construction.

3.1.2 The furnace shall have a chamber depth, i.e. the distance between the exposed face of the specimen and the face of the furnace lining immediately opposite the specimen, of not less than 23 inches (584 mm) and not more than 51 inches (1296 mm).

3.2 Furnace construction materials

3.2.1 The furnace shall be constructed of materials which have a greater resistance to heat flow through the other three sides than through the sample.

3.3 Furnace burners

3.3.1 The furnace shall be heated with burners that are fired using either natural gas or liquefied petroleum gases.

3.3.2 The heat output of the burners shall be controllable and shall expose the specimen to a uniform heating as specified in 4.1.1.

3.3.3 The burners shall ~~be constructed~~ function so that the fuel gas is introduced into the furnace where the gas mixes with air present in the furnace and then burns.

4 Time-Temperature Curve

4.1 General

4.1.1 The fire exposure of door assemblies shall be controlled to conform to the applicable portion of the standard time-temperature curve shown in Appendix A. The points on the curve that determine its character are:

1000°F (538°C) at 5 minutes
1300°F (704°C) at 10 minutes
1462°F (795°C) at 20 minutes
1550°F (843°C) at 30 minutes
1638°F (892°C) at 45 minutes
1700°F (927°C) at 1 hour
1792°F (978°C) at 1-1/2 hours
1850°F (1010°C) at 2 hours
1925°F (1052°C) at 3 hours
2000°F (1093°C) at 4 hours

4.2 Uniformity of temperature distribution

4.2.1 At any time after the first 10 minutes of fire exposure, the temperature rise indicated by any of the thermocouples used to determine the furnace temperature shall not differ from each other by more than 270°F (150°C). With test constructions where either the sample or any associated construction incorporates combustion materials that produce flaming within the furnace or where excess air drawn into the furnace is identified as causing localized heating or cooling of one or more of the furnace thermocouple hot junctions, the deviation of temperature rise from each other recorded by the thermocouples so affected shall not exceed 450°F (250°C).

5 Furnace Temperatures

5.1 The temperatures of the test exposure shall be deemed to be the average temperature obtained from the readings of not less than nine thermocouples symmetrically disposed and distributed to show the temperature near all parts of the test assembly, see Figure 5.1. The thermocouples shall be protected by sealed porcelain tube having 3/4 inch (19.1 mm) outside diameter and 1/8 inch (3.2 mm) wall thickness or, as an alternate, in the case of base-metal thermocouples, protected by 1/2 inch (12.7 mm) wrought-steel or wrought-iron pipe of standard weight.

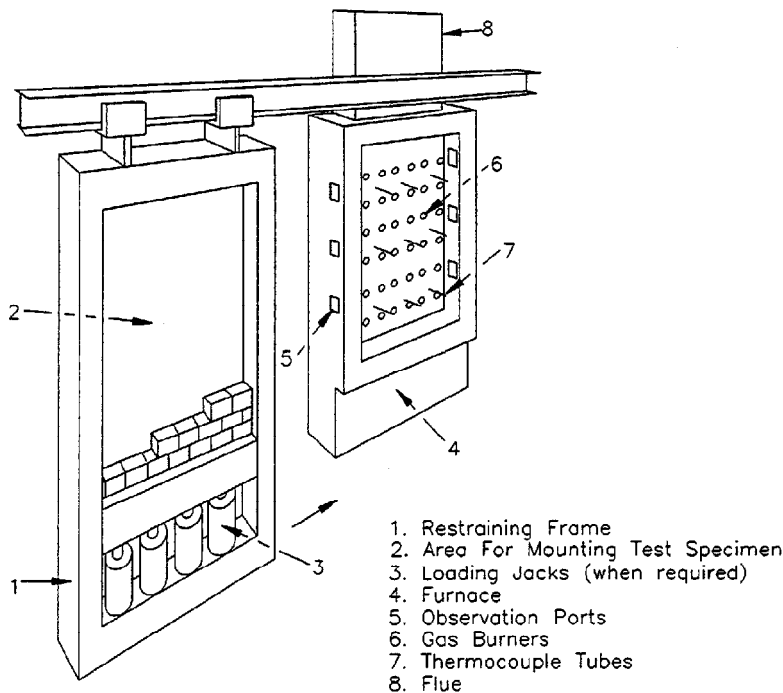
5.2 The junction of the thermocouples shall be initially located 6 inches (152 mm) from the exposed face of the test assembly or from the masonry in which the assembly is installed. ~~, during the entire test exposure. The~~ During the fire exposure, if the movement of the test sample causes the sample's distance to the thermocouple junction to vary, the location of the junction shall be adjusted reset to 6 inches (152 mm) at intervals not exceeding 10 minutes during the first 30 minutes of the test. Thereafter, the intervals are to be increased to not more than 30 minutes.

5.3 The temperatures shall be read at intervals not exceeding 1 minute.

5.4 The accuracy of the furnace control shall be such that the area under the time-temperature curve, obtained by averaging the results from the thermocouple readings, is within 10 percent of the corresponding area under the standard time-temperature curve for fire tests of 1 hour or less duration, within 7.5 percent for those over 1 hour and not more than 2 hours, and within 5 percent for tests exceeding 2 hours in duration.

5.5 For a summary of the accuracies for the various rating periods, see Appendix A.

Figure 5.1
Test furnace



S2320

6 Unexposed Surface Temperatures and Cotton Pad Test

6.1 Unexposed surface temperatures are to be recorded, and are to be determined in the following manner.

Exception: Single-layer metal doors need not comply with this section.

6.2 Unexposed surface temperatures shall be taken at not less than three points, with a minimum of one thermocouple in each 16-square foot (1.5 m²) area of the door. Thermocouples shall not be located over reinforcements extending through the door, over glass panels, or nearer than 12 inches (305 mm) from the edge of the door.

6.3 Surface temperatures of test specimens are to be measured by means of thermocouples with a wire diameter of not more than 0.03 inch (0.7 mm). Each thermocouple is to be ~~attached~~ brazed to the center of the face of a copper disk 1/2 inch (12 mm) in diameter and 0.01 inch (0.2 mm) thick, which is secured to the surface of the specimen at the required position.

6.4 Unexposed surface temperatures are to be measured with thermocouples placed under flexible, oven-dry, felted pads. The properties of these pads are to comply with the requirements specified in Appendix B.

6.5 The disk and the pad are to be fixed to the surface of the specimen by pins, tape, or a required adhesive, based on the nature of the material forming the specimen.

6.6 Unexposed surface temperatures are to be read at intervals not exceeding 1 minute.

6.7 The thermocouples and pads are to be removed after 30 minutes of fire exposure.

Exception: The thermocouples and pads are to remain on the assembly when unexposed surface temperature data beyond the first 30 minutes of fire exposure is being evaluated.

(NEW)

6.8 The passage of flames and gases through cracks, holes, or other openings in or around a door shall be determined by applying a cotton pad to such openings at regular intervals during the test. The cotton pad shall not be in contact with the element but shall be held for not less than 10 seconds and not more than 30 seconds between $1 \pm 1/4$ inches (25 ± 5 mm) away from and centrally opposite any cracks, holes, or other openings in or around the door. The pad shall not be re-used if it has absorbed any moisture or become charred during a previous application.

Exception: The cotton pad shall not be applied at areas where the temperature of that part of the sample has risen greater than 250°F (140°C) above the ambient temperature.

(NEW)

6.9 The cotton pad, measuring 4 inches (100 mm) square by 3/4 inches (20 mm) thick, shall consist of new undyed and soft cotton fibers without any admixture of artificial fibers, and shall have a mass between 3 and 4 grams. The pad shall be conditioned by drying in an oven at 212°F (100°C) for at least 30 minutes. The pad shall be attached by wire clips to a 4 inch by 4 inch (100 mm by 100 mm) frame of 0.04 inch (1 mm) diameter wire.

7 Furnace Pressure

7.1 The pressure in the furnace, relative to atmosphere, is to be measured at the top of the assembly and at a location ~~between one-third down and two-thirds down from the top of the assembly, and at the bottom of the assembly~~ at the neutral plane.

7.2 The pressure probe is to be constructed from 1/2 inch (12.7 mm) diameter stainless steel tube with a welded, closed end, and incorporating nine radial, 1/16-inch (1.6-mm) diameter holes spaced equidistance around the tube's perimeter. The probe is to be located so that the center line of the sensing holes are positioned 6 ± 1 inches (152 ± 2.5 mm) from the surface of the exposed face of the test assembly and 18 inches (457 mm) from the edges of the furnace. The probes are to be positioned horizontally in the furnace without a change in vertical elevation of the probes or tubing within the furnace.

7.3 Data recording is to provide monitoring of the output of an electric pressure transducer in the range of ~~± 0.0025 w.c.~~ ± 0.25 inches H₂O (66 Pa) with an accuracy of ± 1 percent. The pressure transducers are to be located within 3 feet (914 mm) vertically, and 10 feet (3048 mm) horizontally from the static probes outside the furnace.

7.4 Pressures are to be read at intervals not exceeding 1 minute.

7.5 The pressure is to be maintained in the furnace while also maintaining a minimum of 4 percent oxygen in the furnace.

7.6 The oxygen percentage is to be determined by centering a minimum of one 1/4-inch (6.4-mm) inside diameter stainless steel tube containing eight 1/16 inch (1.6 mm) diameter holes in the damper plenum, approximately half way between the furnace and the exhaust damper. The tube is then to be connected to an oxygen analyzer which has an accuracy of ± 0.1 percent in the range of 0 to 10 percent. Locating more than one probe in the plenum and averaging the readings is permitted.

7.7 The oxygen percentages are to be read at intervals not exceeding 1 minute.

TEST ASSEMBLIES

8 Construction and Size

8.1 The construction and size of the test door assembly, consisting of single doors, doors in pairs, or specialty doors (such as Dutch doors, double-egress doors, and the like), shall be representative of that for which the classification or rating is being evaluated.

8.2 A floor structure shall be provided as part of the opening to be protected, except where such floor interferes with the operation of the door. The floor segment shall be of noncombustible material and shall project into the furnace approximately twice the thickness of the test door or to the limit of the frame, whichever is greater.

9 Mounting for Test Purposes

9.1 Swinging doors, except as specified in 9.4 and 9.5, shall be mounted so as to open into the furnace chamber.

9.2 The mounting of all doors shall be such that they fit within the frame. Such mounting shall not prevent free and easy operation of the test door.

9.3 Clearances for swinging doors shall be as follows:

- a) One-eighth (+0, minus 1/16) inch (3.1 $\pm$ 1 mm) along the top;
- b) One-eighth (+0, minus 1/16) inch (3.1 $\pm$ 1 mm) along the hinge and latch jambs;
- c) One-eighth (+0, minus 1/16) inch (3.1 $\pm$ 1 mm) along the meeting edge of doors in pairs;
- d) Three-eighths (+0, minus 1/16) inch (9.5 +0, minus 1.6 mm) at the bottom edge of a single swing door; and
- e) One-fourth (+0, minus 1/16) inch (6.4 +0, minus 1.6 mm) at the bottom of a pair of doors.

9.4 Door frames shall be evaluated when mounted so as to have the doors open either away from or into the furnace chamber, at the discretion of the testing authority, to obtain representative information on the performance of the construction under test.

9.5 Surface-mounted hardware (for example, fire-exit devices and door closers) for use on fire doors shall be evaluated by being installed on one door assembly swinging into the furnace chamber and another door assembly swinging away from the furnace chamber.

CONDUCT OF TESTS**10 Time of Testing**

10.1 Masonry shall have the strength to retain the assembly securely in position throughout the Fire Endurance Test, Section 11, and the Hose Stream Test, Section 12.

11 Fire Endurance Test

11.1 The pressure in the furnace chamber is to be maintained nearly equal to the atmospheric pressure.

11.2 Within 5 minutes of elapsed time into the fire exposure, the neutral plane of the furnace is to be established at a ~~minimum~~ maximum of ~~one-third down from the top~~ 40 inches (1016 mm) up from the bottom of the test ~~sample~~ assembly.

11.3 The pressure that is maintained over the top one-third of the door assembly is not to exceed 0.08 inch H₂O (20 Pa) over any portion of the test sample.

11.4 The test is to be continued until the exposure period of the classification or rating being evaluated is reached.

12 Hose Stream Test

12.1 Immediately ~~following~~ after and within 1-1/2 minutes of the end of the Fire Endurance Test, Section 11, the test assembly is to be subjected to the impact, erosion, and cooling effects of a hose stream directed first at the middle and then at all parts of the exposed surface, making changes in direction slowly. See Appendix C for a description of the pattern.

12.2 The hose stream is to be delivered through a 2-1/2 inch (63.5 mm) hose discharging through a ~~National Standard Playpipe of corresponding size equipped with a 1-1/8 inch (28.6 mm) discharge tip of the standard taper smooth bore pattern without shoulder at the orifice~~ play pipe as described in the Standard for Play Pipes for Water Supply Testing in Fire Protection Service, UL 385. The water pressure at the base of the ~~nozzle~~ play pipe and duration of application in seconds per square foot (s/m²) of exposed area are to be as prescribed in Table 12.1.

Table 12.1
Water pressure at base of ~~nozzle~~ play pipe and duration of application

Desired rating	Water pressure at base of ~~nozzle~~ <u>play pipe</u> , psi (kPa)	Duration of application, seconds per square foot (s/m ²) of exposed area
3-hour or 4-hour	45 (310)	3.0 (32)
1-1/2-hour and over if less than 3-hour	30 (207)	1.5 (16)
1 -hour and over if less than 1 -1/2 -hour	30 (207)	0.9 (10)
Less than 1 hour	30 (207)	0.6 (6)

NOTE – The exposed area shall be calculated using the outside dimensions of the test specimen, including a frame or other parts of the assembly when provided, but normally not including the wall into which the specimen is mounted. Where multiple test specimens are mounted in the same wall, the hose stream is to be calculated and applied to each sample individually, or the rectangular wall area encompassing all of the specimens is to be considered as the exposed area since the hose stream must traverse this area during its application.

12.3 The tip of the ~~nozzle~~ play pipe shall be located 20 feet (6 m) from and on a line normal to the center of the test door. When impossible to be so located, the ~~nozzle~~ play pipe shall be on a line deviating not more than 30 degrees from the line normal to the center of the test door. When so located, the distance from the center shall be less than 20 feet by an amount equal to 1 foot (0.3 m) for each 10 degrees of deviation from the normal.

REPORT

13 General

13.1 Results shall be reported in accordance with the performance in the tests prescribed in these test methods. The report shall show the performance under the desired exposure period chosen from the following: 20-minute, 30-minute, 3/4-hour, 1-hour, 1-1/2-hour, 3-hour, or 4-hour.

13.2 The report shall include the temperature measurements of the furnace, including ~~the tolerance to their deviation from the~~ specified time-temperature curve and, if determined, of the unexposed side of the test assembly. See 6.1.

13.3 The report shall also contain a record of all observations having a bearing on the performance of the test assembly.

13.4 Any flaming on the unexposed surface of the assembly shall be recorded.

13.5 The amount of movement of any portion of the edges of the door adjacent to the door frame from the original position shall be recorded. See Conditions of Acceptance, General, Section 14, and Specific, Section 15.

13.6 The materials and construction of the door, frame, and wall or partition, and the details of the installation, hardware, door frame and wall anchors, trim, finish, and clearance shall be recorded or appropriately referenced to provide positive identification or duplication in all respects.

13.7 Pressure measurements made in the furnace and the location of such measurements relative to the neutral plane ~~one-third down from the top~~ of the door assembly and the plane at the top of the door assembly are to be recorded.

CONDITIONS OF ACCEPTANCE

14 General

14.1 A door assembly shall be determined to comply with the requirements for performance when it remains in the opening during the Fire Endurance Test, Section 11, and the Hose-Stream Test, Section 12, within the following limitations.

14.2 The test assembly shall withstand the Fire Endurance Test, Section 11, and the Hose-Stream Test, Section 12, without developing openings anywhere through the assembly.

Exception No. 1: For assemblies with a fire exposure period of 1-1/2 hours or less, dislodging of small portions of glass, as specified in 15.14 and 15.15, by the hose stream is permitted.

Exception No. 2: Separation between meeting edges of pairs of doors within the limits specified in 15.5 and 15.6 is permitted.

(14.2 continued)

Exception No. 3: An opening between the bottom edge of a door and sill within the limits specified in 9.3 is permitted.

14.3 An opening for the purpose of the requirement in 14.2, is defined as a through-hole in the assembly that is capable of being seen from the unexposed side when viewed from the direction perpendicular to the plane of the assembly at the location of the suspected opening.

15 Specific

15.1 No flaming shall occur on the unexposed surface of a door assembly nor shall the sample permit the passage of hot gases sufficient to ignite the cotton pad.

Exception No. 1: Sustained flaming of less than 10 seconds duration is permitted.

Exception No. 2: After 30 minutes, intermittent light flaming [not greater than 6 inches (152 mm) long, ~~or burning~~ nor for periods exceeding 5-minute intervals along the edges of doors] is permitted.

Exception No. 3: Light flaming during the last 15 minutes of the classification period of 45 minutes or greater, is permitted on the unexposed surface area of the door, when it is contained within a distance of 1-1/2 inches (38.1 mm) from a vertical door edge and within 3 inches (76.2 mm) from the top edge of the door and within 3 inches from the top edge of the frame of a vision panel. ~~is permitted.~~

15.2 When hardware is to be evaluated for use on fire doors, it shall hold the door closed in accordance with the conditions of acceptance for the intended door assembly classification period and, in addition, the latch bolt shall remain projected and shall be intact after the test. The hardware is not required to be operable after test.

15.3 The movement of swinging doors shall not result in any portion of the edges adjacent to the door frame moving from the original position in a direction perpendicular to the plane of the door more than the thickness of the door during the ~~first half of the~~ entire classification period, nor more than 1-1/2 times the door thickness ~~during the entire classification period or as a result of the Hose Stream Test, Section 12.~~

15.4 The movement of swinging doors mounted in pairs shall not result in any portion of the meeting edges moving more than the thickness of the door away from the adjacent door edge in a direction perpendicular to the plane of the doors during the entire classification period or as a result of the Hose Stream Test, Section 12.

15.5 An assembly consisting of a pair of swinging doors incorporating an astragal shall not separate in a direction parallel to the plane of the doors more than 3/4 inch (19.1 mm) nor a distance equal to the throw of a latch bolt at the latch location.

15.6 An assembly consisting of a pair of swinging doors without an overlapping astragal, with or without a resilient astragal, for a fire and hose stream exposure of 1-1/2 hours or less, shall not separate along the meeting edges more than 3/8 inch (9.5 mm), including the initial clearance between doors.

15.7 An assembly consisting of a single swinging door shall not separate from the frame more than 1/2 inch (12.7 mm) at the latch location.

15.8 Door frames to be evaluated with doors shall remain securely fastened to the wall on all sides and shall not permit through openings between frame and doors or between frame and adjacent wall.

15.9 A resilient astragal, when provided without an overlapping metal astragal, shall not deteriorate to result in through openings during the Fire Endurance Test, Section 11. Small portions, less than 10 percent, are ~~capable of dislodging~~ permitted to be dislodged during the Hose Stream Test, Section 12.

Exception: The whole astragal is permitted to be dislodged during the hose stream test when separation of the meeting edges of the doors is within the limit specified in 15.6.

15.10 A glazing assembly complies with the requirements for acceptable performance when it remains in the opening during the Fire Endurance Test, Section 11, and Hose Stream Test, Section 12, within the following limitations.

15.11 A glazing assembly shall not be loosened from its fastenings.

15.12 Movement of the glazing assembly at the perimeter of openable components from the initial closed position shall not exceed the thickness of the frame member at any point.

15.13 During the fire exposure test, separation of the glass edges from the frame so as to create an opening is not permitted.

15.14 Separation of the glass edges during the Hose Stream Test, Section 12, from the glazing frame by movements away from the frame so as to create an opening shall not exceed 30 percent of each individual glass light perimeter.

15.15 During the Hose Stream Test, Section 12, openings created by glass breakage in the central area of each glass light shall not exceed 5 percent of the area of each individual glass light.

15.16 Openings for the purpose of the requirements in 15.14 and 15.15 are defined as through-holes in the assembly that are capable of being seen from the unexposed side when viewed from the direction perpendicular to the plane of the assembly at the location of the suspected opening.

APPENDIX A – STANDARD TIME-TEMPERATURE CURVE FOR CONTROL OF FIRE TESTS

Time, Hr.:Min.	Temperature, °F	Area above 68°F base		Temperature, °C	Area above 20°C base	
		°F – Min.	°F – Hr.		°C – Min.	°C – Hr.
0:00	68	00	0	20	00	0
0:05	1,000	2,330	39	538	1,290	22
0:10	1,300	7,740	129	704	4,300	72
0:15	1,399	14,150	236	760	7,860	131
0:20	1,462	20,970	350	795	11,650	194
0:25	1,510	28,050	468	821	15,590	260
0:30	1,550	35,360	589	843	19,650	328
0:35	1,584	42,860	714	862	23,810	397
0:40	1,613	50,510	842	878	28,060	468
0:45	1,638	58,300	971	892	32,390	540
0:50	1,661	66,200	1,103	905	36,780	613
0:55	1,681	74,220	1,237	916	41,230	687
1:00	1,700	82,330	1,372	927	45,740	762
1:05	1,718	90,540	1,509	937	50,300	838
1:10	1,735	98,830	1,647	946	54,910	915
1:15	1,750	107,200	1,787	955	59,560	993
1:20	1,765	115,650	1,928	963	64,250	1,071
1:25	1,779	124,180	2,070	971	68,990	1,150
1:30	1,792	132,760	2,213	978	73,760	1,229
1:35	1,804	141,420	2,357	985	78,560	1,309
1:40	1,815	150,120	2,502	991	83,400	1,390
1:45	1,826	158,890	2,648	996	88,280	1,471
1:50	1,835	167,700	2,795	1,001	93,170	1,553
1:55	1,843	176,550	2,942	1,006	98,080	1,635
2:00	1,850	185,440	3,091	1,010	103,020	1,717
2:10	1,862	203,330	3,389	1,017	112,960	1,882
2:20	1,875	221,330	3,689	1,024	122,960	2,049
2:30	1,888	239,470	3,991	1,031	133,040	2,217
2:40	1,900	257,720	4,295	1,038	143,180	2,386
2:50	1,912	276,110	4,602	1,045	153,390	2,556
3:00	1,925	294,610	4,910	1,052	163,670	2,728
3:10	1,938	313,250	5,221	1,059	174,030	2,900
3:20	1,950	332,000	5,533	1,066	184,450	3,074
3:30	1,962	350,890	5,848	1,072	194,940	3,249
3:40	1,975	369,890	6,165	1,079	205,500	3,425
3:50	1,988	389,030	6,484	1,086	216,130	3,602
4:00	2,000	408,280	6,805	1,093	226,820	3,780

(Continued)

STANDARD TIME-TEMPERATURE CURVE FOR CONTROL OF FIRE TESTS (Cont'd)

Time, Hr.:Min.	Temperature, °F	Area above 68°F base		Temperature, °C	Area above 20°C base	
		°F – Min.	°F – Hr.		°C – Min.	°C – Hr.
4:10	2,012	427,670	7,128	1,100	237,590	3,960
4:20	2,025	447,180	7,153	1,107	248,430	4,140
4:30	2,038	466,810	7,780	1,114	259,340	4,322
4:40	2,050	486,560	8,110	1,121	270,310	4,505
4:50	2,062	506,450	8,441	1,128	281,360	4,689
5:00	2,075	526,450	8,774	1,135	292,470	4,874
5:10	2,088	546,580	9,110	1,142	303,660	5,061
5:20	2,100	566,840	9,447	1,149	314,910	5,248
5:30	2,112	587,220	9,787	1,156	326,240	5,437
5:40	2,125	607,730	10,129	1,163	337,630	5,627
5:50	2,138	628,630	10,473	1,170	349,090	5,818
6:00	2,150	649,120	10,819	1,177	360,620	6,010
6:10	2,162	670,000	11,167	1,184	372,230	6,204
6:20	2,175	691,010	11,517	1,191	383,900	6,398
6:30	2,188	712,140	11,869	1,198	395,640	6,594
6:40	2,200	733,400	12,223	1,204	407,450	6,791
6:50	2,212	754,780	12,580	1,211	419,330	6,989
7:00	2,225	776,290	12,938	1,218	431,270	7,188
7:10	2,238	797,920	13,299	1,225	443,290	7,388
7:20	2,250	819,680	13,661	1,232	455,380	7,590
7:30	2,262	841,560	14,026	1,239	467,540	7,792
7:40	2,275	863,570	14,393	1,246	479,760	7,996
7:50	2,288	885,700	14,762	1,253	492,060	8,201
8:00	2,300	907,960	15,133	1,260	504,420	8,407

APPENDIX B – REQUIREMENTS FOR THERMOCOUPLE PADS

~~B1 Asbestos pads used in measurements of temperature of unexposed surfaces of specimens are to be of felted amosite asbestos free of organic additives and are to have the following characteristics:~~

- ~~a) Length and width – $6 \pm 1/8$ inches (152 ± 3.2 mm).~~
- ~~b) Thickness^a – 0.40 ± 0.05 inch (10.2 ± 1.3 mm).~~
- ~~c) Dry weight – 0.260 ± 0.026 pound-mass (0.118 ± 0.012 kg).~~
- ~~d) Thermal conductivity at 150°F (66°C) – 0.38 ± 0.027 Btu-inch per hour per square foot per degree F (0.055 ± 0.0039 W/m·K).~~
- ~~e) Hardness^b – 10 to 25 (modified Brinnell).~~

~~^a The thickness measurement is to be made under the light load of a 1/2-inch (12.7 mm) diameter pad of a dial micrometer gage.~~

~~^b The hardness measurement is to be made by pressing a 1 inch (25.4 mm) diameter steel ball against the specimen and measuring the indentation obtained between a minor load of 2 pounds-mass (0.91 kg) and an additional major load of 10 pounds-mass (4.5 kg) [12 pound-mass (5.4 kg) total load]. The hardness is obtained by the relationship:~~

$$\text{Hardness} = \frac{2.24}{y}$$

~~in which y is the difference in indentation in inches.~~

~~B2 B1~~ The pads are not to break when shaped to contact the surface against which they are placed.

~~B3 B2~~ Refractory fiber material^c material^a is to be used as a substitute for asbestos in thermocouple pads, when distortion of the unexposed face of the test specimen is insignificant. Such material is not to be used on surfaces subject to sharp distortions or discontinuities during the test. A pad formed from this material is to have the following characteristics:

- a) Length and width – $6 \pm 1/8$ 1.2 ± 0.02 inches (152 ± 3 30 ± 0.5 mm).
- b) Thickness^a – 0.375 ± 0.063 0.8 ± 0.02 inch (9.5 ± 1.6 2 ± 0.5 mm).
- c) Dry weight – 0.147 ± 0.053 pounds (67 ± 24 g) Density – 56.2 ± 6.2 lb/ft³ (900 ± 100 kg/m³).
- d) Thermal conductivity at 150°F (66°C) – 0.37 ± 0.03 Btu-inch per hour per square foot per degree F (0.053 ± 0.004 W/m·K).
- e) Hardness^b (on soft face) – 2.25 to 4.5 (modified Brinnell).

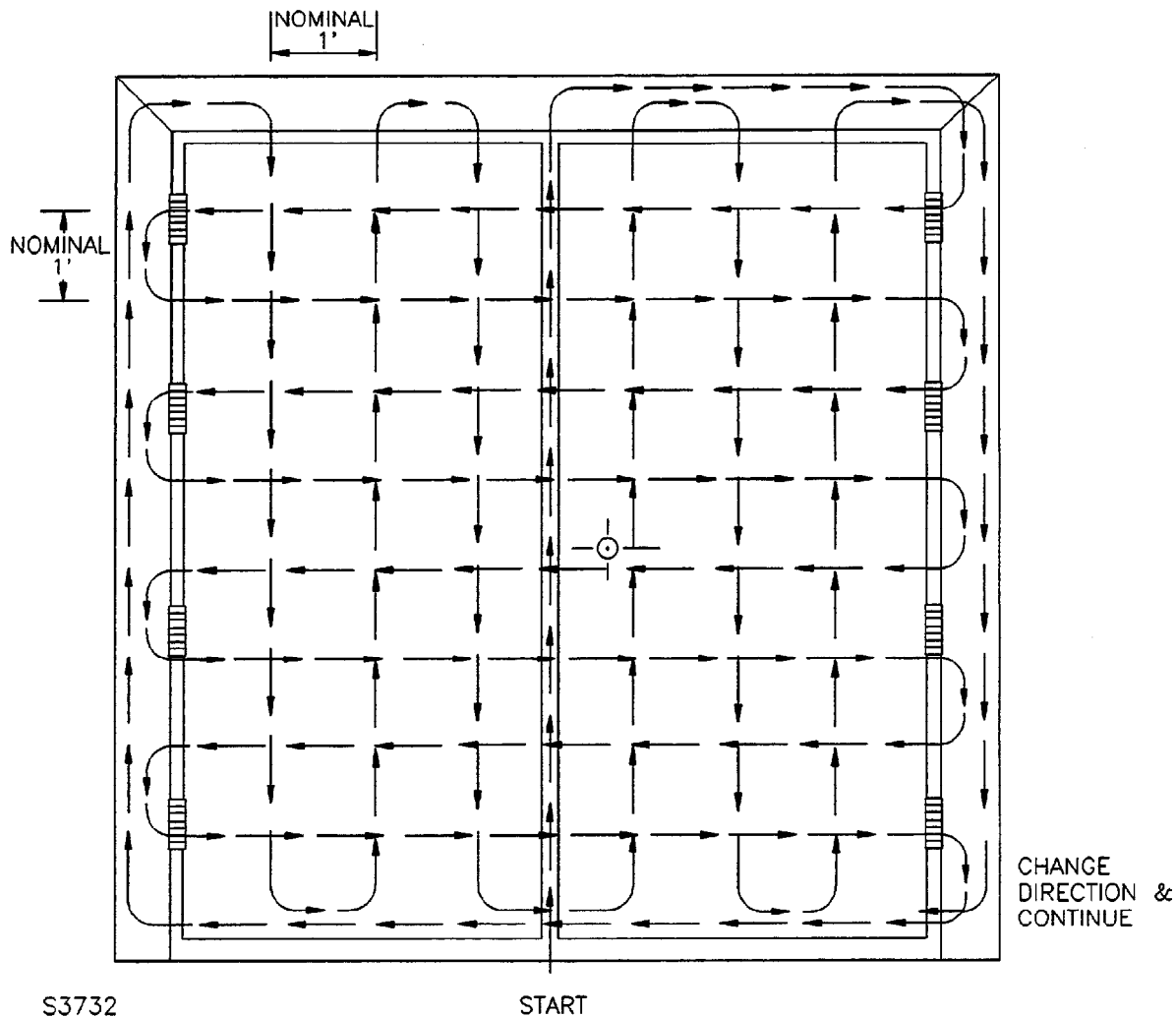
~~^c Johns-Manville Ceraform 126, or the equivalent, is capable of being used as refractory fiber material.~~

~~^a Johns-Manville Ceraform 126, or the equivalent, is capable of being used as refractory fiber material.~~

APPENDIX C – HOSE STREAM PATTERN

The hose stream is to be played over the test sample starting at the middle bottom center and then at all parts changing directions slowly. Figure C1 shows the typical pattern for one type of assembly, pairs of swinging doors. The pattern is capable of being mirrored, reversed, or otherwise modified to accommodate samples of various sizes and shapes.

Figure C1
Hose stream pattern



A P P E N D I X B

The following is a list of the major changes between the existing UL 10B standard and the February, 1996 (first) draft of UL 10C.

1. UL 10C is proposed to address only swinging doors. It is understood that since the ICBO only indicated a desire for a positive pressure test for swinging fire doors, and the NFPRF project only generated data for swinging doors, the scope of the draft of UL 10C is limited to swinging doors.
2. Based on the NFPRF work, it was shown that the international type of thermocouple (i.e. BS 476) used to measure unexposed surface temperature demonstrates certain advantages. Therefore, this type of thermocouple is specified for use in the UL 10C draft. As there was no evidence to support the use of the international type of thermocouple used to measure furnace temperature over those currently used in UL 10B, the current thermocouples are included in the UL 10C draft.
3. The limitation on "excess smoke" specified in the current Uniform Building Code Standard 7-2 test method was not included since there is no current test protocol available to make a valid measurement of "excess smoke." The UL 10C draft refers to the Recommended Practice for the Installation of Smoke-Control Door Assemblies, NFPA 105, for evaluation of smoke passage around the sample and anticipates that smoke from the sample will be limited by the positive pressure test method.
4. Proposed UL 10C contains a description of the test furnace. The description is consistent with furnaces currently in use in this country with the exception that the burner type is limited to a post mix rather than a premix type. The post mix burner type was chosen as a worst-case condition considering the passage of flames to the unexposed side of the assembly when the opening is compromised and is consistent with the same fire scenario that occurs in a burning room. The change to a post mix burner will not affect current testing laboratory's abilities to test assemblies on their current equipment. The NFPRF project showed that current systems can be converted to post mix with relative ease and still meet the rigorous evaluation of ICBO Evaluation Services.
5. There are no "gap gauges" included in proposed UL 10C since the current methods of measuring gaps, along with observations of flaming, will control the measurement of the excess distortion of the sample.
6. Relative movement of the door away from the frame stop has been retained as the door thickness for the first half of the fire test, and 1-1/2 times the door thickness for the second half of the test, and as a result of the hose stream. There has been a desire to decrease the limit to an overall maximum of door thickness, but there was insufficient data available to justify the need for this reduction.
7. The "cotton pad" test is not included in proposed UL 10C because of both its limited reliability and usefulness and the ability of the furnace to provide visible flaming due to the use of post mix burners to address the escape of hot gases.
8. The location of the neutral pressure plane during the test was established at "a minimum of 1/3 down from the top of the door." This location was selected as being relatively consistent with the location which would naturally occur in many "typical" burning rooms while still exposing the door assembly to positive pressure to evaluate its performance. By establishing the pressure plane at a "minimum" distance, a test sponsor can choose to lower the neutral plane so that a determination of performance to various international standards can be made at the same time as to UL 10C.

9. In order to clarify the application of the hose stream exposure, the pattern for the hose stream test has been further defined.

10. To maintain further consistency with international standards, minimal amounts of flaming (less than 10 seconds, sustained) have been made an exception to the "No Flaming" requirement in proposed UL 10C.

APPENDIX C**DESIGNATED RESPONSIBILITY FOR UL
PRODUCT CATEGORIES**

GSOX, FIRE DOORS, BULLET-RESISTING TYPE FIRE DOORS
 GSXV, FIRE DOORS, SLIDING TYPE FIRE DOORS
 GSXZ, FIRE DOORS, SPECIAL PURPOSE TYPE FIRE DOORS
 GSYX, FIRE DOORS, SWINGING TYPE FIRE DOORS
 GVTV, FIRE DOORS, DOOR AND WINDOW FRAMES
 GVUX, FIRE DOORS, MISCELLANEOUS FIRE DOOR ACCESSORIES
 GVUY, FIRE DOORS, CLADDING MATERIALS FOR DOORS AND FRAMES
 GVVR, FIRE DOORS, FIRE DOOR COORDINATORS
 GVVX, FIRE DOORS, FIRE DOOR GLASS LIGHT FRAMES
 GVWZ, FIRE DOORS, GASKETING MATERIALS FOR FIRE DOORS
 GVZS, FIRE DOORS, FIRE DOOR LOUVERS
 HAAU, FIRE DOORS, FIRE DOOR VIEWERS
 KCMZ, GLAZING MATERIALS

The individuals shown in the following tables are involved with the investigation of products covered under the subject categories. The Primary Designated Engineer (**shown in UPPERCASE letters**) coordinates the establishment and uniform interpretation of UL requirements applicable to the product categories.

Should you have questions regarding the interpretation of the requirements proposed in this bulletin or any adopted requirements that affect your product, you are encouraged to contact the individual at the office to which you normally submit your products.

The Responsible Department Manager for the subject categories is William Metes at UL's Northbrook office. The Responsible Department Manager oversees the significant interpretations made by the Primary Designated Engineer and arbitrates any differences regarding interpretation of UL requirements.

CCN	Office/Subsidiary	Responsible Engineer	Extension
GSOX, GSXZ, GVUX, GVUY, GVVR, GVVX, GVWZ, GVZS, HAAU	Northbrook	HOWARD GRUSZYNSKI	42507
	RTP	Mike Cunningham	11669
	Santa Clara	Garrett Tom	32438

CCN	Office/Subsidiary	Responsible Engineer	Extension
GSXV	Northbrook	HOWARD GRUSZYNSKI	42507
	RTP	Mike Cunningham	11669
	Santa Clara	Garrett Tom	32438

CCN	Office/Subsidiary	Responsible Engineer	Extension
GSYX, GVTV	Camas	Gene Wirth	55606
	Northbrook	HOWARD GRUSZYNSKI	42507
	RTP	Mike Cunningham	11669
	Santa Clara	Garrett Tom	32438

CCN	Office/Subsidiary	Responsible Engineer	Extension
KCMZ	Camas	Gene Wirth	55606
	Northbrook	HOWARD GRUSZYNSKI	42507
	RTP	Mike Cunningham	11669

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Subjects 10A (10B)

333 Pfingsten Road
 Northbrook, IL 60062
 June 3, 1996

TO: Fire Council of Underwriters Laboratories Inc.,
 Subscribers to UL's Classification Services for Fire Doors,
 Subscribers to UL's Standards Service for:
 Tin-Clad Fire Doors,
 Fire Tests of Door Assemblies

SUBJECT: Enhanced Certificate of Compliance Service for Fire Doors

UL announces an Enhanced Certificate of Compliance Service for Fire Doors.

This enhanced certification program includes all features of the existing Certificate of Compliance Service, and additionally includes an embossed "gold" seal, high grade glossy paper and signature by UL's Chief Engineer. The enhanced certificate will be offered in regular and notarized versions, as is the case in the existing Certificate of Compliance Service.

The Certificate of Compliance Service and the new Enhanced Certificate of Compliance Service provide UL clients with supplementary verification of compliance to the appropriate requirements. The certificate can be presented to inspection authorities, distributors and other parties as necessary to facilitate acceptance of UL products throughout the world.

A Certificate of Compliance and an Enhanced Certificate of Compliance can be issued only for a UL Listed, Component Recognized or Classified Product.

Appendix A summarizes the significant features of these certification programs.

Please mail or fax (fax: 847-272-9562) your request for either of these programs to UL's International Compliance Services (ICS) Dept., attention: Ms. Earlene Mitchell or contact the individual at the office to which you normally submit your products. Upon receipt of your request we will provide you with cost and other applicable information.

A not-for-profit organization
 dedicated to public safety and
 committed to quality service

Subjects 10A (10B)

-2-

June 3, 1996

Questions regarding interpretation of requirements should be directed to the responsible UL Staff. Please see Appendix B of this bulletin regarding designated responsibility for the subject product categories.

UNDERWRITERS LABORATORIES INC.

Jola Wroblewska

JOLA WROBLEWSKA (Ext. 43008)
Staff Engineer
International Compliance Services Department

SR:JTM

10ABULP01

REVIEWED BY:

James J. Urban

JAMES J. URBAN (Ext. 42774)
Associate Managing Engineer
Engineering Services 411C

A P P E N D I X A**Enhanced Certificate of Compliance Service Features**

- * Provides clients with supplementary verification of compliance to the requirements
- * Certificate can be presented as needed to inspection authorities, distributors and other parties as necessary to facilitate acceptance of UL's products throughout the world
- * Certificate includes an embossed gold seal
- * Certificate printed on high grade glossy paper
- * Certificate signed by UL's Chief Engineer

Certificate of Compliance Service Features

- * Provides clients with supplementary verification of compliance to the requirements
- * Certificate can be presented as needed to inspection authorities, distributors and other parties as necessary to facilitate acceptance of UL's products throughout the world

Information Required to Issue a Certificate of Compliance

The following information is needed in order for UL to issue a Certificate of Compliance:

1. Listee's name and Address
2. UL File Number(s)
3. Report Issue Date
4. Catalog numbers or model numbers for which the Certificate is to be issued
5. Additional information such as fire rating, door design and assembly size

APPENDIX B

DESIGNATED RESPONSIBILITY FOR UL

PRODUCT CATEGORIES

GSOT, FIRE DOORS, ACCESS TYPE FIRE DOORS
 GSPR, FIRE DOORS, CHUTE TYPE FIRE DOORS
 GSQX, FIRE DOORS, CURTAIN TYPE FIRE DOORS
 GSRJ2, FIRE DOORS, DOOR CONSTRUCTION MATERIALS –
 COMPONENT
 GSRV, FIRE DOORS, DUMBWAITER TYPE FIRE DOORS
 GSST, FIRE DOORS, FREIGHT ELEVATOR STEEL PANEL,
 HOLLOW METAL AND METAL CLAD TYPE FIRE DOORS
 GSUX, FIRE DOORS, PASSENGER ELEVATOR TYPE FIRE DOORS
 GSVV, FIRE DOORS, ROLLING-STEEL TYPE FIRE DOORS
 GSWT, FIRE DOORS, SERVICE COUNTER TYPE FIRE DOORS
 GTLB, FIRE DOORS, COMB DOOR CLOSERS, HOLDERS,
 RETROFIT DEVICES
 GVTV, FIRE DOORS, DOOR AND WINDOW FRAMES
 GVUX, FIRE DOORS, MISCELLANEOUS FIRE DOOR ACCESSORIES
 GWWW, FIRE DOORS, (BUILDERS HARDWARE) ACCESSORIES FOR
 SINGLE-POINT LOCKS OR LATCHES AND FIRE EXIT
 HARDWARE
 GWXT, FIRE DOORS, (HARDWARE) BUILDERS HARDWARE,
 AUXILIARY LOCKS
 GWZQ, FIRE DOORS, (BUILDERS HARDWARE) (HARDWARE) DOOR
 HINGES
 GXOW, FIRE DOORS, (HARDWARE) (BUILDERS HARDWARE) FLUSH
 OR SURFACE BOLTS, AUTOMATIC TYPE
 HAAU, FIRE DOORS, FIRE DOOR VIEWERS
 HABG, FIRE DOORS, TWENTY MINUTE TYPE DOOR ASSEMBLY
 COMPONENT ACCESSORIES
 HABT, FIRE DOORS, TWENTY MINUTE TYPE DOOR ASSEMBLY
 COMPONENTS FIRE TESTED WITHOUT HOSE STREAM

The individuals shown in the following tables are involved with the investigation of products covered under the subject categories. The Primary Designated Engineer (**shown in UPPERCASE letters**) coordinates the establishment and uniform interpretation of UL requirements applicable to the product categories. The Designated Engineers (**shown in lowercase letters**) work with the Primary Designated Engineer to interpret requirements and maintain standards.

Should you have questions regarding any adopted requirements that affect your product, you are encouraged to contact the individual at the office to which you normally submit your products.

The Responsible Department Manager for the subject categories is William Metes at UL's Northbrook office. The Responsible Department Manager oversees the significant interpretations made by the Primary Designated Engineer and arbitrates any differences regarding interpretation of UL requirements.