



## FAR 3064

### FIRE RESISTANCE OF A HORIZONTAL FOLDING CURTAIN TO SS489:2001

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# FIRE RESISTANCE OF A HORIZONTAL FOLDING CURTAIN SS489:2001

## 1. CLIENT

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## 2. INTRODUCTION

This report gives BRANZ's assessment on the fire resistance of the horizontal folding curtain tested to UL 10b if it had been tested in accordance with SS489:2001.

## 3. BACKGROUND

In Underwriters Laboratories Inc (UL) fire resistance test file No. R6799-2 Project No. 97NK30045 tested a folding curtain door assembly in accordance with UL 10B (NFPA 252, CAN 4-S104) for 180 minutes then subjected it to a hose stream test. The folding curtain door maintained the test criteria for the duration of the fire test and subsequent hose stream test. The sliding door consisted of a double skinned interlinked curtain that folded in on itself when open (sliding accordion door). The slats were secured together with a hinge arrangement. The sliding door was mounted within a plasterboard frame which in turn was secured to the brick lined specimen frame. The overall size of the test specimen was 3962 mm wide x 3562 mm high. For specific construction details refer to the UL test report File R6799-2 Project 97NK30045 dated 20<sup>th</sup> November 1997.

In UL File R6799 Project 07NK04154 it was considered that increasing the height of an oversized sliding curtain tested in UL file No. R6799-2 Project No. 97NK30045, would not prejudice its established fire resistance. This is based on drawings supplied to UL with new track details.

UL letter dated 28<sup>th</sup> August 1998 regarding R6799 – Special purpose type fire door assemblies. This letter discusses the labelling of oversize special purpose fire door assemblies including no maximum width limitation to the Won-Door folding curtain design.

## 4. DISCUSSION

### 4.1 Test standards UL10b vs SS489:2001

#### 4.1.1 Furnace conditions

##### 4.1.1.1 Time temperature curve

The two standards follow different time temperature curves which differ in their severity over time. The UL curve has a more rapid rise at the start of the test then falls below the SS489:2001 curve after approximately 60 minutes. In the UL report there is no mention of what the ambient temperature was, so for purposes of this comparison it has been assumed to be 20°C. Based on the area under the curve, for each time

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temperature regime the UL10B curve starts off having a higher temperature then after approximately 50 minutes the UL10B curve starts to fall below the SS489:2001 curve. At 120 minutes the SS489:2001 curve is approximately 1.7% more severe based on the area under curve than the UL10B curve.

In the UL test report it is stated that the furnace complied with the standard for the 180 minute duration of the test, however it is not indicated what the area under the curve was during the test. UL10B allows for  $\pm 7.5\%$  for 120 minute tests where as SS489:2001 allows  $\pm 5\%$  for tests longer than 30 minutes.

An examination of the furnace temperature graph in the UL test report and the comparison of the furnace curves suggests that the furnace conditions would have also complied with SS489:2001 for at least 120 minutes.

#### 4.1.1.2 Furnace thermocouples

A difference between test standards are the furnace thermocouples used. UL10B define either thermocouples protected by a porcelain tube or a wrought-steel/iron tube where as SS489:2001 use either bare wire or 1.5 mm mineral insulated metal sheathed thermocouples. The difference between thermocouples means the UL10B thermocouples are less responsive to rapid temperature rise than those defined in SS489:2001. This is due to having a larger thermal mass to heat up, which in turn means the furnace conditions at the start of the UL test are in fact more severe than indicated by the comparison between curves, as more heat is required to achieve the same temperature rise when compared to the furnace thermocouples used in SS489:2001.

After approximately 40 minutes the temperature rise defined in the curves is reduced and the temperature indicated by the different thermocouples are likely to be more consistent. This difference in thermocouples indicates the severity of exposure on the test specimen is likely to be closer to the SS489:2001 curve at 120 minutes than a comparison between curves indicates. Therefore it is further considered the furnace temperature gives similar heating conditions to those in SS489:2001 for at least 120 minutes.

#### 4.1.1.3 Furnace pressure

The pressure conditions of UL10B define a pressure of 0 Pa  $\pm 2.4$  Pa ( $\pm 0.01$  inches of water) at the top of the specimen where as SS489:2001 defines a neutral plane at 500 mm from the sill but at no time to exceed 20 Pa as the head of the specimen. In this case SS489:2001 is a more severe exposure condition as furnace gases will be pushed through any holes in the test specimen. If there are any combustible materials in the test specimen this positive pressure could cause ignition to the unexposed face of the combustible products from these materials. It has been stated by the client that the sliding door does not contain any combustible materials so flaming to the unexposed face would not be possible with an all metal construction.

The positive pressure on the specimen could also possibly cause greater erosion of the metal components causing structural collapse and Integrity failure, however as the test was continued for 180 minutes without failure it is considered for this specimen that the furnace pressure conditions of SS489:2001 would not prejudice the fire resistance of the sliding doorset before at least 120 minutes.

#### 4.1.2 Failure criteria

The test specimen is an all metal sliding door and as such is only subject to the Integrity criteria of the test standards. In UL10B the Conditions of Acceptance include

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allowing small flaming on the unexposed face in certain circumstances, doors on guides must not release from the guides or the guide shall not loosen such that the passage of flames could occur, the bottom of the door shall not separate more than 19.1 mm (3/4 inch) or the meeting edge separate by more than 9.5 mm. In the test report it stated that there was no through openings or evidence of flaming for the duration of the test.

The Integrity criteria of SS 489:2001 for uninsulated shutters include flaming in excess of 10 seconds and penetration of a 25 mm gap gauge. Based on the information in the UL test report it is considered that the test specimen did not fail any of the Integrity criteria of SS489:2001 for the duration of the test. Therefore it is considered that the test specimen would maintain the Integrity criteria of the test standard for at least 120 minutes.

## 4.2 Installation details

In UL fire resistance test file R6799-2 Project 97NK30045 the sliding doorset was installed into a steel framed plasterboard wall mounted into a block lined specimen frame. It is considered that if the sliding door is installed into a similar 120 minute fire rated plasterboard wall with similar mounting details it would not prejudice the fire resistance of the wall.

## 4.3 Oversize door

In UL report file No. R6799-2 Project 07NK04154 an oversize special purpose type fire door is considered up to 8.4m (28 feet) in height. This assessment is based on drawings supplied to UL with a new track detail. Although not specifically examined here it is considered if the design of the oversize sliding door meets the requirements of UL10B for 180 minutes it will also meet the requirements of SS489:2001 for at least 120 minutes.

In UL letter dated 28<sup>th</sup> August 1998 reference No R6799 with regards to oversize special purpose type fire door assemblies. It is stated that "No limitation has been established on the maximum width specified for an oversize certificated assembly due to the specific folding curtain construction of the Wondoor design." There is no maximum width defined by UL and therefore it is also considered this would not prejudice the fire performance before at least 120 minutes.

## 5. CONCLUSION

It is considered that based on the UL test report File R6799-2 Project 97NK30045 and Project 07NK04154, if the sliding doorset had been tested in accordance with SS 489:2001 for an un-insulated specimen it would have achieved at least 120 minutes Integrity.

## 6. LIMITATIONS

This assessment is subject to the completeness and accuracy of the information supplied.

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