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Bushfire test to AS 1530.8.1 on Weepguard weephole barrier installed in brick coarse work with non raked mortar detail

Testing Report

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Date: 6th December 2013
Revision: Revision C - amended report

Client: AC & L Marlborough
CSIRO Material number: 12/11
Commercial-in-confidence

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Proposal Details

Document: Testing Report

Project: Bushfire test to AS 1530.8.1 on Weepguard weephole barrier installed in brick coarse work with non raked mortar detail

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Proposal Status and Revision History

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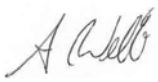
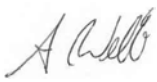
Proposal Authorisation

AUTHOR	REVIEWED BY	AUTHORISED BY
B. Tiganis	A. Webb	A. Webb
Fire Safety Engineering	Fire Safety Engineering	Fire Safety Engineering
		
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1 Introduction

This report describes a pilot scale test performed on a product namely Weepguard used to cover building weepholes, to determine its performance under bushfire conditions based on AS 1530.8.1[1], a 12.5 kW/m^2 radiant heat exposure and a Class A timber crib. As a standard test specimen for testing the product under AS 1530.8.1 was not available the test was performed with the Weepguard weephole barrier installed in a brick wall detail supplied by AC & L Marlborough as described in Sections 2 &5. The results and relevant conclusions of the testing and hence any certification apply specifically and only to the specimen in the complete system assessed as described in Section 2& 5.

Tests were performed on behalf of AC & L Marlborough. The test was conducted on 13th September 2012 at CSIRO's Highett Laboratory by a team lead by Alex Webb. It was observed by Bill Tiganis.

The CSIRO Specimen Identification Number: 12/11.

1.1 Sample Identification

See Table 1.

1.2 Sponsor

AC & L Marlborough

58 Ocean Reach, Cape Woolamai, Victoria 3925, Australia.

1.3 Manufacturer

Forme Technologies, Carrum Downs, Victoria 3201.

1.4 Job Number

FE 2539.

1.5 Test Date

13/9/2012.

2 Specimen Description

Samples were selected and provided by the sponsor and described as follows in Table 1. CSIRO were not involved in the sample selection.

Table 1: Sample descriptions

CSIRO material number	Description
12/11	**Trade name or other identification:** Weepguard **Client:** AC & L Marlborough. **Manufacturer:** Material – Duromer Products Pty Ltd, PO BOX 3070 Rhodes NSW 2138. Injection moulding – Forme Technologies Carrum Downs Victoria 3201. **Description of the product:** Weepguard is a one piece weephole barrier with integrated screen mesh (hole dimensions 1.2 mm x 0.5 mm). Weepguard is injection moulded using Duralon Nylon 6 F03 polymer (fire retarded Nylon – 6). **Colour:** Available in several colours. Colour tested was Sandstone. **Adhesive:** No adhesive. **Density:** Specified as 1.17 kg/m^3 **Flame Retardant:** Non halogenated Fire retardant (Equivalent UL 94 V-0 1.6 mm Pass). **Specimen Thickness:** 3 mm

2.1 Documentation

CSIRO specimen description forms have been provided by the client for this specimen. Test Agreement and form FTAF33 dated 6th September 2012.

3 Conditioning of Specimens

Prior to the test, the specimens were conditioned at standard temperature 23+/-3°C and humidity 50+/-5% RH for 7 days.

4 Test Apparatus

The test was conducted using the bushfire radiant panel test facility at CSIRO's Highett Laboratory.

The test apparatus consists of:

- A stationary 1.5m by 1.5m gas fuelled radiant panel providing an effective constant radiant heat source.
- A computer controlled carriage which allows the position of the test specimen relative to the radiant panel to be varied. By varying the position of the test specimen the level of radiant heat exposure was varied (see Figure 1). The system was pre-programmed so a time varying radiant heat profile can be applied to the test specimen.
- Medtherm Corporation, model 64-10SB-18 water cooled Schmidt-Boelter radiometers with a range of 0 - 100 kW/m^2.
- Thermocouples, 1.5mm diameter, Type K, Mineral Insulated Metal Sheath (MIMS) with stainless steel (AISI 310) sheath, magnesium oxide powder insulation and PVC leads

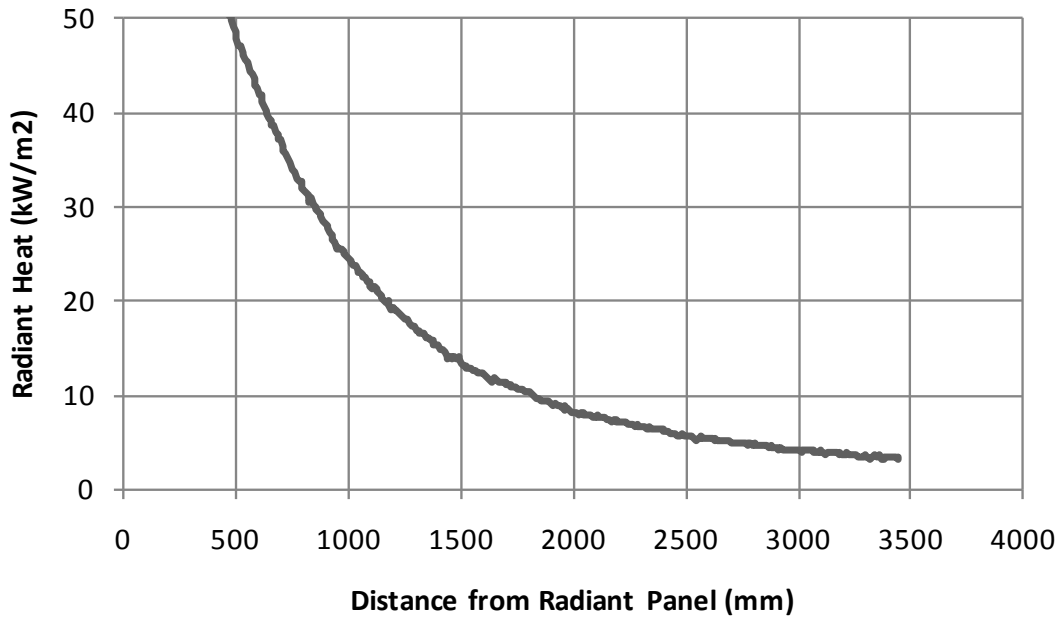

Figure 1: Variation in radiant heat with distance from the radiant panel.

5 Specimen Installation

Date of receipt of the specimens and commencement of conditioning:

The material was received at CSIRO on 23rd August 2012 and conditioned till the day of the test 13th September 2012.

Date of installation:

The specimen was installed by the client and CSIRO staff on the day of testing, 13th September 2012.

Installation technique:

The Weepguard weephole barrier (Figure 2) was installed in an approximate 1m wide three coarse high section of structural brick wall with non raked coarse work (See Figure 3). The Weepguard was installed in the weephole penetration in the second coarse as is typical in building applications in the middle section of the wall (See Figure 3). The Weepguard/wall specimen was mounted onto the test carriage so that the Weepguard specimen was aligned with the centre of the radiant panel. The wall was positioned approximately 50 mm away from a 4.5 mm thick cement sheet that extended from the base of the wall specimen to the top of the test rig. This created a cavity similar which simulates that behind a brick wall in a building application. The ends of the wall specimen and the top were insulated by filling gaps between the wall and the cement sheet using ceramic blanket as were all other openings (Figure 4).

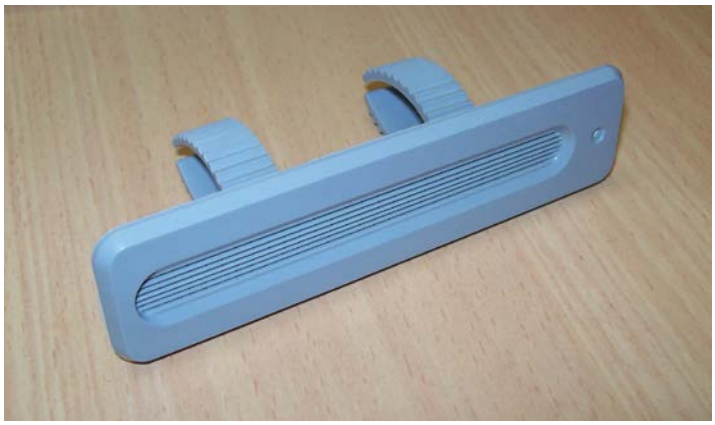

Figure 2: Weepguard weephole barrier.

Figure 3: Weepguard as installed in wall for testing to AS 1530.8.1.

Figure 4: Side view of Weepguard/wall specimen installation showing insulation of cavity at the end and top of the sample.

6 Test Procedure

The test procedure is based on AS 1530.8.1[1]and a 12.5kW/m^2 radiant heat exposure (see Figure 5). The exposure comprises a rapid increase to 12.5 kW/m^2 which was held for 2 minutes before a slow decline. The total time of the radiant heat exposure profile extends to 10 minutes. The lower limit of ~3kW/m^2 observed in Figure 5 is a limitation of the distance the carriage can be moved away from the radiant panel. To simulate possible embers or foliage fires at ground level below the Weepguard installation, a Class A crib ignition source was placed 100 mm under the installed Weepguard barrier. The crib was placed in position within 15 seconds post its ignition and as per standard the installed Weepguard/wall specimen was then exposed to the radiant heat profile within 15 seconds and this was deemed a the start of the test. Thermocouples were used to measure the air temperature in the weephole cavity directly behind the Weepguard barrier, the air temperature in the cavity formed between the brick wall specimen and the cement sheet, and the temperature of the cement sheet surface (non fire side within formed cavity). Radiometers were placed 365 and 250 mm behind the back face of the cement sheet wall in line with the crib position. Thermocouple installation is shown in Figure 6.

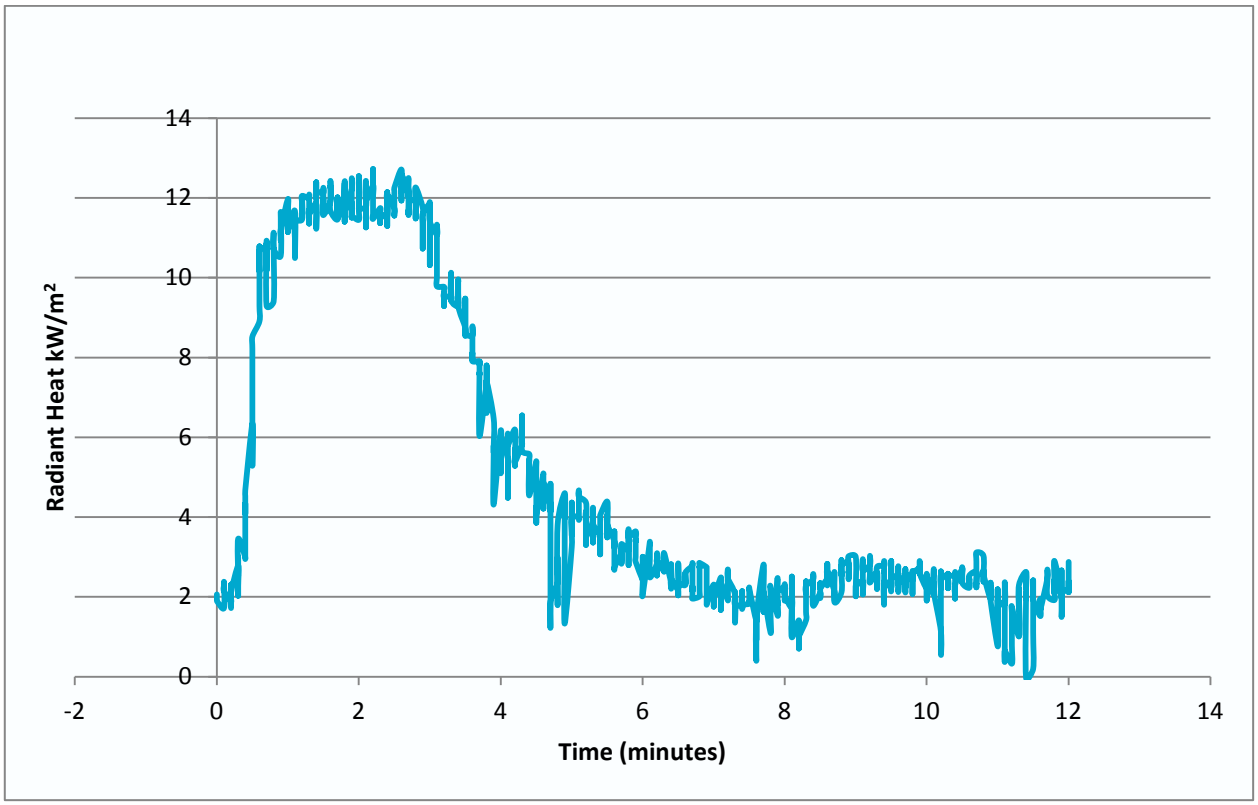

Figure 5: 12.5 kW/m^2 radiant heat exposure profile.

Figure 6: Thermocouples in weephole cavity and in cavity between cement sheet and brick wall.

7 Results and Observations

7.1 Temperatures and radiant heat

The temperature values are shown in Figure 7. The main points to be noted are:

- The weephole cavity reached a peak temperature of 40.9^{o}C at ~ 22 minutes.
- The air cavity temperature between the wall specimen and the cement sheet reached a peak temperature of 26.7^{o}C at 21.5 minutes.
- Surface temperature on the cement sheet reached a peak temperature of 22.9^{o}C at 24.5 minutes.
- The peak temperatures were post the (12.5kW/m^{2}) radiant heat phase which finished at approximately 3 minutes.
- Radiant heat flux at 250 mm & 365mm from the non-fire side was measured as less than 0.5kW/m^{2}.

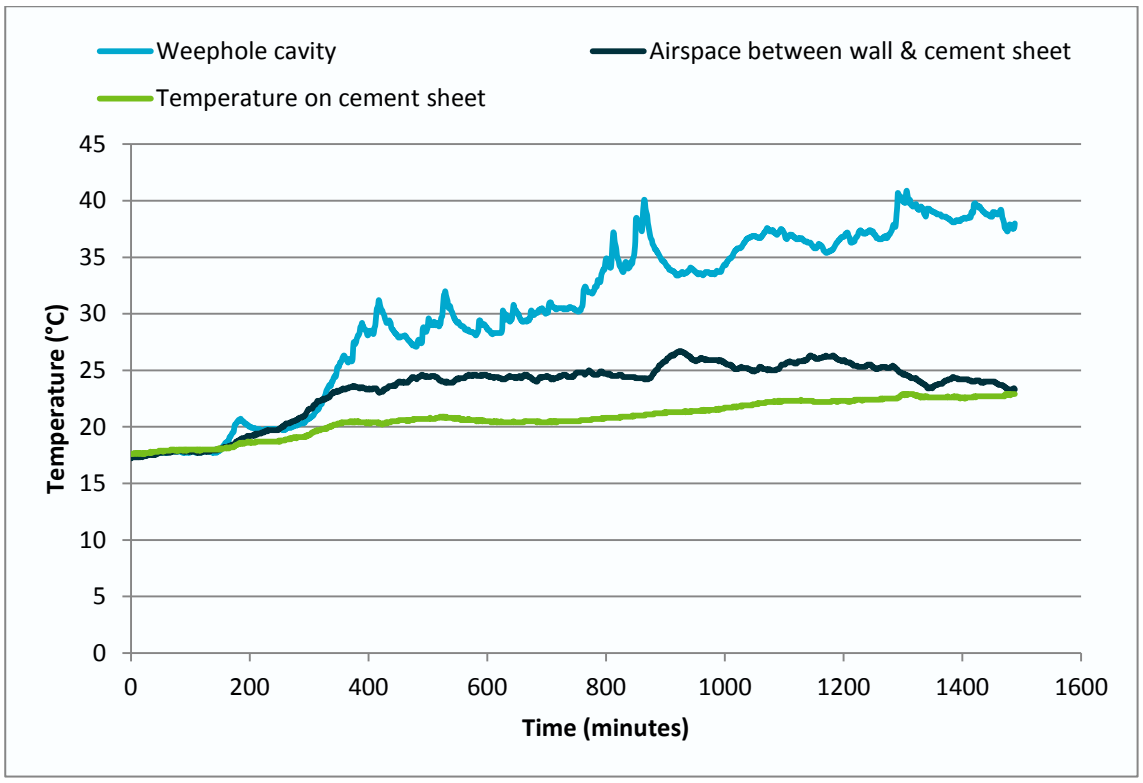

Figure 7: Measured temperatures at the three locations during the test.

7.2 Visual assessment

Photos of the test and post test are shown in Figures 8 to 14.The main points to be noted are:

- The Weepguard barrier did not ignite during the peak (12.5kW/m^2) radiant heat phase or post this phase for a period of 60 minutes.
- Inspection of the Weepguard barrier after the test reveals the specimen was intact and retained its integrity. Slight lifting of the Weepguard barrier edge at both lower and upper edge had occurred, however this was minimal at less than 2 mm lift and not directly above the weephole cavity and hence the weephole cavity was not exposed in any way (Figure 13).
- The integrated mesh although had signs of deformation and slight melting retained its integrity and the mesh holes size did not increase and in fact slight melting caused some holes to seal. (Figure 13). Post test assessment of the mesh integrity for both a hot and cold Weepguard specimen did not reveal specimen deterioration or any hole enlargement.
- General inspection and assessment of the Weepguard specimen at both the specimen edges and integrated mesh prevented a 3 mm gap gauge from going through.

Figure 8: Test at 30 seconds.

Figure 9: Test at 4 minutes.

Figure 10: Test at 7 minutes.

Figure 11: Test at 13 minutes.

Figure 12: Weepguard/wall specimen at 20 minutes.

Figure 13: Post test Weepguard inspection.

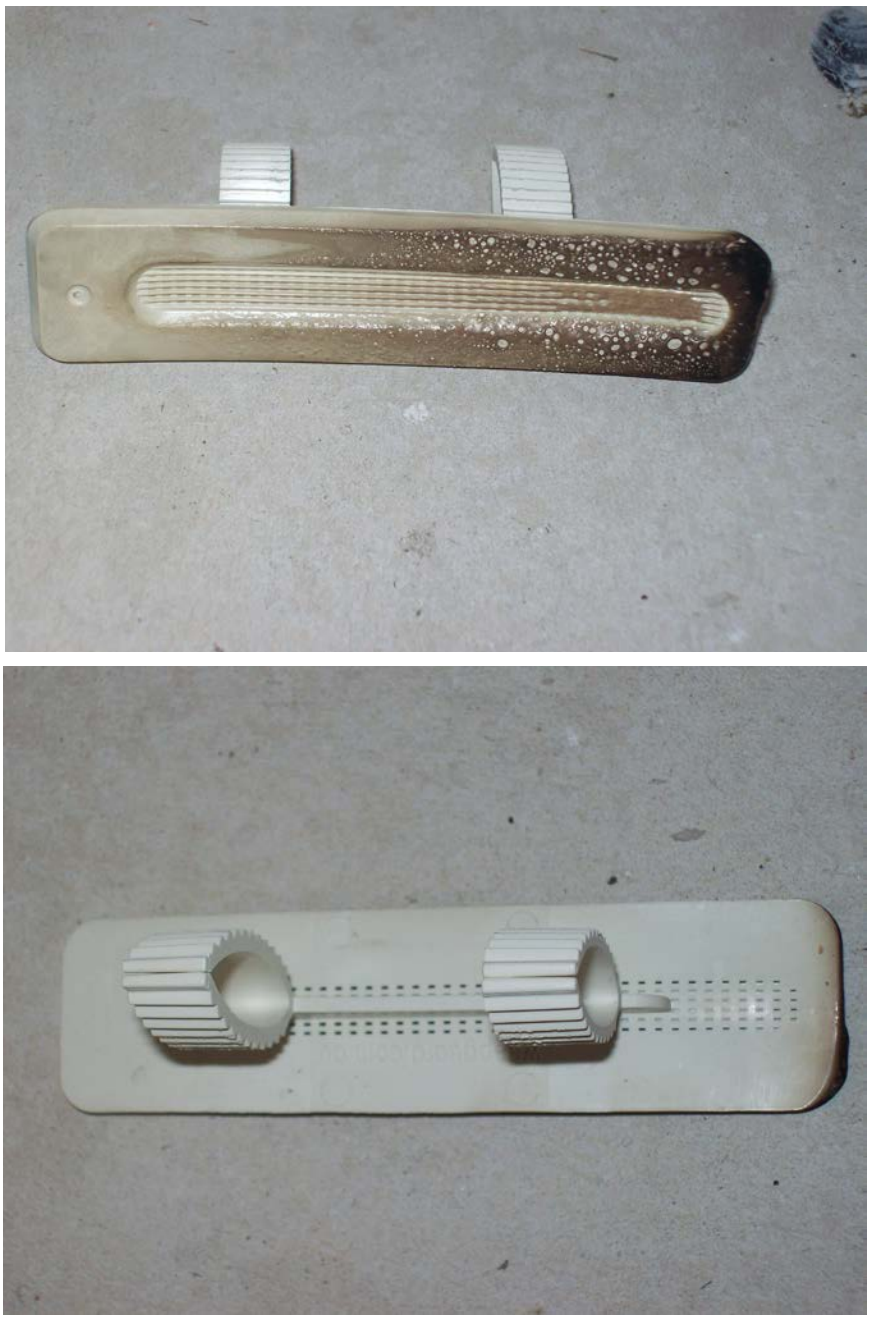

Figure 14: Post test inspection of Weepguard weephole barrier removed from wall structure.

8 Conclusion

The following performance was observed in respect of Clause 14.4 of AS1530.8.1-2007 criteria:

1. The Weepguard weephole barrier passed the gap requirement in AS 1530.8.1, formation of through gaps greater than 3mm.

    - No gaps formed which would allow a 3mm diameter rod to pass through.

2. The Weepguard weephole barrier passed the flaming requirements in AS 1530.8.1

    - No flaming on the fire-exposed side at the end of the 60 minutes test period.
    - No sustained flaming for 10 seconds on the non-fire side.

3. The radiant heat flux from the sample passed the requirements in AS 1530.8.1

    - Radiant heat flux 250-mm from the non-fire specimen, not greater than 3 kW/m²between 20 minutes and 60 minutes.
    - Radiant heat flux 365-mm from the non-fire side did not exceed 15 kW/m².

4. All temperatures measured during the assessment passed the requirements in AS 1530.8.1

    - mean and maximum temperature rises were not greater than 140K and 180K, respectively on the non fire side during the 60 minute test.
    - mean and maximum temperature of internal faces including cavities did not exceed 250°C and 300°C respectively between 20 minutes and 60 minutes after commencement of test.

The Weepguard weephole barrier, as part of an overall wall/building system as described in Section 5, when tested at BAL 12.5 in accordance with Clause 20 of AS1530.8.1-2007, met the requirements of the specified criteria in Clause 14.4 of AS1530.8.1-2007. This qualification is specific and only applies to brick coarse work (as described in Section 5) constructed using non raked mortar detail in the area of application of the barrier. The results do not apply to a masonry wall that uses raked mortar work in the area of application of the barrier.

The results of this fire test may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all fire conditions.

This approval does not extend to any modification of the specified system. This approval cannot be applied to another product of similar nature by analogy.

9 Limitations

The test results relate only the behaviour of the specimens of the product under the particular conditions of test: they are not intended to provide a full assessment of fire hazard under all fire conditions.

The test results relate only to the specimen of the product in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and will therefore invalidate the test results. It is the responsibility of the supplier for the product to ensure that the product which is supplied is identical with the specimens which were tested.

The specification and interpretation of fire test methods are subject of ongoing development and refinement. For these reasons it is advised that the relevance of test reports older than 5 years should be considered by the reader and user of results.

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No measurement of uncertainty has been determined.

10 References

1. Standards Australia (2007), “Methods for fire tests on building materials, components and structures part 8.1: Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources AS 1530.8.1’, Standards Australia.

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