BCRC REPORT OF FIELD FIRE TEST

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17 July 2019

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Live fire exposure test on AHMC rendered and un-rendered wall

Dear Klara

BCRC was asked to conduct a fire exposure test on a rendered AHMC wall. The AHMC specification is for all external walls in bushfire exposed areas to be rendered with a 10mm layer of AHMC render. The wording in the AHMC construction handbook is included below:

> For an external AHMC hemp masonry wall on a house in a bushfire exposed location, the AHMC Construction Manual recommends:
>
> - the wall be at least 200mm thick;
> - the hempcrete cover to the studs must exceed 65mm; and
> - the wall must be rendered externally with at least a 10mm thick layer of AHMC render.

The structure shown below in Photo 1 was built in March 2017 during an AHMC workshop. The wall construction was undertaken by novice trainees under the tutelage of Klara Marosszeky. The fire test illustrated below was conducted on the south facing wall, which had been exposed to the weather with a 400mm roof overhang since construction.

The wall was rendered on 31 July 2019 with AHMC render in a thickness of between 6 and 11 mm by an unskilled renderer. The photos show a rough style of rendered finish.

The fire test was conducted on 16 August on the south wall when the render was 17 days old, giving it time to set and dry out. The fire test is in effect a flame exposure test for 60 minutes. The photos are annotated and show the following:

- The construction of the wall shows that the wall is 200mm thick, the 75mm nominal size studs are centrally located and 70mm deep. The AHMC Hempcrete cover to the studs is approximately 65mm.
- The photos show the progress of the fire test in approximately 5-minute intervals up to 60 minutes. The photos show the fire from the front and the side at each time interval.
- Where the render was more than 9mm thick, the underlying hempcrete remained sound, its colour was unchanged and was found to be in its original condition. The render was softened by the fire test and scraping back of the surface of the render, and resurfacing the render is recommended.

Photo 1: un-rendered wall

Photo 2: wall 200mm thick

Photo 3: Cover to studs shown as 65mm

Photo 4: Rough rendered wall

Photo 5: Fire 32 seconds into 60-minute test	Photo 6: Fire 32 seconds from side
	
Photo 7: Fire 4 Min 17 sec into 60-minute test	Photo 8: Fire 4 Min 17 sec from side
	
Photo 9: Fire 11 min 9 sec into 60-minute test	Photo 10: Fire 11 min 9 sec from side

Photo 11: Fire 17 min 10 sec into 60-minute test

Photo 12: Fire 17 min 10 sec from side

Photo 13: Fire 22 min 36 sec into 60-minute test

Photo 14: Fire 22 min 36 sec from side

Photo 15: Fire 28 min 32 sec into 60-minute test

Photo 16: Fire 28 min 32 sec from side

Photo 17: Fire 32 min 48 sec into 60-minute test

Photo 18: Fire 32 min 48 sec from side

Photo 19: Fire 37 min 34 sec into 60-minute test

Photo 20: Fire 37 min 34 sec from side

Photo 21: Fire 44 min 32 sec into 60-minute test

Photo 22: Fire 44 min 32 sec from side

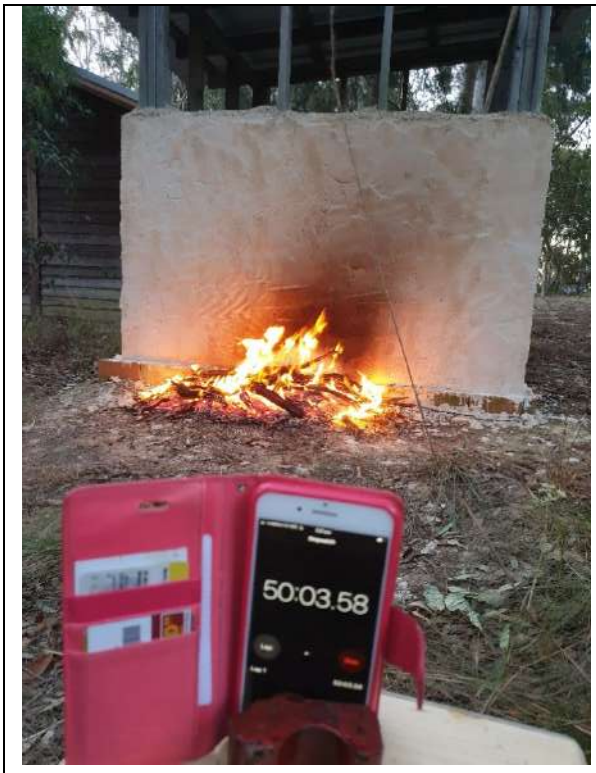

Photo 23: Fire 50 min 03 sec into 60-minute test

Photo 24: Fire 50 min 03 sec from side

Photo 23: Fire 55 min 03 sec into 60-minute test

Photo 24: Fire 55 min 03 sec from side

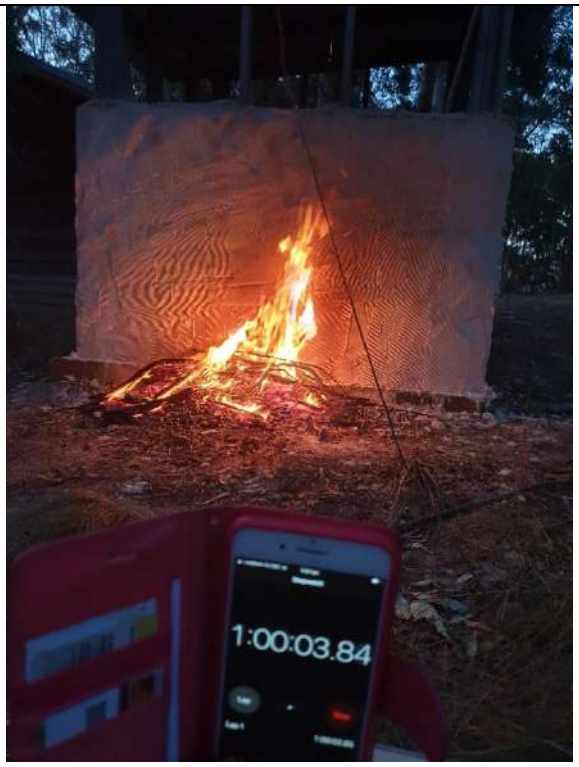

Photo 25: Fire 1 hour into 60-minute test

Photo 26: Fire 1 hour from side

Photo 27: Fire out 1 hour 4 min test over

Photo 28: Close up of sound render after fire had cooled down

Photo 29: Site of investigation into the effect of the fire of the hempcrete located at the centre of the fire affected area

Photo 30: Condition of hempcrete beneath the render. The render thickness was 6mm at the bottom and 12mm at the top of the cut. The colour and consistency of the underlying hempcrete was not altered where the thickness of the render exceeded 9mm. with a thinner render layer some discolouration was evident

At the conclusion of the test, the render was tested for drumminess, the render was sound and appeared to be fully adhered to the hempcrete substrate. Some faint hair line cracks were visible on the surface of the render.

A section of the render was removed for further investigation. The location of the investigation is shown in Photo 29. The render was sound though it had been softened by the effects of the fire.

Photo 30 shows a close-up of the hempcrete beneath the render and shows the thickness of the render. The render thickness varied from 6mm at the bottom to 12 mm at the top. It was found, and this is visible in the photo, that where the render was more than 9mm thick, the hemp was not discoloured at all and had not been affected by the fire exposure. Where the render thickness was between 6 to 9mm the colour of hempcrete substrate altered by the heat transferred through the render. The depth of the charring was limited to 2-3mm.

The result of the test indicates that with a minimum of 10mm of AHMC render over an AHMC hempcrete wall (the system that is specified in the AHMC Construction Manual for external exposure in a bushfire area), a 1 hour flame exposure fire test created only very superficial damage to the wall system, softening the surface layer of the render and discolouring the surface of the render. The underlying hempcrete was unaltered in colour or apparent consistency. No chemical testing was undertaken as a part of this investigation.

Yours sincerely,

Jonathon Dyson

Jonathon Dyson
NSW Manager
BCRC