

## **BRE Global ACP/Insulation**

### **BS 8414-1 Fire Tests**

**For**

### **Department of Communities & Local Government**

#### **Summary**

BRE Global ran a total of 7 Façade Tests on 3 different categories of ACP's with 3 different Insulations. The installations included vertical and horizontal cavity barriers. The following summarizes the key parameters and the results. Ref: <https://www.gov.uk/guidance/building-safety-programme>

#### **ACP's**

The brand(s) of ACP was not disclosed but identified by the calorific value (MJ/kg) of the core through a screening test BS EN ISO 1716:2010 under the following categories –

Category 1 – Limited combustibility -  $\leq 3$  MJ/kg

Category 2 – Limited flame retardant -  $> 3$  MJ/kg and  $\leq 35$  MJ/kg

Category 3 – No flame-retardant properties -  $> 35$  MJ/kg

The representative panels used for the testing had the following calorific values:

Category 1 – 2.3 MJ/kg

Category 2 – 13.6 MJ/kg

Category 3 – 46.4 MJ/kg

As a comparison, the ALPOLIC range of ACP's have the following calorific values as stated in their literature – ALPOLIC A2  $< 3$  MJ/kg, ALPOLIC-fr  $< 13$  MJ/kg and ALPOLIC PE  $> 45$  MJ/kg. Other manufacturers have not provide this information in their data. The key point here is that to European Standards there is a wide range in the calorific value within Category 2. While the ALPOLIC-fr product states it is  $< 30\%$  PE, we don't know how much less and how that compares to the other manufacturers that also state their FR product is around  $30\%$  PE. Until more information can be obtained from the manufacturers, at this point all we can do is assume that FR ACP's with stated  $30\%$  PE in their core, would have a similar Calorific value to ALPOLIC-fr and the tested Category 2 product in the BRE reports.

Note: Our thanks go to ALPOLIC for providing this data in their technical specification.

#### **Insulations**

The insulations used in the tests were PIR, Stone Wool and Phenolic. Again, no manufacturers names or product designations were provided however the PIR and Phenolic insulation was assumed to be compliant/fire retardant. The following was reported –

PIR – 100 mm, foil faced, density  $31.2 \text{ kg/m}^3$ , moisture content from 2.4% to 3.9%

Stone wool – 180 mm, density  $47.7 \text{ kg/m}^3$ , moisture content from 0.5% to 0.6%

Phenolic – 100 mm, foil faced, density  $32 \text{ kg/m}^3$ , moisture content 8.5%

## Cavity Barriers provided in all tests

The vertical cavity barriers were 75 mm wide by 240 mm stone wool with stated integrity/insulation performance of 90/30 minutes, compressed 10 mm. They were installed 1980 mm apart with the combustion chamber opening centred between them. The wing wall had the vertical barrier at the outside edge about 1250 mm from the main wall.

The horizontal cavity barriers were 75 mm wide by 205 mm deep stone wool with intumescent and stated integrity/insulation performance of 90/30 minutes. The intumescent looks like a 15mm thick foam attached to the edge of the rock wool horizontal barrier. There is a 25mm gap between the horizontal cavity barrier and the ACP to allow ventilation vertically. In a fire the intumescent layer expands to fill this 25mm gap. The horizontal cavity barriers were installed at the following locations:

- Directly above the combustion chamber opening
- 2395 mm above the first cavity barrier
- 2330 mm above the second cavity barrier
- Close to the top of the rig, 1635 mm above the third cavity barrier and 6360 mm above the combustion chamber opening

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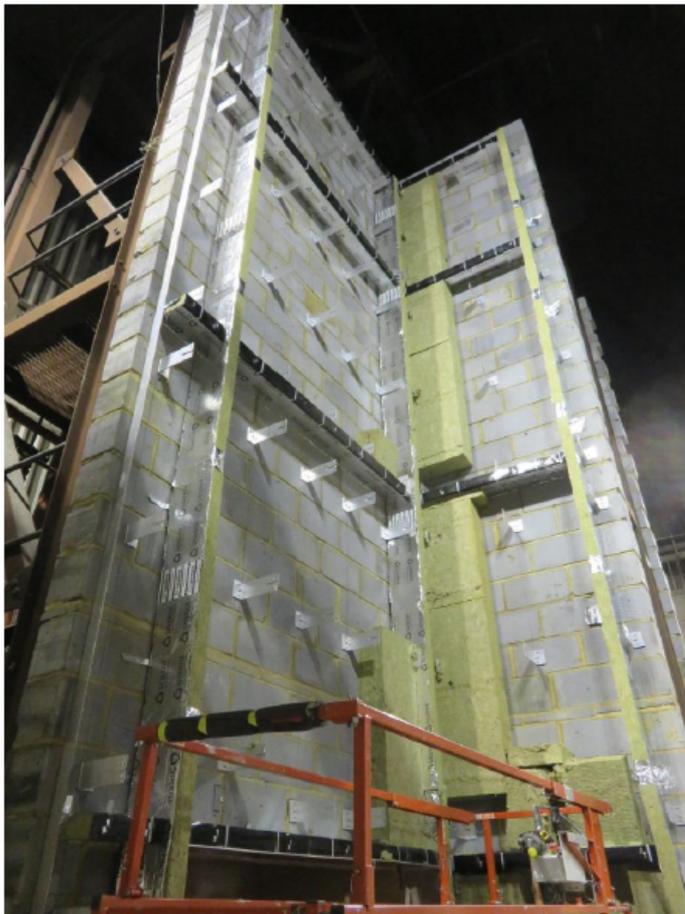


Figure 5. Horizontal intumescent cavity barriers fixed through the entire depth on face turned steel brackets, fitted between vertical cavity barriers.

**Table 1 – Summary of the 7 fire tests and results**

| Test | ACP/Insulation | Result | Time to (min)                  |                   |                             |  |
|------|----------------|--------|--------------------------------|-------------------|-----------------------------|--|
|      |                |        | Flaming debris burning > 20sec | Pool fire at base | Flames at or above test rig | Test terminated (crib ext. after 30 min) |
| 1    | Cat 3/PIR      | Fail   | 5                              | 8                 | 7                           | 9  |
| 2    | Cat 3/RW       | Fail   | 5                              | Unavailable       | 7                           | 7  |
| 3    | Cat 2/PIR      | Fail   | 8                              | 9                 | 25                          | 25                                       |
| 4    | Cat 2/RW       | Pass   | 7                              | 9.5               | -                           | 60                                       |
| 5    | Cat 1/PIR      | Pass   | 9                              | 10                | -                           | 60                                       |
| 6    | Cat 1/RW       | Pass   | 9                              | -                 | -                           | 60                                       |
| 7    | Cat 2/Phenolic | Fail   | 8                              | 12                | 28                          | 29                                       |

\*PIR (Polyisocyanurate), RW (Rock Wool)

## Conclusions

The BRE Global tests provide our best indication to date as to the fire behaviour of the three most common categories of ACP's installed on Australian buildings. One very important difference however is that cavity barriers were provided in all tests, whereas the provision of cavity barriers is not required in Australia and hence typically not specified.

Thus, the expectation is that the fire performance seen in the BRE Global results in the table, would probably be considerably worse with no cavity barriers installed. This is a significant concern for the Category 2 (FR or Fire Rated) ACP's with any sort of combustible/fire retardant insulation or sarking installed behind the ACP.

1. Category 3 ACP's – those with near 100% PE core, will burn aggressively vertically (both up and down from the ignition point), regardless of the type of insulation or sarking behind.
2. Category 2 ACP's – those with around 30% PE in their core, will burn vertically beyond two floors above the ignition point if the insulation or sarking behind is combustible/fire retardant.
3. Category 1 ACP's – those with no more than 7% PE, should not propagate a fire beyond two floors above the ignition point, with combustible/fire retardant insulation or sarking.
4. Category 2 and 1 ACP's should not propagate a fire beyond two floors above the ignition point, with non-combustible insulation and/or sarking behind.

Note: This new information would not have been considered in most CODEMARK Certificates of Conformity, hence any reliance on these certificates should be taken with caution. The critical issue not reported in many of the certificates are the complete installation details (including the type if any of insulation installed) for the various full scale façade fire tests considered in their evaluations. As can be seen from the BRE Global testing, the type of insulation installed is critical in the fire performance of the ACP's.