Putting fire resistance to the test

BRANZ has upgraded and extended its fire testing capabilities, carrying out valuable work to ensure that passive fire products meet standards for saving lives and protecting property.

BY GREG BAKER, BRANZ FIRE AND STRUCTURAL ENGINEERING MANAGER

Fire resistance testing, or the ability of a product or system to contain a large-scale fire in part of the building – where the fire started – is an important aspect of life safety. It gives people sufficient time to safely evacuate a building in a fire.

Testing for a fire resistance rating has three components, and the product or system is compromised or fails if:

- the element cannot maintain the applied load – structural adequacy component
- a fire can break through – integrity component
- radiation from the non-fire side of the element is too high – insulation component.

How the ratings work

Consequently, fire resistance ratings comprise three numbers, depending on the result for each of the components in the test.

The numbers do not need to be the same. For example, a fictitious fire-rated element with a /-30/60 fire resistance rating has:

- zero rating for structural adequacy – it is non-loadbearing in a fire
- 30-minute rating for integrity
- 60-minute rating for insulation.

The fire resistance rating required depends on where the element is used in the building.

A typical 1-hour loadbearing fire-rated wall will have a fire resistance rating of 60/60/60, meaning that it has achieved at least 60 minutes for all three criteria in the standard fire resistance test.

On the other hand, a 30-minute fire door will have a /-30/- fire resistance rating.

Products tested for compliance

Apart from research and development, the primary purpose of commercial fire testing at BRANZ is to demonstrate regulatory compliance with the New Zealand Building Code as well as those in international markets.

Compliance with a building code or standard is required in two areas – fire resistance and reaction to fire.

Containing the fire

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Ready to fire up – one of the BRANZ fire testing furnaces.

BRANZ HAS PROVIDED commercial fire testing services to the New Zealand, Australian and Asia-Pacific fire protection industries since the 1970s. Typical customers are manufacturers or suppliers of passive fire protection products and systems.
meaning that it is only required to provide 30 minutes of integrity in the fire test and has no load-carrying or insulation function.

**Two fire resistance test furnaces**

Fire resistance tests are done by placing a test specimen across the mouth of a furnace and following a standard time-temperature curve to ensure that each test specimen is subjected to exactly the same standard fire conditions.

BRANZ has two fire resistance test furnaces - one is used to test 4 m high by 3 m wide specimens and the other to test 2 m high by 1 m wide specimens.

As test standards require that specimens are tested at real scale, the small-scale furnace can only be used to test systems such as fire stopping or fire door hardware. The full-scale furnace tests fire-rated walls and floors.

**Fuel change and more capability**

Until recently, the furnaces at BRANZ were fuelled by diesel. Now, they have been converted to use LPG (liquefied petroleum gas), ensuring the long-term capability of the BRANZ fire resistance testing facility and providing a range of new test methods not previously available.

For example, BRANZ’s fire resistance furnaces can now perform testing to hydrocarbon test standards that simulate a tunnel fire caused by accidents such as fuel spills. This capability is timely as investment in road tunnel infrastructure grows.

**Plus reaction-to-fire testing**

BRANZ also has the facilities to carry out reaction-to-fire testing. This deals with the initial stages of a fire, looking at how flammable or combustible a material is, how quickly it will contribute to fire growth and how much smoke and fire gases will be released.

Testing internal wall and ceiling linings using the ISO 5660 cone calorimeter or ISO 9705 room is required in many applications to produce a Group Number for the product or system.

Cone calorimeter testing is also required to demonstrate compliance for some external cladding situations. For more, visit Fire Testing on the BRANZ website at www.branz.co.nz/fire-testing.