

Imperfect world of firestopping

Resolving firestopping compliance issues in existing buildings can be difficult. BRANZ research is helping bring consistency to the process of determining what is reasonable and practicable when undertaking building alterations.

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FIRESTOPPING is the process of making sure that any openings and gaps in a fire separation do not compromise the ability of the fire separation to resist the spread of fire. Openings and gaps are typically necessary to allow building services to penetrate through the fire separation.

Factors that affect performance

Many factors may affect how well a firestopping solution will perform, including:

- the underlying construction
- the type and size of building service running through the opening and how it is supported
- the opening geometry
- the construction of the firestop itself.

Firestopping traced to 1975 fire

The US-based Firestop Contractors International Association traces modern firestopping back to the 1975 Browns Ferry Nuclear Plant fire.

In this fire, polyurethane foam used as a cable penetration seal was directly ignited by workers testing the penetration for leakage with a candle. Recommendations made as a result of this fire included developing a standard qualification test for firestopping performance.

Method of testing firestopping solutions

In many countries, the accepted method of testing firestopping solutions involves building a representative example of the construction detail and attaching it to a furnace. The detail is then exposed to standardised fire conditions - time-temperature curve and furnace pressure - and the fire-resisting performance is observed for a period.

Specific criteria are used to determine when the construction fails to perform adequately. The fire test results are then only applicable to firestops in real buildings if the as-built construction matches the tested specimen.

Firestopping incorrect too often

What happens when what gets built doesn't match a tested solution? The Building Code compliance of the construction immediately becomes questionable.

Once built, the cost of rectifying questionable construction is almost always an order of magnitude more than doing it correctly the first time. For this reason, it is of utmost importance that firestopping gets done correctly the first time in new construction.

However, observations and conversations with those with experience indicates that nearly all existing buildings have some degree of questionable construction - and not just in New Zealand. Observed variations from tested solutions in real construction range from no firestopping at all - leaving gaping holes in fire separations - to slightly overtightened fasteners or slightly out of tolerance gaps and spacings.

When existing buildings are altered, it can be difficult to agree on what firestopping



Figure 1: BRANZ fire research test investigates common firestopping construction details.



Figure 2: A failed cable penetration in the timber infill floor test – no firestopping had been applied to this penetration.

upgrades are reasonable and practicable to achieve an acceptable level of safety given the extraordinarily high cost of achieving full compliance and the uncertainty in how it may or may not perform in a fire. Ultimately, answering these questions requires careful consideration of the costs involved and the benefits gained.

What is the risk with poor firestopping practices?

The only way to truly find out how well fire separations really perform is to observe what happens in real fires. Fortunately, we haven't observed an increase in New Zealand fire incident fatalities, injuries or losses that can be attributed to questionable firestopping construction in existing buildings.

While this could be due to luck rather than good management - and possibly a result of other factors like decreasing fire starts - it raises questions about how much risk there is associated with existing and historical firestopping practices or lack thereof.

BRANZ puts poor practice to the test

BRANZ recently undertook a research project to look at how some commonly

observed and questionable firestopping installation practices might perform in a fire-resistance test.

The fire tests provided some surprising results, which can be read about in more detail in BRANZ Study Report 410 *Assessing the risk of non-compliant firestopping and smokestopping in New Zealand residential buildings undergoing alterations*.

Some details that were predicted to fail early in the test performed better than expected. Of course, the details tested were only a small subset of the wider range of the potentially non-compliant installations identified in New Zealand buildings.

As part of this research, recommendations were also made for systematically approaching these problems in existing buildings based on industry best practice.

Many initiatives to improve practices

There are many things we can do to improve the situation in the future.

As previously mentioned, firestopping correctly the first time in new construction is ultimately the most cost-effective approach to preventing problems later in the building's life cycle.

Industry awareness, training and controls

are critical, and you can read about initiatives currently under way in New Zealand in this *Build* feature.

At BRANZ, we are developing a continuing professional development (CPD) course that will bring the industry to our facilities and get them directly involved in fire testing. The course participants will have a greater appreciation of why firestopping is so important, what fire testing does and doesn't mean and what deviations from tested solutions may or may not be acceptable under certain circumstances.

We can also use these tests as a research tool to investigate improvements to fire testing methodologies to make tests more representative of the potential risks in real fires.

Industry working to address concerns

Changes to industry practice and knowledge take time, but there are many positive signs that the building industry is working hard to address firestopping concerns in New Zealand buildings. BRANZ will continue to work with the building industry to provide fire separation solutions that work for New Zealanders. ◀

For more ▶ BRANZ Study Report 410 is available at www.branz.co.nz/study_reports.