Fire protection is an important aspect of building design. Fire barriers prevent fire spread within the building, minimising the risk to life safety. Minimising fire spread is usually addressed by providing fire-rated systems that have been tested to, and meet, specific standards called up by the relevant building code.

Understanding fire resistance ratings
In New Zealand and Australia, fire-resistant systems are required to be tested in accordance with AS 1530.4: Methods for fire tests on building materials, components and structures – Fire-resistance test of elements of construction. They achieve a fire resistance rating (or level) based on the test result. The rating is stated in minutes in the form of 120/120/120. The first number relates to the structural ‘stability’ of the tested building element (called structural adequacy in AS 1530.4 and stability in the New Zealand Building Code compliance document for fire safety). This is for load-bearing elements like load-bearing walls, floors, columns and beams. The second number relates to the ‘integrity’ of the tested element, and its ability to provide fire separation and prevent flames and hot gases passing through the element. The third number relates to the ability of the tested element to maintain the temperature on the non-fire side of the separating element to below specific criteria, and is known as ‘insulation’.

The fire resistance rating might be a mix of numbers. Where specific criteria are not relevant a ‘−’ will be shown. For example, a structural element which is only required to support the building but not provide any fire separation could have a fire resistance rating of 90/−/−. A fire door which is not required to support any load but is required to provide separation and achieve at least 30 minutes insulation could have a rating of −/60/30.

Trans-Tasman differences
New Zealand’s approach to testing fire resistance ratings is slightly different to that of Australia. In New Zealand, the Building Code Clause C Fire safety defines the fire resistance rating as ‘... the minimum fire resistance required of primary and secondary elements as determined in the standard test for fire resistance ...’. The standard test currently referenced is AS 1530.4-1997, which provides the test procedure for a number of different fire-resistant systems including walls, door sets and penetrations.

In Australia, the Building Code of Australia defines the fire resistance level as determined by a fire test in accordance with AS 1530.4-2005. Australia also allows tests that have been conducted to previous versions of the adopted standard as evidence of compliance, as long as they have been tested prior to the publication date of the adopted standard.

Evidence of compliance
The documentation used to demonstrate evidence of compliance to AS 1530.4 is a full fire-resistance test report from a fire-testing laboratory, which is registered by the local accreditation body. In New Zealand this is International Accreditation New Zealand (IANZ) and in Australia it is the National Association of Testing Authorities (NATA). BRANZ reports are acceptable in Australia through a reference in the Building Code of Australia to accredited laboratories other than those accredited by NATA. The test standard must also be listed within the scope of the laboratories’ accreditation to be acceptable.

Test and assessment reports
The other type of report detailing a fire-resistant system is an assessment report. There is a distinction between the two types of reports. A test report includes all the details of a system that has been subjected to a fire resistance test. An assessment report discusses variations to a system that has previously been tested and reference is made to the test.

To fully understand what the fire-rated system covered by the documentation is, and to determine if the system installed into a building is actually the same system, it is...
recommended that both assessment and test reports should be read together.

Follow manufacturer’s instructions
People occasionally assume that the installation details for fire-rated systems are generic between manufacturers. They are not. All fire-rated systems have a number of components. All components have an important part to play in the overall performance of that fire-rated system. If one component is substituted for another or installed in a different way, without consultation with the manufacturer, this could influence the system’s performance and/or cause its premature failure in the event of fire.

There is another downside to not following the manufacturer’s instructions. The installed system will not meet the manufacturer’s specification, for which they have the appropriate supporting documentation. If this deviation from the manufacturer’s specifications is not picked up before the building is finally signed off, it can cause significant problems for all parties.

For example, say fire-rated dampers are installed contrary to the manufacturer’s instructions. This is only picked up after all the finishing has been completed. There will be significant costs associated with remedying the problem, both financial and in delays caused. The solution might be either testing the installed system and hoping it will pass the fire test or re-installing the dampers in accordance with the documentation. In a multi-storey building this could involve hundreds of dampers, each requiring access to allow re-installation and then refinishin walls/ceiling.

The devil is in the detail
The installation of fire-rated systems is a complicated process where attention to detail is most important. Any breaches in the system could prejudice the performance of the fire barrier and allow fire to spread within the building. In the case of fire walls, this means the barrier must extend to the underside of the adjoining fire-rated floor/ceiling and any gaps between the floor and wall must be appropriately filled. If there is no floor above, then the barrier must extend to the underside of the roof. All penetrations in the wall/floor must have appropriate fire collars/wraps or other protection to prevent fire spreading due to services.

Fire barriers perform an important function in the overall fire safety of buildings. In the event of a fire, and to prevent what could be an inconvenience becoming a catastrophe, care needs to be taken in the design, attention to documentation and installation of these systems. The design of the fire barriers must be suitable for the type of products selected. The documentation must cover the specific system to be installed and the system must be installed following the manufacturer’s instructions. Any compromises could have a significant impact on the performance of the fire systems and ultimately life safety.