

# Fire Safety Engineering Design and the Implications for Facility Managers

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One of the primary benefits of a fire safety engineering or performance approach to fire and life safety systems design is that it allows for the consideration of all the features that will be inherent in a particular building, including structure, installed systems and management and occupancy regimes, when assessing the overall fire safety requirements. This can lead to substantial cost savings for building developers at the time of construction.

However because fire safety engineered solutions often rely on how the building will be operated and the integration of various systems they can place significant responsibilities on the Facilities Manager to ensure that the fire safety of the building is maintained. A very clear understanding of the resultant elements of a fire safety engineering design is required when formulating occupancy and maintenance management systems and procedures.

## ***Regulatory framework***

Since the adoption of the Building Code of Australia 1996 (BCA '96) by the various States between mid 1997 and early 1998, building designers have had the opportunity to utilise a performance based regulatory compliance approach. Performance based design allows designers to demonstrate to the certifying body that the proposed built structure, services installed and building management will combine to satisfy the BCA's Performance Requirements. This approach is an alternative to the, still available, "deemed-to-satisfy" prescriptive approach which details standard design solutions for the built structure and services without consideration of the potential to integrate various systems or to manage the occupancy and maintenance of the systems to lessen the risk. As such a deemed-to-satisfy approach places few requirements on the facility manager other than to ensure that the statutory maintenance is carried out.

The BCA is in essence a technical document. The administrative procedures for the adoption of the BCA are detailed in State/Territory Legislation. This legislation also sets out a building owners or facility managers duties to satisfy the maintenance requirements. While the intent is reasonably consistent between the states, the detailed requirements to demonstrate compliance varies.

To assist in providing consistency of the maintenance process for essential services, Australian Standards have been developed (such as the AS 1851 "Maintenance of Fire Protection Equipment" series). However, these are not enacted directly via the BCA. It is also important to note that the basis for the Australian Standards is the deemed-to-satisfy system design. Where a performance based approach is adopted these maintenance Standards may or may not be applicable.

## ***Example of a Fire Safety Engineered or Performance Design Approach***

The following example of a performance based design highlights the individual nature of each solution and how it can impact the ongoing maintenance and facility management requirements.

A typical Fire Safety Engineering assessment is to review the required Fire Rating Level (FRL) of a structural steel beam. The relevant BCA Performance Requirement CP1 states “A building must have elements which will, to the degree necessary, maintain structural stability during a fire appropriate to...” various properties and systems.

For a typical high rise office building the deemed-to-satisfy solution to meet this Performance Requirement includes a passive fire rated covering to the beam, a sprinkler system and a zone smoke control system. The maintenance requirements for this design, once it is installed, are likely to be consistent with the Australian Standards and relatively straightforward.

A possible fire safety engineered performance based solution to address the same Performance Requirement may be to provide sprinklers with an increased reliability (e.g. a system with additional equipment and or additional maintenance requirements), a zone smoke control system (with a interrelationship with the operation of the sprinkler system), and have fire load restrictions in close proximity to the beam (e.g. limitations on what can be stored or constructed within a certain distance). The concept being that with the reduced fire load the beam is not subjected to the same quantity of heat in a fire and therefore is structurally stable without added protection. The increased reliability of the sprinklers addresses the redundancy issue. This approach then removes the requirement for passive fire rating and provides a substantial cost reduction for the building developer.

Out of this, for the facility manager, there may be additional equipment to be monitored and maintained, additional maintenance requirements in general, systems that must operate in an integrated manner and a fire load restriction that must be monitored with the nature of the restriction and the frequency of the check inspections detailed in the building occupancy permit as an “Essential Service”.

### ***Types of Maintenance Requirements***

What the above example demonstrates is that resulting from a fire safety engineered or performance based installation there may be four different types of maintenance requirements that a building owner or facility manager will need to address. These are the maintenance of:

- Systems in accordance with Australian Standards
- Systems with modified maintenance requirements based on the Australian Standards
- Interrelationship between systems
- Essential services, that are not covered in any Australian Standard (such as fire load restrictions)

Currently most maintenance regimes are only set up to address the maintenance of systems in line with Australian Standards. It should be noted that the draft replacement for the AS 1851 series (DR 04463) does start to address some of the interrelationship issues for common systems. It will require annual tests of system interfaces such as detection systems and HVAC systems. Yet the new Standard cannot define test procedures for all the possible interrelationships between systems from a performance based design perspective.

A key issue that the requirement to test interrelating systems raises is the need for close coordination between the different specialist service providers. This is not how the

industry currently typically operates and requires an added level of contractual and management complexity to assure the required testing outcomes.

Systems with maintenance requirements similar to existing standards can be a double edged sword. While the benefits of using common practices are obvious, the danger is that the special requirements become lost in the familiarity of the process.

When essential services requirements such as fire load restrictions are not covered by any Standard particular care must be taken by the Authority to detail the requirements on the Occupancy Permit. This must translate the fire safety engineering design intent into a form that a building owner/manage can effectively understand and manage. This might range from particular requirements in relation to say, staff / patron occupancy ratios in a retail or entertainment complex, through to Wood Equivalent Fire Load Densities in storage facilities. Another less obvious problem associated with essential services requirements not covered by any Standard is that it may be difficult to find appropriately qualified organisations to undertake the maintenance and testing required.

### ***Documentation and Records Keeping***

Ultimately the only way to ensure that the required maintenance duties are being carried out is through detailed documentation and records keeping and a rigorous management regime. Ideally documentation should include the original performance based design report by the fire safety engineer, the translation of that report into the essential services maintenance requirements as interpreted by the relevant authority and accurate and complete “as-installed” details for the systems. Ongoing records keeping should include documentation that the maintenance has been undertaken and all test records. Management processes must ensure that the maintenance and testing is actually being carried out to the required standard and technical quality level.

### ***Conclusion***

Fire safety engineered solutions can offer significant first cost economies at construction however often depend on particular operational and maintenance regimes to ensure they are effective and compliant. This imposes significant responsibilities on building owners and their facility managers to ensure that the fire safety of the building is maintained.

Facility managers responsible for buildings that feature a fire safety engineered solution must have a full understanding of the management, operational and maintenance arrangements required to assure regulatory compliance and most importantly to *ensure* that the systems will work as intended when lives depend on them.

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