Building information modelling has an important role to play in the future of fire protection.

**Figure 1** BIM-MEP PLUS overall workflow

- **VIRTUAL BUILD**
  - Design BIM Model LOD 100-300
  - Fabrication BIM Model LOD 400
  - Construction BIM Model LOD 400

- **SITE DELIVERY**
  - Commission as built BIM Model LOD 500
  - Export Fabrication

AS BUILT SUITABLE FOR FACILITY MANAGEMENT
BIM is already in use by many parts of the construction industry.

BY GEOFF FLOWER
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Building information modelling, or BIM, is increasingly being used for design of buildings, particularly by architects, structural engineers and mechanical engineers. BIM has many potential advantages, and these disciplines have been early adopters—leaving the fire protection industry behind to play catch-up. While many projects that have adopted BIM include fire protection, mostly it is just to fit in with the rest of the building design and we are not getting the real advantages.

So what is BIM—and how is it different from traditional CAD? Both are forms of computer-aided design, but while CAD is essentially a tool based on manual drawing, BIM is a process based on data and transfer of that data. This data forms the ‘information’ part of BIM.

Put simply, a CAD drawing comprises lines and symbols arranged to represent a system, while BIM is a model of a system represented by lines and symbols.

The difference is that unlike CAD, the model knows that components of a system are connected to each other. For instance, a BIM model of a fire sprinkler system may comprise several sprinkler heads connected to pipework, which is connected to a sprinkler control valve assembly that is supplied from a static water storage tank via a fire pump-set. Each of the components knows it is connected, and there is the opportunity to include data within each component of the model.

The types of data or information that can be included in a BIM model are as follows:
- Geospatial (3D): information about dimensional and relative location of the component
- Time (4D): time attributes such as delivery lead times, installation times
- Cost (5D): cost data of the component
- Design parameters: information relating to the basis of design, e.g. occupancy or hazard classification
- Detailed material and equipment attributes: e.g. cable cross-section area, pump duty point
- Commissioning results: data obtained during commissioning, e.g. sound levels obtained during emergency warning and intercommunication system commissioning.

Much of the focus on BIM to date has been around the geospatial information or 3D building design to avoid clashes between large building elements during construction. This avoids rework and significantly reduces costs. Other potential benefits include:
- Undertaking calculations based upon the model (don’t need to model twice)
- Computer-aided manufacture/export model directly to fabricators
- Computer-aided installation—providing significant safety benefits.

BIM promises significant benefits. However, several challenges still need to be addressed. One of the key challenges is training, since the tools and approach used to create BIM models are significantly different from traditional CAD. Much of the recent focus on training in the fire industry has been on site installation and maintenance personnel, but the adoption of BIM will require a significant investment in training of design and drafting personnel.

Putting the issue of training aside, the bigger challenge is barriers that prevent the flow of information between building designers. This is due to issues such as:
- Use of different software tools
- Development of proprietary elements
- Incompatible workflows
- Different terminology.

One advantage of being a late adopter is that the fire protection industry can take advantage of the work undertaken by the early adopters so that we can reap the benefits more quickly.

Of particular relevance is an initiative of the Air Conditioning and Mechanical Contractors’ Association, known as ‘BIM-MEPUS’. While initially focused on air-conditioning systems, it has been developed with broader building services in mind. MEP is the term used in the US for ‘mechanical electrical plumbing’, which in Australia and the UK is generally referred to as building services.

In the early days of BIM adoption in Australian building projects, each party in the design and installation team developed their own proprietary content. This significantly disrupted the flow of information between project stakeholders and eroded the benefits of BIM adoption. To put this in perspective, a 2004 National Institute of Standards and Technology report estimated that the cost of inadequate interoperability in the US capital facilities industry was at least US$15.8 billion.

In 2010, the BIM-MEPUS initiative was formed with two initial objectives: achieving seamless interoperability of building model information from the design team to the construction team, and integration with the supply chain, such as fabricators and product manufacturers. BIM-MEPUS publishes standards and templates comprising workflows, guideline documents, specifications and models. When adopted by all project stakeholders, these resources mean that the process is clearly defined, and that each party understands the information they are expected to both provide and receive.

This means that the model developed by the design team is passed directly to the construction team, which can issue it to fabricators and update the design to ‘as-built’.

The commissioning team adds commissioning data to the model before handing it over to the building owner, who can then use the building model for ongoing maintenance of the building (Figure 1).

The BIM-MEPUS standards for
A Fire Protection Association Australia Conference & Tradeshow 2018.

Geoff Flower spoke about BIM at the recent Fire Australia Conference & Tradeshow 2018.

Building Information Modelling

Fire protection has several systems, including those in Table 1.

One of the first challenges in defining the nomenclature is to decide if the special hazards systems need to be defined separately, or should be simply categorised as one fire-suppression system. Furthermore, most special hazards systems incorporate a fire detection and alarm system, so it would need to be considered how this fits in. Another similar issue is that of combined suppression systems, such as a combined sprinkler and hydrant system, which use common infrastructure.

The BIM-MEPauS naming convention is a gaseous-suppression local control station considered as plant (part of the control and indicating equipment)?

Equipment includes valves, pressure/flow switches, booster assemblies, fire hydrants, fire hose reels, fire detectors, emergency warning speakers and fire extinguishers. Fittings would include elements such as sprinkler heads and cable junction boxes. However, there are several potential grey areas as to whether an element is classified as equipment or a fitting; for instance, in the previous description, fire detectors have been identified as equipment while sprinkler heads are classified as fittings.

While the classification of equipment and fittings will need further debate, one of the guiding principles is the type of information that needs to be associated with the component and the need to schedule the components. Equipment will typically be scheduled with information about commissioning or other attributes, whereas fittings typically would not be scheduled. For example, a schedule of fire extinguishers with the type, capacity and rating of each extinguisher is important baseline data, whereas a schedule of every sprinkler head is not normally of much benefit.

Fire Protection Association Australia has recently signed a memorandum of understanding with BIM-MEPauS to support the initiative. It is intended that BIM-MEPauS will host several fire protection industry forums in which FPA Australia members will be invited to participate. This is our call to action and chance to have our say in the founding documentation for the Australian industry standard for BIM as applied to fire protection. Look out for the announcements, as this is an opportunity not to be missed.

Table 1 Fire protection systems

<table>
<thead>
<tr>
<th>Fire-suppression systems</th>
<th>Sprinkler (including wet, dry, pre-action and deluge)</th>
<th>Fire hydrant</th>
<th>Fire hose reel</th>
<th>Portable fire extinguishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire detection and alarm systems</td>
<td>Fire detection</td>
<td>Emergency warning system</td>
<td>Emergency intercom system</td>
<td>Fire alarm monitoring system</td>
</tr>
<tr>
<td>Special hazards suppression systems</td>
<td>Gaseous suppression</td>
<td>Water mist</td>
<td>Foam suppression</td>
<td>Wet chemical kitchen suppression</td>
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</tbody>
</table>