

PLUMBING CONNECTION

SPRING QUARTER SEPTEMBER 2010

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UNITS DANGEROUS?

FIRE SAFETY REQUIRES
THE RIGHT STANDARD

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URINE DIVERSION
SEES THE RISE OF THE
'YELLOW' PLUMBER

BIM: A smarter way
forward for the
plumbing industry



A model of a modern major dimension

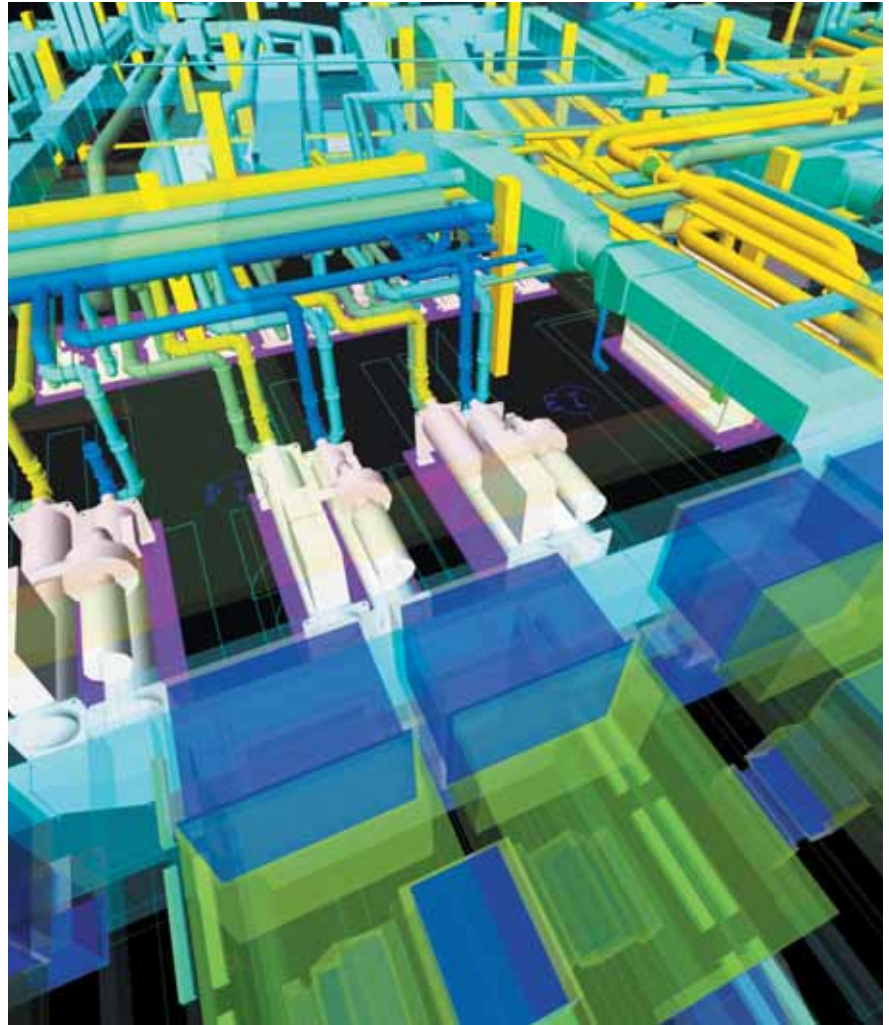
The Australian construction industry has been relatively slow to embrace building information modelling, or BIM as it is more commonly known. As BIM Manager – CAD MANAGER James L Williams (JLW), Michael King explains it is time to educate the trade industry to start producing AutoCAD models, rather than going straight to BIM modelling. The future is about finding the correct segue from where it is to where it is going.

Firstly, let's recap what we know about BIM. In the United States and across Europe, BIM is one of the largest and most rapidly growing developments in the Mechanical Electrical and Plumbing (MEP) industry. BIM uses three-dimensional real-time modelling software to increase productivity in building design and construction. (see page 48 of last issue)

In overseas industries, they are recognising that time, cost investment and patience in BIM will eventually be rewarded. They also recognise that the opportunities for engineers to move beyond the constraints of diagrammatic design and create practical real-world representations, is key to moving the industry forward. Working in realistic, three-dimensional software enables different disciplines to co-ordinate easily and allows the engineers to properly visualise how a design will function within a project.

Effectively, BIM streamlines the design process and creates opportunities for earlier design concepts, earlier decision making and better documentation. Contractors, architects and engineers are able to make changes in real time and engineers in the different disciplines can work on models simultaneously.

Unfortunately, in Australia many



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contractors, engineers and hydraulic consultants are yet to get involved: reluctant to change from workable, yet laboured methods. However, as technology develops, change is inevitable and those businesses caught behind could find themselves in trouble when it comes to winning a new contract.

Having said this, BIM in the hydraulics/plumbing industry is alive and flourishing in Australia – it just takes a little longer to find it.

Involving industry

We don't think of looking at the HVAC industry to find plumbers and hydraulics system specialists who are heavily involved in furthering the BIM process.

However, any HVAC contract contains a huge hydraulics component and service providers employ a large workforce of plumbing specialists.

HVAC hydraulic content can represent a major portion of the total amount of plumbing services provided on a project



– particularly health care and research type projects.

As a HVAC contractor, JLW provide the following hydraulic services as a norm:

- Chilled water
- Heating water
- Condenser water
- Boilers
- Steam
- Tri-generation systems (absorption chillers)
- Glycol systems (extreme low temperature water)
- Condensate drainage
- Chilled beam piping systems

With BIM being the future construction industry direction, the HVAC industry is in the hot seat as a solution provider with impact across many other services.

HVAC companies in a contractual sense must take the lead in co-ordination of all services including associated

HVAC hydraulic content can represent a major portion of the total amount of plumbing services provided on a project says JL William's BIM manager/CAD Manager Michael King. That's why embracing BIM is necessary.



services such as plumbing, fire and electrical (among others).

The HVAC industry is therefore developing BIM processes which naturally engage hydraulics systems thereby affecting the plumbing industry.

Project: Bio Science La Trobe University

One example of how these processes will work will be realised at the new Biosciences Research Centre at La Trobe University's Bundoora campus in Melbourne.

The university finalised an agreement with the State government to build a \$230m world-class agricultural Biosciences Research Centre.

The new venture is being funded by a \$180m contribution by the State government and \$50m from LaTrobe. Up to 400 scientists from Department for Planning and Infrastructure (DPI), La Trobe and the private sector will work at the centre, which is scheduled to be ready for occupation by the end of 2011.

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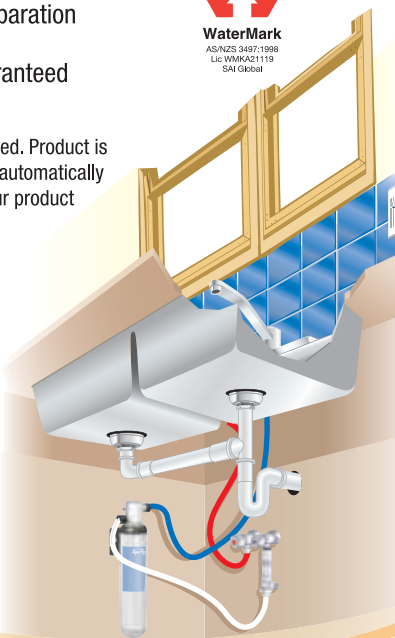
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BIM

Benefits for the MEP industry of moving towards BIM

More talented engineers are often able to visualise in three dimensions while drawing in two. Today, being able to work simultaneously in two and three dimensional drawings eliminates a lot of guesswork and error.

Co-ordination among disciplines ensures that changes made within a design are immediately applied to all disciplines. Changes are made automatically to every view and annotation.

Engineers can design specific aspects within their disciplines and see only those aspects, or they can see work from other disciplines to ensure their work does not interfere with something else. For example, a plumbing engineer may have a workset designed for hot and cold water that can be designed without seeing the other disciplines, but can later be checked off to ensure no co-ordination problems exist. Or, when looking at a roof plan, he may place roof and overflow drains without knowing the locations and conflict with the air conditioning units. Turning on the HVAC worksets will allow him to see the conflicts.

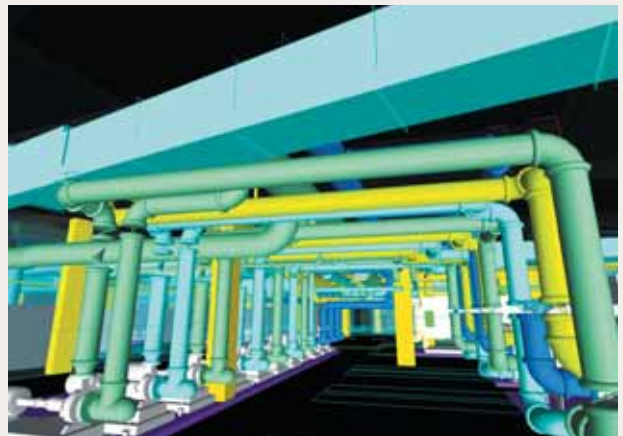
Another example may see a fire protection engineer draw a run of fire protection branch piping which can be measured against the other disciplines to determine if the specific elevation will conflict with ductwork or domestic water pipe.

BIM can also make the illustration of pipework easier. With the push of a few buttons the user can place the various fittings to a run of pipe. The Revit program allows 'routing solutions' which provides multiple options to connect pipes. This allows the plumber to slope pipe upward or downward at any given rate depending on the application. Pipe can be placed at specific offset elevations, it can be colour co-ordinated and can be seen in full geometry or as line representations and the user can create specific types of pipe.

Revit also allows the user to create piping isometrics by altering the visibility of the existing design. If the user needed to create a piping isometric for a men's toilet, he could zoom in on the area in a three-dimensional view, hide the visibility of everything but the piping to the fixture and then create a view of that area. The view would be a snapshot of the three-dimensional model and means instead of drawing a new piping isometric, the engineer can convert what has already been done to the isometric view.

Another Revit feature is that the engineer can size piping and calculate flow within a plumbing system. After entering fixture unit values of the fixtures within a system, Revit uses conversion charts found in the International Plumbing Code to determine flow rate. The pipe size is then calculated based on hydraulic data charts, using the calculated flow rate and rate of velocity within the pipe.

Finally, the scope of a project can be monitored as schedules for water heaters, plumbing fixtures, sprinklers and pump equipment can easily be created. For example, if several different types of water heaters need to be factored, the engineer can filter these to automatically generate a schedule for all heaters at once. This schedule itemises each type of heater and lists any pertinent information.



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test the new integration of workflow systems. JLW are actively modelling their own services, the architecture, structure and also other contractor systems (including electrical, hydraulics and fire) at critical points within the project to enable accurate coordination of all systems. These 3D CAD based models are regularly exchanged with all associated contractors as they are developed. Each contractor is using the information to help develop their own system layout specifics.

In addition with each model issue, JLW are utilising Navisworks® software where a full 3D file is generated. Each subcontracting group has now loaded the Navisworks Freedom software provided free by Autodesk® and is capable of freely integrating the model in visual sense with walk through capability and general viewing.

In simple terms the production of coordinated 3D models may actually represent the largest hurdle facing the plumbing industry today on its path to achieving BIM.

Autodesk Navisworks products deliver project review software for 3D coordination, 4D planning, photorealistic visualisation, dynamic simulation and accurate analysis. They create a whole-project model by integrating design and construction information, including complex building information modelling (BIM), Digital Prototyping (DP) and process plant data. With Autodesk Navisworks project review software, you can collaborate, co-ordinate, and communicate more effectively to reduce problems during design and construction.

Getting into BIM

While the production of a coordinated 3D model is not BIM, it is a key component in achieving a BIM outcome.

In simple terms the production of coordinated 3D models may actually represent the largest hurdle facing the plumbing industry today on its path to achieving BIM.

Historically to this stage the plumbing (and fire/electrical) world has not been required to produce any real level of documentation and bridging this gap in such a short time seems near impossible.

However with the need to produce highly co-ordinated service models sitting with the HVAC contractor we are now seeing the development of workflows designed to address this lack of capability within the plumbing (and other) documentation area.

What will be the outworking of this cross pollination? ➤



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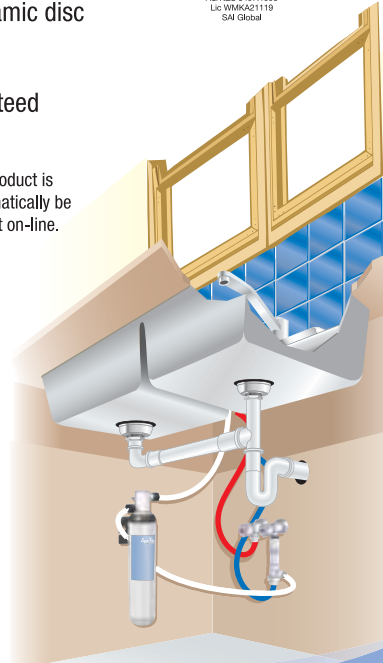
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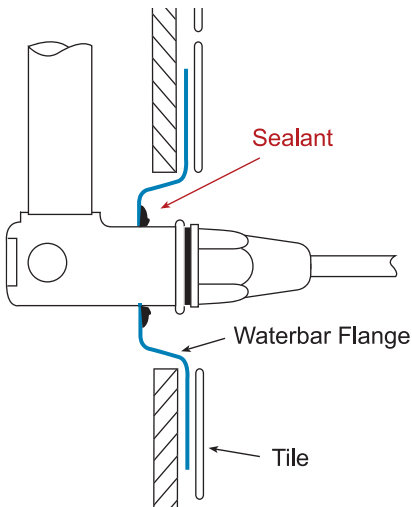
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BIM

BIM in action

One of Australia's most iconic landmarks has used BIM for its redevelopment phases. The Sydney Opera House had seven different and incompatible digital information systems that managed functions as diverse as building maintenance, accounting, building presentation and asset value management. In addition, the services were separated into four main technical groups; electrical, mechanical, building and CAVS (communications and audio visual services). The four areas are serviced by different contractors, each with independent digital systems. The Sydney Opera House had to manually transfer information from these contractors to their own systems.

The Opera House was chosen in 2005 because it was completed without basic two-dimensional drawings and had no definitive set of plans incorporating service changes.

"The project focused on digital modelling, services procurement and performance benchmarking themes as dimensions of the FM (Facilities Management) equation, which when integrated, improve FM's ability to support an organisation's objectives. In the report research outcomes were then aligned within the broader context of the Sydney Opera House's total asset management in support of their organisation's business enterprise," said John McCarthy chairman of the FM Action Agenda and the CRC for Construction Innovation at the time.



Specific benefits of BIM to Sydney Opera House include:

- faster and more effective facilities management where information can easily be shared and reused by the variety of contractor and staff employed;
- design proposals for upgrades and refurbishments can be rigorously analysed and simulations performed easily;
- production of building documentation is of high quality and highly flexible;
- controlled whole-of-life costs and environmental data leads to predictable building performance and tighter budget planning;
- government, industry and manufacturers all have a single common language to describe elements of the building (common protocol).

At JLW we are providing workshops with associated contractors (plumbing, electrical, fire etc) based on real projects where we are sharing our knowledge of available technology and its application with regard to 3D documentation and review.

We are showing – through application – the benefits of developing models to enhance our coordination process.

We are also providing free technical advice for our fellow contractors as to how this may be achieved in their own offices. It is important to note that it is much easier to teach BIM to an engineer than to teach engineering to a BIM specialist.

It is in the interest of our industry that we share our knowledge as it ultimately affects our own outcome.

How do we plan to achieve BIM, get over the first major hurdle and get everyone on the same page regarding the

benefits and necessity of 3D models? We help to provide the necessary education where possible and help develop incentives to seek such outcomes.

If we can do this – and the whole industry can put in place similar plans – the next stage of linking the associated data to the 3D model will be easy and the plumbing industry including contractors will see the benefits of moving forward with BIM. ■

Author Michael King is BIM Manager – CAD MANAGER JL Williams (JLW). Michael moved to JLW in the capacity of BIM Manager to provide assistance in developing a BIM outcome capable of being applied to major commercial contracts.

JL Williams (JLW) is a HVAC specialist with over 135 years experience in the Australian market (www.jlwilliams.com.au).