When the Justice and Emergency Services Precinct opens its doors in Christchurch most of the work done by John Leen and his team will be buried out of sight. The $300 million development is bringing together all justice and emergency services into one purpose-built area in the city and is due to be operational by mid-2017.

John Leen Plumbing has installed more than 12km of piping at the site but the majority of its efforts will be hidden under tonnes of concrete. The Wellington-based firm secured the contract for all plumbing, heating and drainage work at the precinct after being involved with the first phase of construction in 2014.

Director John Leen, who is also Board Chairman of Master Plumbers, Gasfitters & Drainlayers NZ, says a large part of the work until now has involved laying pipes in sections that are then covered by concrete. “With a lot of these big developments in Christchurch, they do it in stages, in slabs,” he says.

“We tendered last year and won a section, which kept us busy from August to November, and it involved all the plumbing, electrical and other piping. Anything cast in the concrete we put in, other than the reinforcing steel. These slabs are 1200mm thick and there’s something like 10 cubic metres of concrete and tonnes of steel in them.

“After that project we were asked to tender for the whole building, which we did and we won that. So here we are a year later still on site and we have also picked up civil works around the edge of the precinct.”

A first for New Zealand

The precinct is one of many projects underway to help rebuild Christchurch after the devastating earthquakes of 2010 and 2011.

Located in the central city, it will house up to 1,100 staff and be the regional headquarters for the Ministry of Justice, New Zealand Police, Department of Corrections, New Zealand Fire Service and St John. It will also be the city’s Civil Defence base.

It is the largest multi-agency government co-location project in New Zealand’s history. An estimated 2,000 people will work in or use the 42,000 sq m precinct daily.
The building work, which is being led by Fletcher Construction, is due to be completed by early 2017 before the various agencies move in by the middle of that year.

**Innovation required**

A high-powered dig got the project started early last year when more than 20,000 cubic metres of soil, the equivalent of eight Olympic-sized swimming pools, was excavated. The soil was mixed with 2,500 tonnes of cement and placed back into the ground on top of a heavy-duty 1.2 metre-thick concrete base.

The numerous slabs that sit in the ground of the precinct have gone on top of this and are designed to meet the most rigid seismic standards—“if the building shakes the slab moves with the ground”—and this required some innovation for John and his colleagues.

“The biggest challenge has been programming the work because we can’t do anything until certain other tasks are complete. The bottom steel mat grid is laid and then we go along and put our stands in to hold the pipes. We worked with [engineering company] Vaico to come up with Ghost Bars and H-frames so we could sit pipes at the right level,” he says.

“It’s relatively new in the way we’re supporting the pipe in frames and then brace all the pipes because they come under intense pressure when the concrete is poured into the slabs.

“Water is put into the pipes to protect them as the concrete cures and we monitor them for a week. The water tests the pipe but we leave it in there to stop pipes floating in the concrete and do not want the temperature of the concrete curing to affect the pipe.”

Adding to the complexity of the task was that some of the pipes were 60 metres long and traversed across more than one slab.

“We had pipes going from one side of the site to the other. The slabs were poured in sections so we’d have handiwork which would continue into the next pour. Some of the pipes traverse across three or four pours.

“It was a real hands-on process, resolving issues on site, and most issues appeared in the first couple of pours and after that we had the answers to the next pour and the next one after that.”

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Strategic move

About a dozen staff from John Leen Plumbing have been at the site at any time since the project began but that number will be nearer 20 as work continues over the coming year.

John now spends considerably more time in Christchurch than in Wellington and says his company’s workload has increased greatly since becoming involved with the precinct and other jobs around the South Island’s biggest city. The precinct is the first major public building to be built since the earthquakes struck.

“We are pleased and proud to be involved in the precinct. It was a strategic, planned move. Since the earthquake we knew there would be commercial development and Wellington is flatlining and there’s not enough to keep a company of my size busy. We have doubled the size of our business coming down here. “We always had it in mind to be involved in Christchurch and we’re pleased to be a part of the rebuild. I’m looking forward to things ramping up even more from here. The Justice Precinct has been a big one and we will continue to follow on from there and are tendering for other Christchurch projects.”

View the Drone flyover video of Justice Precinct at https://vimeo.com/141344496

BIM for the precinct

A high-tech approach to building design has helped smooth out the demands of bringing together various agencies and contractors to create the Justice and Emergency Services Precinct.

The Christchurch development has utilised Building Information Modelling (BIM), which allows a digital 3D model of the entire building to be produced during the design process. The model features real-life attributes within a computer and, by sharing that information among contractors, it aims to eliminate any problems that historically would only be discovered on site once building had begun.

John Leen says BIM has been around for a few years but is only now starting to be used more widely in the industry, including in the precinct project. “After our early involvement we then spent about six months working through a BIM model for the rest of the work at the precinct.

“The BIM model has every component of the build modelled into it. We can work through all the clashes and resolve those before we even start work on the site,” he says.

“It helps you to see where every pipe will go because seismically it can be a nightmare to get those things right with everything else involved in such a construction, such as vast amounts of steel work.

“We have a 40-inch TV in the shed on site and our guys can take a 3D walk around the piping, look over it, under it and all the way around it to understand how other structures affect what we are doing.”

John expects to see BIM become an increasingly prominent part of the building process, especially for larger projects. The government has a BIM acceleration committee as part of its goal of 20 per cent more efficiency in the construction industry by 2020. The committee is a nationwide alliance of industry and government, established in February 2014 to coordinate efforts to increase the use of BIM nationwide.

“There are plenty who knock BIM and people argue you can sort things out on site. But if done well, reports suggest we’re looking at a 30-35 per cent saving in the construction process if BIM is used in a timely manner,” John says.

“When that happens you resolve all the clash issues in the office before you head out on to the site. It means we know the locations of any pipe in the building, measurements and gridlines and we can confidently put things in and know we should not have to touch them again and they won’t be in the way of anything else.

“There’s a huge benefit from BIM and it brings real advantages depending on the size of project and its degree of difficulty.”
IN FOCUS

December 2015/January 2016

MY INTRODUCTION TO building information modelling (BIM) was back at university in 2008, creating 3D model designs and projects in a design programme in AutoCAD.

Computer-aided design has been around since the 1970s and advances in this technology have now overtaken technical drawing completely. Students are no longer taught in a drawing studio—they learn in an office environment, sitting at a computer creating drafts and plans that can be modified at the click of a button.

Software now gives us the ability not only to design a building but also to introduce a level of detail that has never been seen before. At tender stage, a coordinated BIM model can create a spreadsheet, which can list sections of pipe, fittings, fixtures, bends, tees, hangers, clips and so on—all at various sizes and measurements.

You can model the invert levels for all pipe systems: water, soil, waste, vent, siphonic, gravity, overflows… everything. You can check each component, down to a wedge, nut, fitting, into the comfloor. You can check falls, heights, set outs, spacings, clearances etc… the list is endless. You will have the ability to tender for a project and submit pricing based on an exact figure drawn from a model. Then, as the model progresses to construction stage, a recalculation can be taken to determine any variation.

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Reducing service clashes

BIM coordination meetings have allowed a working model to advance to a stage that has reduced service clashes and removed them from the design before services are installed. Clashes are sorted offsite before they become an issue. We are able to take a virtual walk through the model of the space.

At the click of a button, we can remove a section of wall or hide a section of ceiling to expose the layout of the building services. We can show our team on site a 3D picture of how, where and exactly what to install on site. This is carried out in a program called BIM-X, which allows drawings to be sent to an i-Pad on site automatically, as soon as they are updated—reducing the need for and cost of printing, and ensuring staff are working from the latest information.

We are at the beginning of the future of the construction industry. When we see the advances that have occurred since the introduction of CAD in the Seventies, just think what we will be able to achieve in the next 10, 20 years. Soon we will be able to put on a pair of virtual reality glasses and walk around a building before it’s even been built.

Playing catch up

The most important thing I can see for the progression of BIM is timing; we're already behind. It’s not a case of deciding whether to jump on board. This is the direction the construction industry is going—we need to catch up. We need models more advanced at tender stage. We also need the people who are drawing these models to understand the various Codes and Standards, to ensure a compliant design. The model is only as good as the person creating it!

The eventual aim of inputting everything into a 3D design/model is for it to be used by the client to control the daily operation of the completed building— known as
facilities management, or FM for short. However, the information the model uses is the most important aspect if it is to be utilised correctly. Everyone will need to be working to a standard formula so that information being passed through the building community is always coherent and recognisable.

**BIM training**

David McDonald recently attended a BIM training course as part of a Best-Practice BIM in NZ two-day workshop from the NZ Institute of Quantity Surveyors. He also took part in an initial ‘train the trainer’ session. The eventual plan is for all who attended the session to deliver the course to more people. Courses will be held in conjunction with BRANZ and the UK-based BRE, with the support of Dan Rossiter and Paul Oakley, the original course presenters. To view a BRANZ Build magazine interview with Dan Rossiter and Paul Oakley about BIM in the UK and New Zealand, go to youtube.com and type ‘BIM in New Zealand - Build 150’ in the search bar.

I would recommend reading the BIM Handbook, and researching PAS 91:2013, BS-1192 and the soon to be released ISO-1192. Some case studies can also be a good insight to the benefits (see resources in panel). BIM standards are currently being generated for NZ. The BIM Handbook is due to be revised and republished in the second quarter of 2016, when it is expected to confirm the mandate to follow BS-1192 and ISO-1192 as above.

**Contract selection**

Everyone in the construction industry needs to be aware of how BIM could affect them if not correctly planned and implemented. The BIM Acceleration Committee have the right idea and are consulting leaders in the field for advice on how to take this forward. The more knowledge you have, the more input and say you have in driving these Standards to work for the industry.

Barriers to the introduction of BIM are the cost of software, the lack of trust by the industry, and the lack of software technical knowledge. Unfamiliarity with BIM and its benefits can affect contractor selection. I am of the opinion that eventually the implementation of BIM will reduce project costs, increase the speed of project delivery and allow for better coordination. There will be better design accuracy and improved project safety. If contractors take the opportunity and develop their knowledge of BIM, they will not be sidelined when it comes to awarding contracts.

**BIM research resources**

- AVANTI project case study - [http://www.cpic.org.uk/publications/avanti](http://www.cpic.org.uk/publications/avanti)
- BIM video tutorials online are a great free resource.

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