NBL News
News from theNational Biocontainment Laboratory
Ministry for Primary Industries
Manatū Ahu Matua

Kia ora

Welcome to issue four of NBL News. Progress on the construction of the National Biocontainment Laboratory continues as the contractors erect the primary structural steel columns on the site following the completion of the ground floor slab. With over half the steel now in place the outline shape of the building is becoming apparent, and it's now easier to visualise the form and scale of the finished lab. The structural steel is an integral part of the seismic design, providing a very rigid structure that minimises 'drift' between floors during an earthquake.

The seismic engineering has been at the forefront of the team's minds following the earthquakes in and around Kaikoura. Thorough inspections of the construction site confirmed that the structure performed exactly as it should have at this stage of construction during the 7.8 magnitude earthquake on November 14th 2016. The accelerations of the earthquake in Upper Hutt were not, however, enough to activate the lead rubber bearings in place under the growing structure. You can read more about the new lab's earthquake resiliency here.

Aerial photo of construction site, March 2017

In the last issue we outlined some of the activities outside of the construction space which are now underway, including defining the training requirements for lab staff, and finalising the commissioning details. There are other works associated with the project that are integral to getting the new labs operational, which we will cover later in this issue.

Sitting across the breadth of the project scope, and accountable for the success of the project is our Project Manager, Mark Barnes. Mark has recently joined the MPI team to manage the day-to-day activities of the project, and ensure that all aspects are completed on time and to budget. Mark has a long history in construction management in the pharmaceutical industry, and brings a wealth of experience to the project team. You can read more about Mark and the expertise he brings to the project here.

Steel work progress

Over the last six months, the main activity on the construction site has been focussed on installing the primary structural steel which forms the 'bones' of the new building. The large steel columns and beams are manufactured offsite at a factory in Taranaki, and delivered by road to the construction site in Upper Hutt before being carefully erected on site. The sections are held in place with temporary supports before a team of welders join up the pre-fabricated sections, fixing them into their final positions. Each weld uses 25kg of welding wire, and so far we have used four and a half tonnes of welding wire on the primary steel. There is a rigorous quality assurance (QA) programme that accompanies the installation of the structural steel, checking everything from the positioning of the sections to non-destructive testing of the finished welds to ensure a true and strong structure, rigid enough to minimise inter-storey drift to help keep containment during a seismic event.

Poor weather conditions in the Wellington area over the summer months have provided some challenges to the team installing the structural steel, as the crane cannot be used when the wind is too strong, and wet conditions create other health and safety hazards. Despite these factors, the team has made good progress over the last few months, and the contractors are now installing the composite floor slabs at the north end of the building.

The exterior of the building is expected to be finished and weathertight by the end of this year, and will be followed by the complex interior fit-out, with the installation of building systems designed by international experts. Once construction is complete there is a robust testing and certification process before the new lab can open for business in early 2019. We'll keep you updated on this in future issues.

8 October 2016: First "H" sections installed on site

4 November 2016: More steel erected

22 February 2017: The shape of the new lab becomes clearer as more steel is put up

28 March 2017: Contractors begin installing the floor on the upper level of the building, getting ready to pour concrete

Advanced seismic engineering protects new lab

One of the key challenges to building a high-containment laboratory in a seismically active zone such as Wellington is addressing the issue of building movement when an earthquake hits. To mitigate the new building experiencing severe movement, the lab has been built on base isolators, which separate the building from the ground and are able to absorb much of the energy released during an earthquake. This reduces the accelerations felt within the building.

Complex foundation system now buried under the building

The base isolators will allow the building to move 900mm relative to the ground in any direction. In addition to the isolators, the four corners of the new lab are held down by "anchor piles" which penetrate 13 metres into the ground below the basement. The bottom half of each pile is made up of reinforced concrete cast into the ground below, the top half a hollow cylinder, with double layered steel casing at the perimeter. Inside each of the casings is a tensioned steel cable which together hold the bottom of the building down to the pile anchors and stop it "jumping" off the foundations if an upwards movement were to occur during an earthquake.

Contractors connect the anchor piles to the underside of the new lab

These complex foundation systems combined with the stiff steel superstructure will minimise bending and stretching of the building during an earthquake. This is a key feature in preventing cracks in the walls that could breach the containment barrier and stop the lab from being used until fully repaired.

The site was unaffected by November 2016's 7.8 magnitude earthquake near Kaikoura, but it was a reminder for the team working on the build of the impact earthquakes can have, and the reason we spent the first year of construction completing the sound foundations the lab sits on. Following a thorough inspection of the site, engineers confirmed that the building performed exactly as it should have done at this stage of construction with the ground accelerations experienced.

The lead rubber bearings are in the basement, sitting above the underground foundations.

Q&A with Mark Barnes – Project Manager

Mark Barnes has recently joined the MPI team, stepping into the Project Manager role. This month we asked Mark a few questions about his role and the challenges and rewards it brings.

Your role is managing the project on the client side. Can you tell us a bit about what this involves?

As the MPI Project Manager, it is my responsibility to lead the project team to ensure the project meets its objectives. These include ensuring that the quality targets are achieved so that the new building is certified; and the project is delivered to programme and to budget. The project is more than just the new building, although this is the most visible part. It is also the delivery of various site infrastructure changes (for example security, data, power) and the operational transition from the existing labs to the new building. Success can only be achieved by a motivated team who work together and align with the project objectives. In simple terms my role is to ensure this happens. It is made easier on this project by the fact we have a great team.

What are some of the day-to-day challenges you deal with on a project like this?

No project ever runs smoothly. There are always issues that pop up during the design phase, the construction phase or the operational start-up. In this case the new building design is complete and construction is underway. However, the devil is in the detail and sometimes a plan just does not go as expected. This means that we have to find a solution which could be a design change, or a different installation method. Recently our tower crane broke down just as we started pouring concrete. This meant that the sequence of work had to change until it was repaired. It reminded us that the unexpected does happen, but you have to carry on and overcome issues that arise!

How does working in New Zealand so far compare with your experience overseas?

Working as a Project Manager in New Zealand is very much the same as in the UK. The project types and challenges are the same (with one notable exception being that designs have to take earthquakes into account) and the reward of a job being done well is the same. One thing underpins all of this and that is a project can only happen if there are motivated people with the right skills and knowledge involved. I am happy to say that this is the case here on the MPI project. I hope it is the same for all projects in New Zealand, but as this is my first project here, only time will tell!

How did you get into project management? What are some of the things you find most enjoyable in this line of work?

I suppose I fell into Project Management. I graduated with an Engineering degree at a time in the UK when opportunities were few so I looked around and applied for any work that I was qualified to do! I joined the UK Civil Service and started my career in "project world," supporting the UK armed forces in the UK and overseas. As a young Engineer, I found that I enjoyed the diversity of projects and the opportunities I had to see different places and experience new things. Later on I moved into the pharmaceutical sector in a project management role. This was rewarding as all the work had a very real purpose. I was involved in providing new manufacturing and research facilities which were used to discover and manufacture new medicines for patients. This was great motivation and it is amazing what can be achieved when you can see a patient benefitting from what you are doing. You can clearly see and identify with "why" the project is necessary. The NBL is similar in that I am playing a small part in a project that has a clear "why," in that it is of national importance and will help to protect New Zealand's Primary Industries. It is not just any old project!

It's been a few months since you joined the team here at MPI, are you able to share any highlights so far? What are some of the things you are looking forward to over the next two years?

The highlight is definitely the people at MPI. I have been made very welcome and everyone has a smile. This certainly makes Wallaceville an enjoyable place to work. The biggest thing I am looking forward to is the successful completion of this project. Every project has to finish, so although that means my time at MPI will be over which will be a sad day, it also means that the project will have been successfully completed. That will be a good thing.

Australian Inspector-General of Biosecurity visits Wallaceville

On the 21st of February 2017 the building site was visited by Dr Helen Scott-Orr, the Australian Inspector General of Biosecurity. Dr Scott-Orr, who has previously worked in diagnostic and research laboratories, has an oversight role for the Australian biosecurity system, and was visiting New Zealand to learn more about New Zealand's capability and processes for exotic pest and disease incursions. Dr Joseph O'Keefe, NBL Project Director, gave a summary of the project including its objectives, how the design was developed and the overall project plan. Then Chris Edwards, Fletcher Construction Project Manager, showed Dr Scott-Orr the construction site, including visiting the undercroft to inspect the seismic protection works.

The project is happy to host visits to the site and explain the features of the new laboratory. As the new labs near completion, we expect to be able to show visitors a lot more of the biocontainment systems.

Fletcher Construction Project Manager Chris Edwards leads the Australian delegation on a tour of the construction site.

Wallaceville site services

The National Biocontainment Laboratory will be the only lab of its type in New Zealand. Because it plays such an important role in securing trade in animal products and protecting our economy, provision needs to be made for secure services to the site.

Building the new lab at Wallaceville provides the opportunity for us to evaluate the site's infrastructure as a whole. As well as building in resilience and capacity for the new lab, we are incorporating flexibility for possible future site developments. Reviewing existing services such as IT infrastructure and electricity now can limit potential disruption to the site in the future.

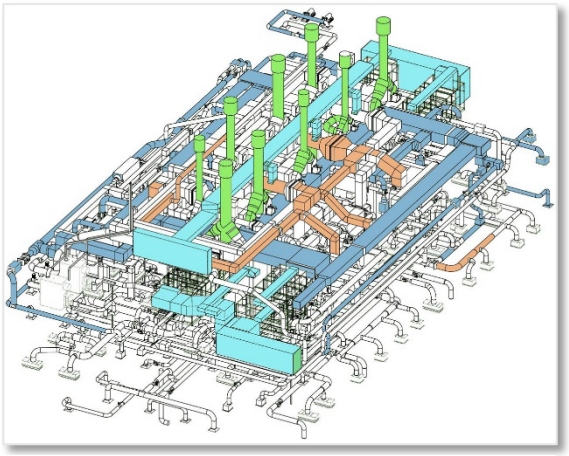
Ensuring adequate electrical infrastructure has been a strong focus during the design phase, and has included placing a large generator on the roof of the lab which will allow it to function during a power cut. In addition, the project will upgrade the electrical infrastructure to the site to manage the higher electrical draw from the new building. The project team has been working with the local lines company, Wellington Electricity Limited, to procure and install a new transformer and high-voltage underground cable to deliver the electricity supply.

Other types of services are also key for the ongoing functioning of the laboratory. Both the fire water supply and IT infrastructure have been reviewed to ensure they are able to service the new lab, and potentially additional development to the site in the future. This has led to the provision of conduits for additional IT infrastructure, and a dedicated fire water supply line.

We are working closely with on-site stakeholders MPI and ESR, Wellington Electricity Ltd., and Fletcher Construction Company to complete the services upgrade. Biocontainment Engineer Nathan Woods has been coordinating this work to date, aiming for completion in late 2017. This ultimately means that we will be able to "plug in" the new lab to the services it requires to operate when the time comes.

Building links with local suppliers

Building high-containment labs is very specialised in all aspects. The new laboratory has a highly complex air handling system used to keep all the laboratory spaces at negative pressure compared to normal atmospheric pressure. Achieving this is complex, especially when the laboratory has over four kilometres of air handling duct, all of which must be air-tight.



Graphic representation of the lab's air handling system.

While many of the specialised containment devices are manufactured offshore by containment engineering specialists, the team is dedicated to using local suppliers where the right skills and technology are available. Earlier this year MPI project team members and design consultants were invited by Benmax, the project's mechanical services contractor, to have a look at the duct leak testing set-up and prototype ducting which is being manufactured in Upper Hutt, just around the corner from the construction site.

In early March, the design and client team visited Benmax's local manufacturer, located in an industrial park at the edge of Upper Hutt's CBD. At the factory we were shown the prototype section of ducting that was being tested for air leakage. The prototype was being used to test different types of welds both for ease of manufacture and air tightness prior to starting full production. The air ducts for the new lab must meet stringent requirements for air tightness to ensure all air being circulated within the building can be fully filtered before being released back into the atmosphere.

Ensuring quality assurance (QA) is a critical aspect of the project, with representatives of the project team being required to attend factory acceptance testing of major plant and equipment components as part of the project's verification process. These QA visits will become more frequent as the project progresses towards the systems and services fit-out phase. Having a supplier on the doorstep therefore has some obvious advantages when schedules get busy.

As well as fabricating parts of the air handling system just 10 minutes' walk from the lab construction site, the base isolators were designed and manufactured by Lower Hutt company Robinson Seismic, founded by New Zealand's own Bill Robinson who invented lead rubber bearings, components that are integral to our new lab's seismic protection system.

The Wallaceville laboratory has been part of the Hutt Valley community since 1905 and half the laboratory staff live in Upper Hutt. Sourcing from local suppliers wherever possible is important for us as part of the Hutt Valley community.