slattery

Kaizen: Health & Research 01

The (Construction) Cost of Research

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2020 and Covid-19 have affected all industries globally. Positivity is returning as governments and organisations begin to develop means of societal and economic recovery through innovation. In September 2020, the Group of Eight universities released a blueprint aimed at preserving the research capacity and capabilities of Australia's world-leading universities. The blueprint highlighted the importance of 'excellence' in research and the importance of continued strategic support - transparent and full-funding of research initiatives to ensure maximum return on investment. More importantly, it confirms that government expenditure in innovation, health and research will play a crucial role in the economic and Covid-19 recovery.

In this Kaizen paper, Slattery considers the cost considerations when constructing a research laboratory and the steps that can be put in place to mitigate cost risk. With many universities and research agencies enhancing their focus on research capabilities, it is important to understand these cost drivers prior to undertaking a new laboratory project.

Refresh on laboratory physical containment

When discussing laboratories, the term 'PC' is often discussed. PC or Physical Containment refers to a facility's ability to prevent potentially dangerous micro-organisms from entering the world outside the laboratory they are contained within. In Australia, there are 4 levels of Physical Containment. This ranges from PC1, being for the lowest risk activity, to PC4 for activities which are extremely dangerous and life threatening. Therefore, as PC levels increase, cost also increases.

In accordance with federal government guidelines, features of each PC level includes:

PC1:

- Activities that do not pose a threat or disease to laboratory workers and users
- Areas are not required to be isolated from the building they are contained within
- Work is generally undertaken on open benches
- Appropriate PC level for primary and secondary student, and undergraduate tertiary activities.

PC2:

- Activities that pose a moderate hazard to laboratory workers and users and a limited community risk
- Requires greater control including access control, airlocks, etc.
- Requires greater levels of safety measures including safety showers, fume cupboards, etc.
- Work is generally undertaken on open benches.

PC3:

- Activities that pose a high hazard to laboratory workers and users and a limited community risk.
- Greater design requirements including air locks, no recirculation of air, equipment sterilisation, specialist waste treatment, biological safety cabinets, etc.

PC4:

- Activities that are extremely dangerous and life threatening.
- Requires the highest level of protection and containment.
- Complete isolation of spaces including being bound by a sealed internal shell, sealing of all penetrations, etc.

University of Melbourne
Bio21 Level 4 Refurbishment
Image courtesy of Arete

Benchmark data

Slattery has analysed its extensive database of laboratory refurbishment cost data to understand whether any trends emerge between the various physical containment levels. The following graphs identify the total construction cost (TCC) as an overall $/m² rate as well as the mechanical services $/m² rate.

TCC excludes consultant fees, loose furniture, specialist equipment and other non-construction relates costs.

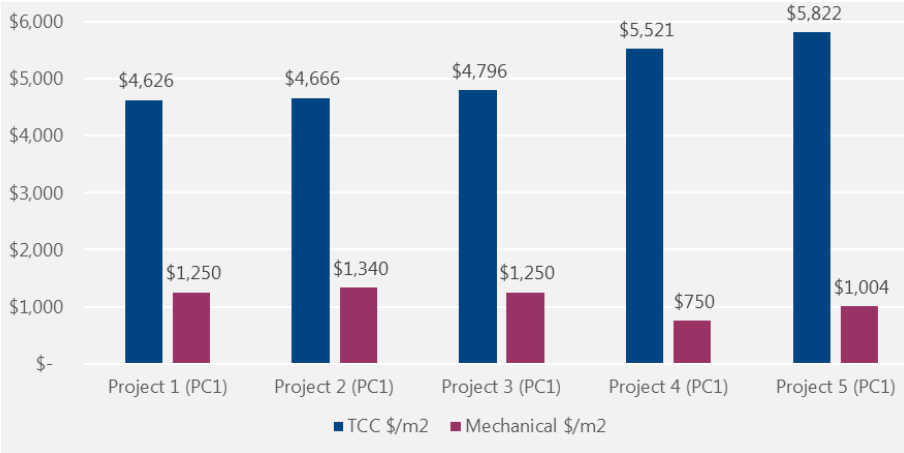


Figure 1: PC1 Laboratories

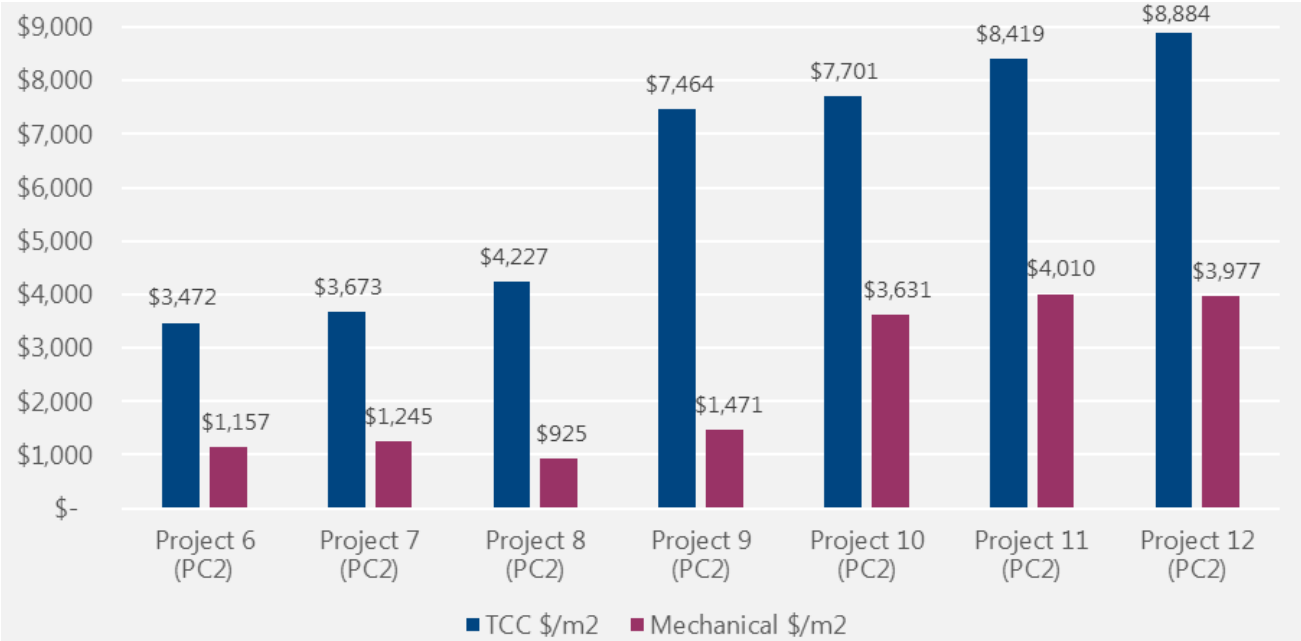


Figure 2: PC2 Laboratories

University of Melbourne
Bio21 Level 4 Refurbishment
Image courtesy of Arete

Benchmark data (cont'd)

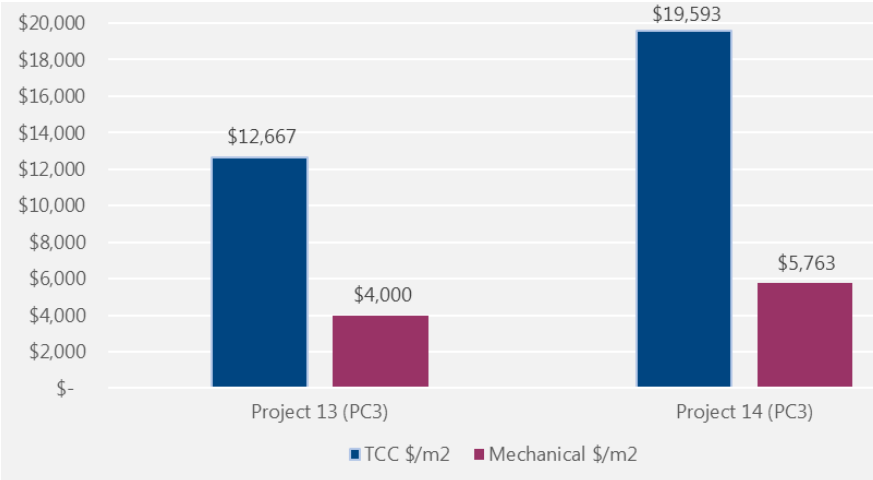


Figure 3: PC3 Laboratories

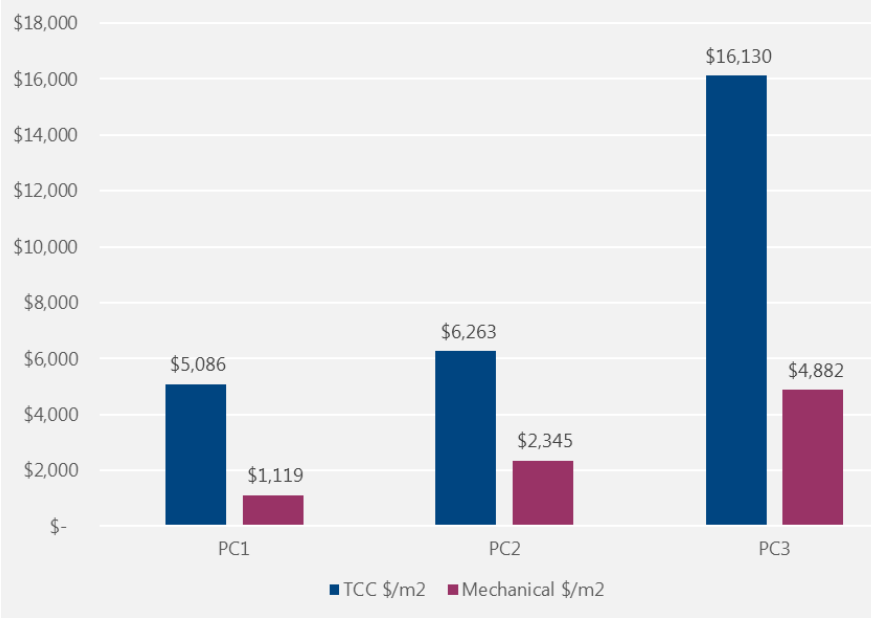
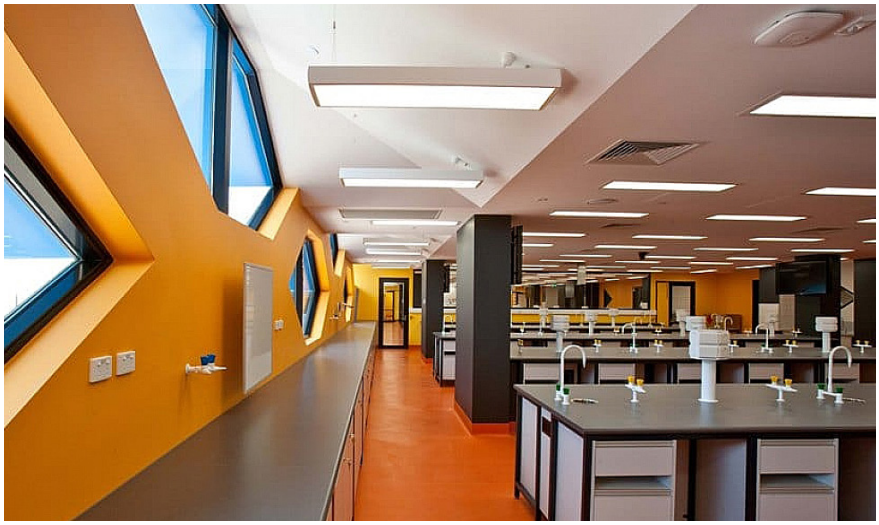


Figure 4: Average $/m²



La Trobe Institute of Molecular Science (LIMS)

Cost insights

The benchmark data indicates that despite a general upwards trend in cost based on the PC level, there are many inconsistencies. For example, the lowest project in the PC2 data range is less than any of the PC1 projects. The data shows that PC1 laboratories can range from $4,626 to $5,822/m², PC2 from $3,472/m² to $8,884/m² and PC3 from $12,667/m² to $19,593/m². It is also likely that there are many examples around Australia where costs lie outside of these ranges.

Whilst these ranges offer some insight as to the likely cost premium of a PC2 lab over a PC1 (for example), the ranges are significant indicating that the application of benchmark data at business case or feasibility stage can be problematic without understanding the unique requirements for a particular space.

Mechanical services is one of the largest variables and is one of the main reasons why we see such large variances in overall $/m² perspective. For example, within the PC2 laboratories, mechanical services alone range between $925/m² to $4,010/m². We provide more commentary later in this Kaizen on the importance of understanding the mechanical requirements early in the design phase.

Other elements which range wildly across the projects we have benchmarked include electrical services and joinery.

Other key cost considerations

Considerations that have significant impact upon project costs include:

Mechanical Services: The engineering and costing of mechanical services within laboratories can be complex. Generating cost estimates for laboratories at the feasibility stage can be challenging, and there is no magic formula or sqm rate to apply. Understanding the activities conducted within a laboratory is paramount. The designated use of the laboratory should be reviewed in detail during the early design process to capture costs associated with the sophisticated HVAC environmental control needed to maintain comfort and occupational health.

Mechanical services in a laboratory are designed to meet stringent design constraints and complex criteria, this is reflected in the high construction costs. The internal environment requires close control and conditioning. Typically, the installation comprises specialist mechanical services items of equipment with items selected to meet very specific demands and precise control of the temperature, humidity, room pressure, movement of air and air changes. Very often the mechanical systems run 24/7 to ensure that the laboratory environment is kept stable. Given these nuances, mechanical services can have significant impact on costs.

Purpose Built vs Refurbishment: The efficiencies of building a new purpose-built facility is far greater than the adaptable reuse and refurbishment of existing buildings. However, as many laboratories are bespoke and do not occupy a large area, the refurbishment of an existing building is more feasible. When refurbishing an existing building for laboratories, it is important to consider:

- Hazardous materials
- Floor to floor heights due to additional complex service zones
- Services infrastructure upgrade requirements
- Riser locations
- Floor strengthening and anti-vibration
- Acoustics and vibrations resulting from future activities

Containment: Our cost data indicates that the construction cost of a laboratory becomes greater as you increase the physical containment. It is therefore important to understand the PC levels required for each project, and the consequential requirements of each categorisation.

Area / Efficiency: In conjunction with cost increases due to containment requirements, the cost of a laboratory becomes greater with increases in area and containment.

Client Requirements: Understanding the requirements of the client or researcher is paramount to cost implications. When developing research and innovation hubs/districts, there is an imperative to create collaborative communities to solve problems that individuals on their own cannot solve. This requires a reimagining of the labs, including their supporting functions, and their operations. By creating these collaborative communities, we are asking the researchers to work differently; asking them to change. This proves to be an initial challenge, therefore it is necessary to understand what this means to them. When we create these new labs and innovation ecosystems, we need to bring the researchers along on the journey and simultaneously support their "change journey". The touring of other facilities and allowing their input into the return brief can also assist .

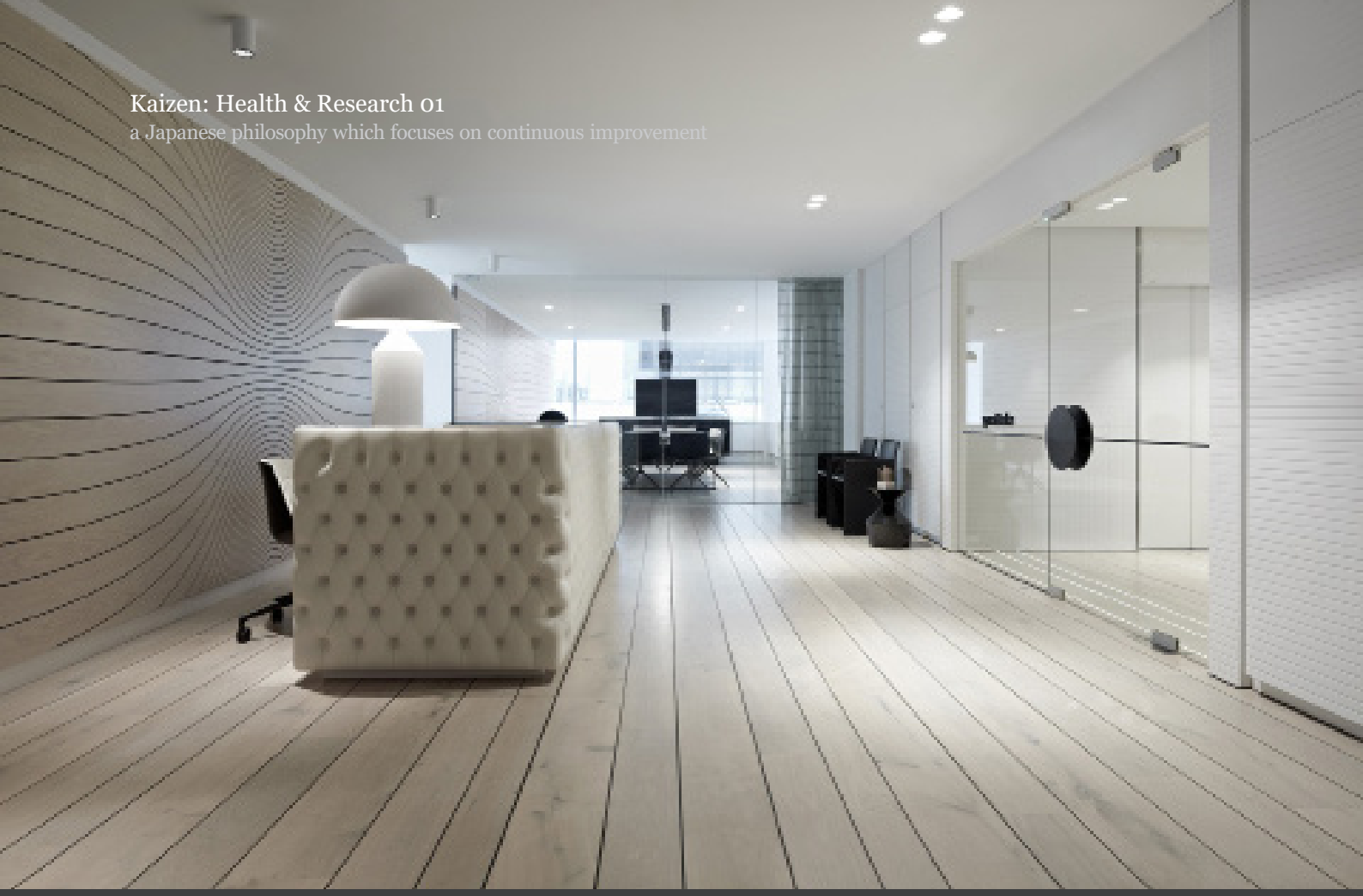
Specialist Equipment: Some research requires very expensive equipment that may not be able to provide a variety of tasks. It is important that these requirements are known early in the project to ensure an appropriate Specialist Equipment budget is considered and developed. It is also crucial to understand the design requirements of such specialist equipment including infrastructure requirements, services requirements, various special requirements, etc.

Recommendations

A collaborative approach is key to ensuring success when constructing research laboratories. As laboratories are being reimagined, its users must be part of the journey from concept to implementation. Key ingredients of a successful laboratory project include:

- Gain input from stakeholders and researchers - it is necessary to understand all bespoke requirements and the nature of research being or intended to be undertaken.
- Present options to the relevant academics for feedback
- Ensure early due diligence, especially when undertaking an adaptive reuse of an existing building.
- Early consideration of specialist equipment and their specific requirements.
- Engage a consultant team with strong research and laboratory experience.
- Provide clear and cohesive communication of the design and construction process to researchers, as many are unfamiliar with the process
- Select a contractor tender list with relevant experience through an early EOI process
- Engage professionals including Architects, Quantity Surveyors and MEP Consultants early in the design process to enable accuracy in the planning, design, and costing

Monash University
Burnet Tower BC2 Laboratory



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a Japanese philosophy which focuses on continuous improvement

About Slattery & Kaizen

Slattery is a property and construction advisory firm specialising in quantity surveying, cost management and early phase project advisory, with an outstanding history spanning more than 40 years.

A commitment to excellence and innovation, and an ability to become an integral part of the project team has earned Slattery the trust and respect of clients and project teams alike. Slattery adds value by taking control and ownership of the cost management process from the outset. We understand the importance to drive innovation and productivity.

Slattery's Kaizen Papers focus on sharing knowledge, ideas and pertinent cost information related to our industry. Kaizen is the Japanese word for improvement, and a business philosophy that strives for continuous improvement in process. We produce papers across the sectors we work with, which are shared with our clients and made available on our website for all to view.

We invite you to explore these further at www.slattery.com.au/thought-leadership

A dedicated Health & Research team

Slattery works with public health departments, private health developers and operators, and leading health and community providers to plan, design and construct new and refurbished health and research facilities across Australia.

Our Health team has the capability, capacity and expertise to advise on a variety of projects, leveraging more than 30 years of Australian and international experience in health infrastructure projects.

We provide a dedicated, thorough and considered team approach from initial feasibility and master-planning to project completion onsite, to optimise value for our clients and the community.

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