BLD469202

Digitising New Zealand's Innovation Agency: A Client's Journey into BIM360

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Learning Objectives

- Discover procurement methodologies for the successful appointment of consultants and contractors in high-trust digital environments.
- Discover the benefits and challenges of implementing ISO 19650 on small to medium-scale projects.
- Discover the benefits and challenges of working in a high trust "live" BIM 360 environment that's hosted by the client/building owner.
- Learn about unexpected client and stakeholder successes from adopting a high-trust, cloud-based, collaborative environment.

Description

This is the story of how Callaghan Innovation were able to successfully develop an ISO 19650 aligned process for a programme of works, and successfully implement on a BIM pilot project with Architect and BIM specialist Warren and Mahoney, as part of the redesign of their Gracefield Innovation Quarter (GIQ) site.

It provides a client's perspective of the implementation of ISO 19650 and how the procurement process allowed for establishing a high-trust, cloud-based BIM 360 environment, hosted by the client and operated by the lead consultant. With client BIM advisor WSP, for asset management aligned ISO 19650 programme documentation and architect and project BIM manager Warren & Mahoney for the BIM pilot project.

This presentation is targeted at building owners, asset, maintenance and facility managers, BIM managers, project managers, project stakeholders, and those involved with the design and delivery of construction projects.

Speakers

Hugh Evans is Design Lead for Callaghan Innovation and responsible for a team involved with the $130m redevelopment of the Gracefield Innovation Quarter (GIQ) site.

Hugh has worked across the fields of consulting and mechanical engineering, and in other multidisciplinary roles, he is a chartered professional engineer and has a track record of delivering leadership across projects in Australia, New Zealand, Singapore, Norway, UK and USA.
In joining Callaghan Innovation Hugh sees a unique opportunity to bring the latest digital techniques to the redevelopment of a site that has a host of legacy issues, but a vision to support world-changing innovation through R&D.

Jason Howden is Associate Principal and Digital Innovation Leader for Warren and Mahoney, an Australasian architecture practice with 300 staff across 7 studios throughout New Zealand and Australia. For 25 years Jason has been at the forefront of BIM, leading its development, promotion and education around the world.

Jason is a complex-project specialist who has consulted on some of the world's largest public service facilities, including hospitals, laboratories, prisons and airports, with values ranging from $100 million to over $1.5 billion. As W+M's Digital Innovation Leader he works closely with our clients to develop bespoke technologies and processes to deliver the best possible outcomes for their projects.

Contents

Introduction

This industry talk provides an insight as to the why, and how, of the application of ISO 19650 and BIM 360 design collaboration software to a small to medium sized project, as part of a larger programme of works, for the redevelopment of a site that encompasses laboratories, office space and workshops, and is host to researchers, scientists and engineers.

The talk provides an insight to the roles and responsibilities, associated with the application of ISO 19650, for both the appointing (client) and appointed parties (consultants and contractors), and an insight as to why this 'small-to-medium' sized project was perceived as a "lighthouse" moment for Architect and BIM specialist Warren and Mahoney (W+M).

This handout, and presentation, provide a summary, and insights, to the application of an international BIM standard, specific methodologies and use of software used for projects that form part of a tactical programme of works, as part of a journey to digital transformation previously associated with large sized projects, and exemplifies a versatility of these BIM approaches for smaller and medium sized projects.

Gracefield Innovation Quarter

Callaghan Innovation is New Zealand's innovation agency, activating innovation and helping businesses grow faster for a better New Zealand. Our primary objective is to support science and technology-based innovation and its commercialisation by businesses.

We partner with ambitious businesses of all sizes, providing a range of innovation and research and development (R&D) solutions to suit each stage of growth and enhance the operation of New Zealand's innovation ecosystem, working closely with government partners, Crown Research Institutes, and other organisations that help increase business investment in R&D and innovation.

Our people – including more than 200 of New Zealand's leading scientists and engineers – empower innovators by connecting people, opportunities, and networks, and providing tailored technical solutions, skills and capability development programmes, and grants co-funding.

We operate across New Zealand, including at the Gracefield Innovation Quarter (GIQ, or Gracefield), a site located in close proximity to Wellington (New Zealand's capital city and the seat of central government).

GIQ is a 10-hectare site, with 34,000m^2 of laboratories, office space, workshops and pilot labs and has a central role to Callaghan Innovation's mission to help New Zealand businesses understand where technology is taking the world.

GIQ Programme

In May 2019 the Government approved a Business Case for the GIQ Programme, a $130m redevelopment to develop a vibrant, supportive and connected innovation community.

The GIQ Programme undertakes to improve safety, compliance and resilience at the site and to develop the facilities and partnerships to deliver "a vibrant, supportive and

connected innovation community", supporting our namesake Sir Paul Callaghan's vision of New Zealand as "a place where talent wants to live".
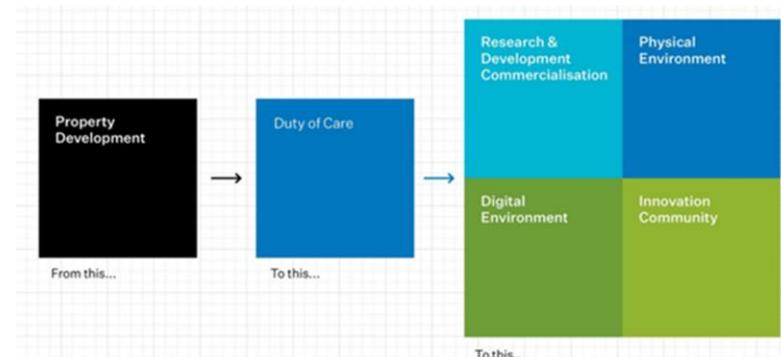

Figure 1. GIQ Programme

The GIQ team was established to rethink the design and construction process, capitalising on the increased levels of BIM adoption, and to lead on the implementation of a new era of digitised construction.
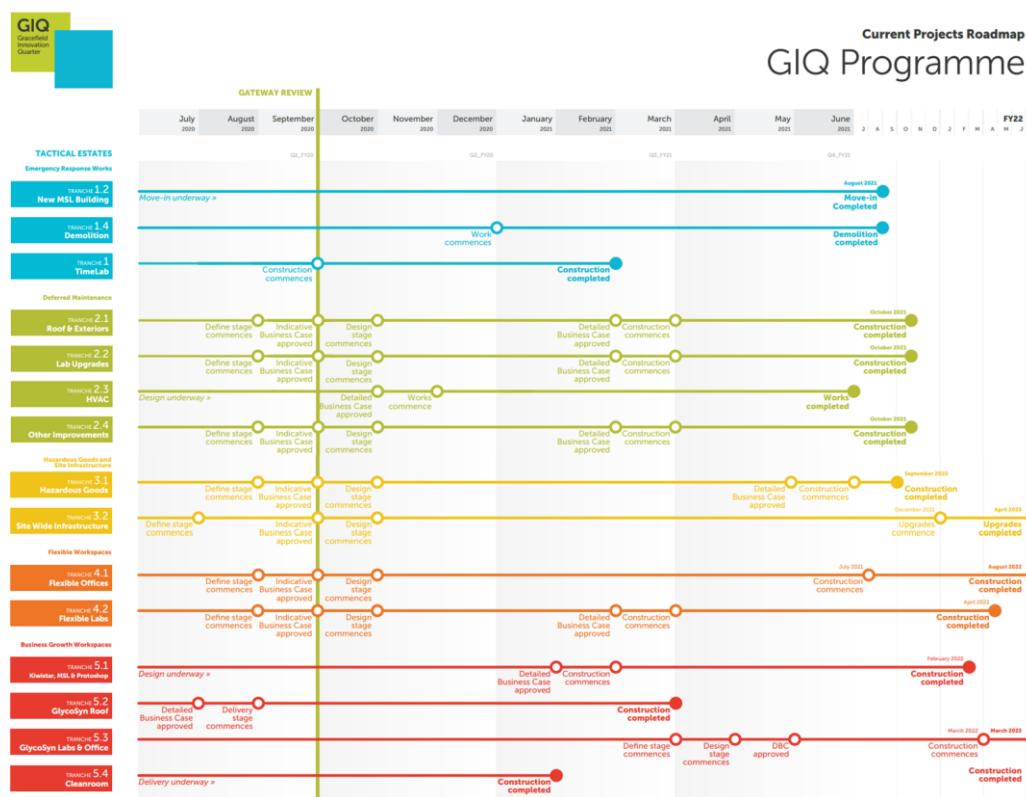

Figure 2. GIQ Road Map

At the time of AU 2020 we are one year into a four-year programme of work, with progress on projects to support the redevelopment of the Gracefield site underway, and a digital journey underway, to support the programme, that include development of a Digital Twin, geometric model of the site, and BIM strategies.

Digital Twin

The GIQ team has commenced development of a "Digital Twin", and currently have a geometric representation of the physical assets on the site, this is supplemented by GIS information, including 'real-time' rendering & VR software.

Digital twins are not a single piece of technology but combine multiple data sources to deliver a complete and realistic representation of the physical world. The digital twin is a work in progress, and forms the basis for the Project Information Model, as issued at commencement of a new project. In the future we envisage it providing a platform for capture of asset information and IoT sensors, to inform an understanding of the condition (and operation) of our physical assets, and for preventative maintenance plans to be prepared.

Figure 3. 'Fly-thru' of GIQ Site & Digital Twin renders

BLD469202-GIQ-K-VI-001-Flythru_1080-RevA.mp4 is accessible via: https://drive.autodesk.com/new/de2982716/shares/SH56a43QTfd62c1cd9682354508a4173665d, with password "GIQ".

Procurement methodologies

This section addresses procurement methodologies for the successful appointment of consultants and contractors in high-trust digital environments.

Procurement Charter and Methodologies

The procurement plans and planning for the GIQ Programme are in alignment with the New Zealand Government's [Procurement Charter](#).

The charter sets out the expectations as to how agencies should conduct their procurement activity to achieve public value, and directs agencies to consider "creating opportunities for local businesses and small-to-medium enterprises" to participate in the procurement process, and undertake "initiatives to contribute to a low emissions economy and promote greater environmental responsibility".

The charter also prompts for "new and innovative solutions", and to give businesses "the opportunity to demonstrate their expertise" and to "encourage collaboration for collective impact". These requirements align with 'broader outcomes' and Government Procurement Rules.

Methodologies were developed to support this approach and include the GIQ Project Delivery Framework, that is configured to align across several standards and frameworks, including:

- Managing Successful Programmes MSP™.
- Prince2 project stages.
- ISO 19650.
- Programme Governance Approvals.
- New Zealand Treasury Better Business Case model.
- 'He rangi hou kei tua' – the Callaghan Innovation Change Framework.
- New Zealand Construction Industry Council Guidelines.

Professional services – Project Delivery Team procurement

The first of many projects, the procurement process allowed for an understanding of the scope of work involved with the project, and the wider GIQ Programme, to be circulated widely, to a wide representation of suppliers.

Procurement was undertaken via a two-stage process, with an open process followed by shortlisting based on certain prerequisite capabilities.

The intention was to allow responders to demonstrate their:

      i)   BIM capabilities.
      ii)   Willingness to participate in the adoption of ISO 19650.
      iii)   Familiarity with cloud-based, high-trust, collaboration tools.

Registration of Interest (ROI)

The ROI summarized the 'high-level' prerequisite requirements.
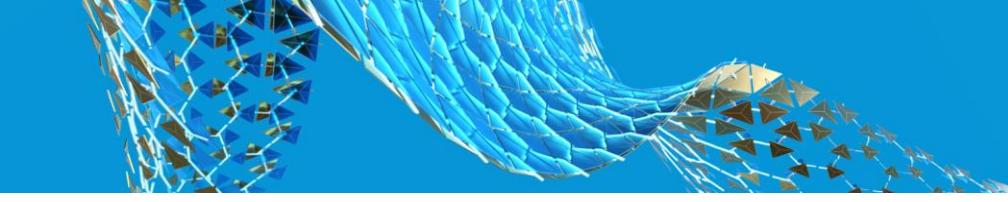
A series of ROI's were issued for Architecture, Building Services, Structural, Civil & Geotechnical and Fire Engineering/Protection, inviting specialised organisations.

- The following was provided align with the ROI:
  - Project summary (and general project information requirements).
  - Project specific drawings from a 'Digital Twin'.
- Responses were assessed on:
  - Reference projects (size, value and relevance).
  - Nominated task team personnel (capability & capacity to undertake).
  - Respondents BIM experience, including with ISO 19650, and (for Lead Appointed Party role) an example BIM Execution Plan (BEP).

Request for Proposal (RFP)

During the second stage we issued a single RFP to the shortlisted consultancies and invited them to respond only to the disciplines they had successfully been shortlisted for.

By providing the same, combined, RFP to all parties we provided an awareness of the scope of work to be undertaken by all disciplines, providing an insight to the overall project requirements.

Presentation format responses were required to be formally submitted, with a Fee Schedule, and 'interactive' presentation sessions were scheduled to provide respondents an opportunity to present and discuss their response to the RFP.

- The following was issued with the RFP:
  - Project Information Requirements (PIR).
  - Exchange Information Requirements (EIR) & File Naming Conventions.
  - Conceptual Drawings (Elevations and Sections), Geotechnical, and Fire reports.
  - Schedule of Pricing.
  - Series of 'plain language' questions about:
    - Innovation, sustainability, Safety-in-Design & design philosophy.
    - BIM protocols and systems, with reference to ISO 19650.
    - Experience deploying Autodesk BIM 360 and collaborative design in a high-trust environment.
- We assessed on:
  - Presentation (responses to plain language questions).
  - Lead roles (named personnel).
  - Pre-appointment BEP (for Lead Appointed Party).
  - Value (best public value).

Lessons Learned

The' two-stage' approach allowed for an 'open market' approach, both ensuring a wide awareness of the GIQ Programme and the specific project, and an indication from the market as to their capabilities with BIM, ISO 19650 and BIM 360.

Interactive Presentation

During the 'interactive' presentations we were able to discuss aspects of the project with respondents (providing the same information to all parties).

This approach allowed for a clear understanding of who was proposed to be undertaking certain key roles (i.e. Discipline Lead, BIM Lead and Model Element Authors) and to understand how they were able to work on a complex site, interact with the project stakeholders, and respond to project priorities.

Of interest was any consistency of personnel nominated in both the ROI and RFP responses; providing a possible insight as to an ability to ensure consistency of the task team personnel across the duration of the project; enabling on-going collaboration in a high-trust environment.

A lesson learned, about the interactive presentation format, was full version presentations were better to be submitted, but only outline presented during the interactive session, allowing more time for a general discussion.

These question and answers discussions proved to be insightful, and allowed for a general sharing of lessons learned (on previous projects), and considerations for innovation in the 3D Model, with seismic restraint design (of non-structural elements) proposed to be undertaken in the Model; along with an option for fire protection, passive fire elements and Safety-in-Design elements to also be represented in the Model.

Level of Development and Information Requirements

Other areas of discussion included the required Level of Development (LOD), expectations, and asset information requirements.

At the point of issuing the RFP we had developed our own ISO 19650 Exchange Information Requirements (EIR) document for the project, but work was still on-going with development of a Callaghan Innovation template BIM Execution Plan (BEP) and an associated Model Production Data Table (MPDT).

Having a Programme version MPDT ensures consistency in the way that all projects are undertaken, enabling a smoother transition from the design and delivery of projects from the programme team back to the organisation and into the asset operation phases. The template MPDT was finalised before the project delivery team progressed to their detailed design.

The MPDT, along with a template BEP, that aligns to work by Te Kāhui Whaihanga (NZ Institute of Architects), was prepared for Callaghan Innovation by Client BIM advisor WSP New Zealand, as part their work supporting the development of a programme BIM Execution Plan (BEP) template, and Model Production Development Table (MPDT) to drive the alignment of asset metadata and information standards, of the PIM with the Asset Information Model (AIM).

The MPDT was developed to align with the UniForm classification system, assessed as the most appropriate system for the GIQ site; suitable for both vertical and in-

ground services infrastructure and offers a robust, and simple to use approach to the structuring of asset metadata.

These documents were then reviewed by the project delivery team and adapted to align with the project requirements. This enabled an understanding of how to deliver the asset information requirements on the project and with approaches to building naming and zoning. Specialised equipment (e.g. sitewide vacuum system) was also considered and integration of 'cost take-off' approaches with the Cost Estimator.

Implementing ISO 19650

This section addresses the benefits and challenges of implementing ISO 19650 on small to medium-scale projects.

Why apply BIM?
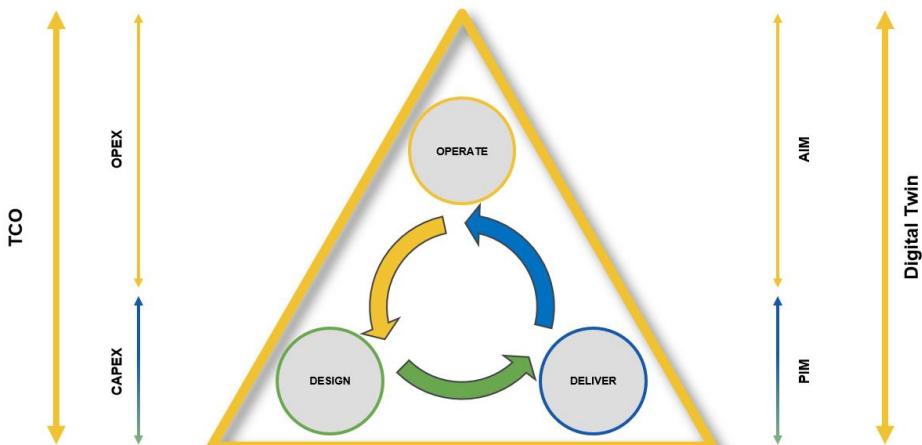
Figure 4. The Golden (BIM) Triangle

Building Information Modelling (BIM) offers a digital information management approach to improve infrastructure delivery and performance. The international BIM standard, ISO 19650, offers a high-level framework that can be applied to all types of assets, and by all types and sizes of organisations, regardless of the procurement strategy.

The "Golden (BIM) Triangle", presented above, encapsulates the flow of information, from design to delivery (within a project) and also how that is informed by asset information requirements, and then influences the operational phase of the asset, as part of a Total Cost of Ownership (TCO).

The TCO approach articulates the challenges, and tensions between the capital and long-term operational phases, and the importance of considering the whole of life aspects throughout the project. It can also be considered to align with the transition from capital to operational expenditure, and from the Project Information Model (PIM) to the Asset Information Model (AIM), when considered within the context of a Digital Twin and ISO 19650.

W+M, as Architect and BIM specialists, articulated a whole of life approach, with innovation such as approaches to embodied carbon analysis, and an understanding of the whole of life considerations, to inform the lifecycle of the asset and TCO.

ISO 19650 Considerations

The international BIM standard connects within the wider context of an asset management system, such as the one described in ISO 55000 Asset Management Standard and addresses the Delivery and Operation of built assets.

It offers flexibility that allows it to be adapted to projects of a wide range of scale and complexity, and whilst associated with larger scale projects is equally applicable for small to medium-scale size projects. The standard enabled a consistent approach to be taken across all GIQ projects.
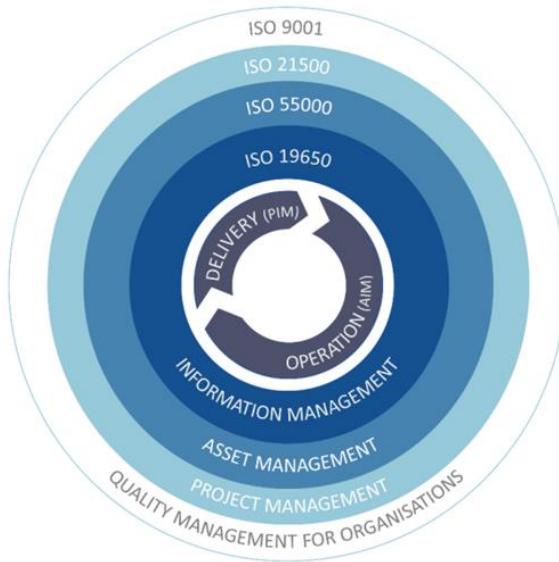

Figure 5. Context of standards

ISO 19650.1 & 2

Part 1: Concepts and principles - provides recommendations for a framework for managing information including exchanging, recording, versioning and organising for all project participants.

This includes a Common Data Environment (CDE), for the collaborative production of information, roles and responsibilities (including legal and security considerations) and the principles of implementation and practical aspects of information. The standard provides "clarity of functions, responsibility, authority and the scope of any task".

Part 2: Delivery phase of the assets - specifies requirements for information management during the delivery phase of assets and addresses information management activities, and outputs over the project, from the perspective of each role described in the standards, namely the Appointing Party (client), the Lead Appointed Party (LAP) and Appointed Party/Task Team.
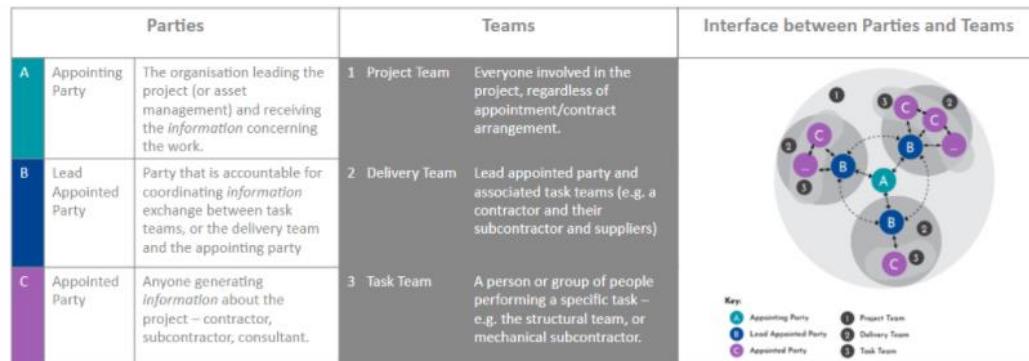
Figure 6. Project, Delivery and Task Teams

The LAP can be the contractor, responsible for appointing subcontractors and trades and the lead design party (e.g. Architects, or BIM Specialists).

We differentiate between appointed parties involved with Design and the Delivery phases. The LAP (for design) is typically the Architect/BIM Lead, on the basis that they are working in the Model and well placed to coordinate across the design progression, however they are not responsible for subcontracting consultants, with all professional services consultants (project managers, cost estimators, architects, BIM specialists and engineers) directly appointed by Callaghan Innovation (and not via the LAP).

Aspect of information management function	👤	👥	📢
Establishing project and LAP information requirements	√		
Provision and management of project CDE	√		
Tender evaluation	√		
LAP appointment	√	√	
Establishing appointed party requirements		√	√
Compiling tender response (pre-appointment BEP etc.)		√	
Summary of delivery team capability/capacity		√	
Task information delivery plans			√
Master information delivery plan	√	√	
Appointed party appointment		√	√
Mobilisation		√	
Information authorisation		√	
Information acceptance	√		

Figure 7. Roles and responsibilities (indicative)

ISO 19650 terms

- Organisational Information Requirements (OIR) – information needed to answer or inform high-level strategic objectives within the asset owner/operator in relation to the built assets owned and operated by them.
- Asset information requirements (AIR) – information needed to answer the organisational information requirements.
- Project information requirements (PIR) – information needed to answer or inform high-level strategic objectives within the asset owner/operator or project client organisation, in relation to a particular built asset project.
- Exchange Information Requirements (EIR) – a document that defines how to transfer the information, in what format, what level of information, and establishes an agreement among the Project Team on how, and with what features, they need to exchange their digital information. To be specified by the appointing party.

Figure 8. Template MIDP

Model Element	Concept Design		Preliminary Design		Developed Design		Detailed Design		Practical Completion	
	Design Team								Construction Team	
	MEA	LoD	MEA	LoD	MEA	LoD	MEA	LoD	MEA	LoD
Enclosure										
Floors - External	A	100	A	200	A	300	A	300	CON	500
Walls - External (Generally)	A	100	A	200	A	300	A	300	CON	500
- Fire Rated External Walls	A	100	A	200	A	300	A	350	CON	500
- Acoustically Rated External Walls	A	100	A	200	A	300	A	350	CON	500
Windows - External	A	100	A	200	A	300	A	300	CON	500
Doors - External	A	100	A	200	A	300	A	300	CON	500
Roofs	A	100	A	200	A	300	A	300	CON	500
Interior										
Floors - Internal	A	100	A	200	A	300	A	300	CON	500
Walls - Internal (Generally)	A	100	A	200	A	300	A	300	CON	500
- Fire Rated Internal Wall	A	100	A	200	A	300	A	350	CON	500
- Acoustically Rated Internal Wall	A	100	A	200	A	300	A	350	CON	500
Windows - Internal	A	100	A	200	A	300	A	300	CON	500
Doors - Internal	A	100	A	200	A	300	A	300	CON	500
Ceilings (Generally)	A	N/A	A	200	A	200	A	300	CON	500
- Fire Rated Ceiling	A	N/A	A	200	A	300	A	350	CON	500
- Acoustically Rated Ceiling	A	N/A	A	200	A	300	A	350	CON	500
Railings and Balustrades	A	N/A	A	200	A	200	A	300	CON	500
Fixtures, Furniture And Equipment										
Fixed Furniture & Fittings	A	N/A	A	200	A	200	A	300	CON	500
Plumbing Fixtures	A	N/A	A	200	A	200	A	300	CON	500
Others										
Raised Floor Construction	A	N/A	A	100	A	200	A	300	CON	500
Stairs	A	100	A	200	A	200	A	300	CON	500
Lifts	A/M	N/A	A/M	200	A/M	200	A/M	300	CON	500

Figure 9. Template MPDT (Architecture) - MEA & LOD

Model Element	UniFormat Code	Design Team Metadata (information) Requirements										Delivery Team Metadata (information) Requirements								
		Revit Family Type	Unit of Measure	Renewable - Finish	Function	Fire Rating	Known H&S Issues	Specified System (BWoF)	Expected Life	Location	Critical Element (Y/N)	Supplier	Installer	Install Cost, Replacement Cost	Install Date	Installer Warranty	Manufacturer's Warranty	Make/model	Reference Code	CostX
Enclosure																				
Floors - External	B1010	Yes	m²	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Walls - External (Generally)	B2010	Yes	m²	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	
- Fire Rated External Walls	B2010	Yes	m²	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	
- Acoustically Rated External Walls	B2010	Yes	m²	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	No	No	No	
Windows - External	B2020	Yes	Qty	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Doors - External	B2050	Yes	Qty	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	
Roofs	B3010	No	m²	Yes	No	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
Interior																				
Floors - Internal	C2030	Yes	m²	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Walls - Internal (Generally)	C1010	Yes	m²	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	No	
- Fire Rated Internal Wall	C1010	Yes	m²	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	No	
- Acoustically Rated Internal Wall	C1010	Yes	m²	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	No	No	
Windows - Internal	C1020	Yes	Qty	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Doors - Internal	C1030	Yes	Qty	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	
Ceilings (Generally)	C1070	Yes	m²	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	
- Fire Rated Ceiling	C1070	Yes	m²	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	
- Acoustically Rated Ceiling	C1070	Yes	m²	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	
Railings and Balustrades	C1090	Yes	m	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	
Fixtures, Furniture And Equipment																				
Fixed Furniture & Fittings	E2010	Yes	Qty	No	No	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
Plumbing Fixtures	D2010	Yes	Qty	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	
Others																				
Raised Floor Construction	C1060	Yes	m²	Yes	No	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	
Stairs	B1080	Yes	Qty	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	
Lifts	D1010	Yes	Qty	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Figure 10. Template MPDT (Architecture), continued - UniForm & Metadata

Benefits of ISO 19650

Having a standardised process for information delivery on construction projects is essential for efficient delivery, and offers value in terms of time, costs and quality.

The concepts and principles of the international BIM standard apply across the whole of life cycle of any built asset, including the design, documentation and construction, and operation, maintenance, refurbishment, repair and end-of-life (recycle/repurpose). They therefore align with overall intended project outcomes and a process of benefit realisation for stakeholders affected by the project.

The standard was aligned to the GIQ project delivery framework with emphasis on discovery, define, design and delivery, but also consideration of the transition to a subsequent operation phase.

Clarity, throughout the project

A key principle of the standard is clearly defining information requirements at project inception. This provides the clarity and certainty all parties need to direct their efforts effectively, including allowing for clients to verify that their requirements have been satisfactorily met.

Implementation

The GIQ team was tasked with embedding and establishing the processes and the capability (understanding and proficiency) for GIQ projects.

Requirements

Successful adoption of ISO 19650 requires a clear and widely communicated understanding of the benefits, a shared vision and leadership support. The standard was adopted and aligned to the GIQ Project delivery Framework. In this handout we summarise the benefits of this approach.

- Discovery
  - Early collaboration and input from operational & facilities management teams to understand "as-is" state.
  - Modelling of existing building information (from as built 2D drawings, supplemented with survey and laser scanning).
  - Early definition of data requirements during the asset lifecycle.
- Define "Conceptual Design" (Pre-Appointment)
  - Rapid design optioneering and comparison of different options, enabling consideration of more efficient, cost-effective, and sustainable solutions.
  - Early stakeholder engagement through 3D rendering of options, supporting business case preparation.
  - Clarity over project information requirements and exchange information requirements and the need to provide these during the appointment process.
- Design (Project Team appointed)
  - Clarity of requirements, between the appointing party (the 'GIQ team' as the client/asset owner) and appointed parties via 'common language' and common data environment.
  - Single, shared, model environment via high-trust, client hosted cloud-based platform – enables collaboration across multi-disciplinary task teams, with clash detection workflows.
  - Better whole of life through BIM and platform for enabled carbon analysis and energy modelling.
  - Safety-in-design, including visual capture of passive file elements, seismic restraint design (non-structural elements) and fire protection aligned to the 3D Model.
  - 4D to identify the most efficient construction sequences and optimise preliminaries (also useful for Stakeholder communications).
  - 5D cost take-off approaches and more accurate, data driven cost control and management to improve cost certainty and budgeting.
- Deliver (Contractor appointed)
  - Concepts for delivering information, reinforcing BIM, and an improvement in mitigating risks related to liability and intellectual ownership of information.
  - Clarity of documentation is expected to result in a reduction in Technical Queries & Requests for Information.
  - The ability to interrogate design models to validate engineering decisions.
  - Improved fabrication and shop drawing processes.
  - Improved site safety through digital method statements and 4D simulations of high-risk activities (e.g. phasing of activities).
  - Improved logistics solution through Radio-frequency identification (RFID) tagged materials (and QR Codes) linked to the project information model.
  - Capture of 'as-installed' information through continuous scanning, or photogrammetry linked to the model.
- Operation & In Use
  - Whole-of-life asset models contain asset metadata and enable predictive maintenance plans to be generated.

- Digital Twin as an asset information model secured in the cloud, offering improved robustness compared to previous paper-based systems and enabling wider access, of a single-source of truth to enable the safe and efficient operation of the site.
- Digital Twin to support adoption of augmented reality technology to support maintenance personnel onboarding and training.
- Digital Twin to enable improved operational performance across the site, to drive operational efficiencies, and for predictive maintenance via machine learning to assess the performance of plant and machinery and equipment across the site.

ISO 19650 - Appointing Party's Role

A key principle of the standard is that of clearly defining information requirements at the project inception. This provides the clarity and certainty all parties need to direct their efforts effectively with the minimum of confusion, cost and time overruns, reworks, waste and conflict. It also allows clients to verify whether their requirements have been satisfactorily met.

ISO 19650 GAP Assessment

In September 2019 an 'ISO 19650 Assessment - GAP analysis' report was undertaken by WSP, in preparation for development of a roadmap towards digitising planned projects at Callaghan Innovation.

This engagement focused on internal taxonomies, structures and working practices, to inform an Information Management Strategy and a plan for the digitisation of business and assets. The associated work also provided clarity about areas and approaches, such as an example file naming strategy. This provided a useful reference for the GIQ team to commence their preparation of ISO 19650 documents to communicate information requirements across GIQ projects.

Appointing party

The GIQ team includes architects, engineers, BIM specialist and GIS geospatial data specialist capabilities. The team has been progressively modelling, and developing a geometric representation of the GIQ site, allowing for development of a 'Digital Twin' of the site. This federated model forms the basis of Project Information Model (PIM) take-offs, allowing Revit model files to be made available to the project team, with clarity about the 'as-is' built environment.

Appointing Party Information Requirements

The Organisational Information Requirements (OIR) and Project Information Requirements (PIR) were developed as part of the GIQ project delivery framework, with content used for inclusion in project business cases and for procurement (in alignment with Government Procurement templates). These were supplemented by the development of Exchange Information Requirements (EIR), which provides clarity to the market as to the systems and approaches to be considered for the project, an example is provided in the Appendix.

Challenges of implementing ISO 19650

The challenges of applying ISO 19650 to projects include, by virtue of it being a new standard, a general unfamiliarity, and reservations, about investing in new processes to

support its adoption without having a clear mandate or commitment to the BIM standard across the Architecture, Engineering & Construction (AEC) sector.

Reference examples

There are some excellent resources available to support the adoption of BIM Level 2 (British PAS 1192), available from United Kingdom organisations (e.g. Scottish Future Trust, an independent company established by the Scottish Government) and explain and provide examples of approaches necessary for delivering 'value for money' across the public sector. The UK BIM Framework also provides an overarching approach to implementing BIM in the UK, in collaboration with BSI, CDBB and the UK BIM Alliance,

It is worth noting though that, with the fairly recent internationalisation of the BIM standard, there are fewer examples specific for ISO 19650; e.g. there are plenty of examples (and templates) showing how to structure "Employer Information Requirements", but fewer are readily available that align with the "Exchange Information Requirements", as presented in ISO 19650.

However, extensive documentation is available to support an overall understanding of the international BIM standard. Useful documentation, referenced by GIQ includes:

- [Australia and New Zealand guide to ISO 19650](#)
- [Information according to BS EN ISO 19650, Guidance Part 1: Concepts](#)
- [Information according to BS EN ISO 19650, Guidance Part 2: Processes for Project Delivery](#)
- [BIM and ISO 19650 from a project management perspective](#).

Mandate / Client Commitment

Equally, for those responding, there is often a lack of coherent and consistent demand, from appointing parties, for the standard, which can make investment in the tools and processes (for one-off projects) a risky endeavour, without certainty of future demand.

Considerations for the GIQ Programme

For the GIQ team this highlighted the importance of allowing the market to respond with their views on how best to achieve alignment to ISO 19650 in New Zealand.

Lessons Learned

In aligning to the international BIM standard it has been necessary to adapt the standard, or to develop work-arounds to ensure compatibility with software, systems and processes.

Adoption to BIM 360

The ISO 191650 approach posed technical challenges, one example being the information container naming perspective (and a slight adoption required to align with BIM 360 swim-lanes approaches for sharing and consuming data).

All model data is to be shared via the provided Autodesk BIM360 Design (hub) Platform.
Sharing of formal model exchanges is to be carried out using the 'Publish – Share – Consume' workflow native within the BIM360 Design platform. This workflow is summarised as per below example.
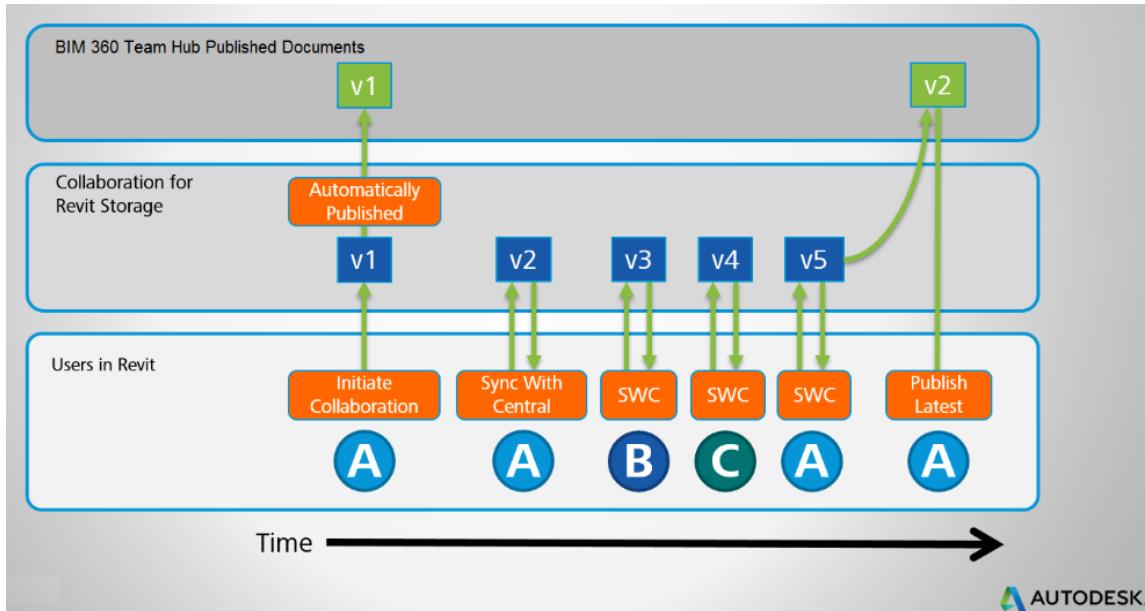
Figure 11. BIM 360 Workflow

Work in progress (WIP) model data shall be created and stored within each discipline's own 'branch' of the project's BIM360 Hub. Regular sharing of WIP model data can either be 'live' linked between the various discipline branches or shared using the above 'Publish – Share – Consume' workflow. This workflow results in model data becoming 'public' to the project team and able to be consumed by all parties.

Naming Convention into Revit Workflows

Another example is the application of naming conventions (elements based on the UK National Annex, to BS EN ISO 19650-2) to Revit templates.

Having a common naming convention, across all projects, allows for a consistent client-centric approach, with alignment to client's conventions. This allows for an ease of identification of key attributes, such as: "project code", "issuing/appointed party", "task team discipline", "location" (building & level).

However, we soon discovered that implementing an ISO 19650 aligned naming convention to Revit required that the numbering system be directly configured to the title block on our drawing sheets.

Initially we tried inputting the full field code into the standard "Sheet Number" parameter, but this caused a few issues, namely:

1. There was no way to use the metadata within the numbering to filter and categorise the information.
2. The task of entering the sheet number was arduous, and prone to errors and mistakes.
3. When applying section, or elevation view references on drawings, we got this:
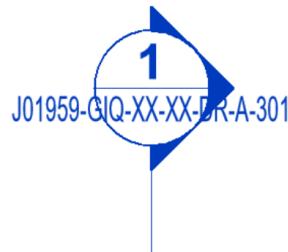
Figure 12. Initial field representation

In the example above the drawing number exceeded the space available in the reference symbol, making it illegible, and the drawings appear untidy.

To resolve this the GIQ team developed parameters for each container (re-assigning existing Revit parameters) and those fields were added to our title blocks.
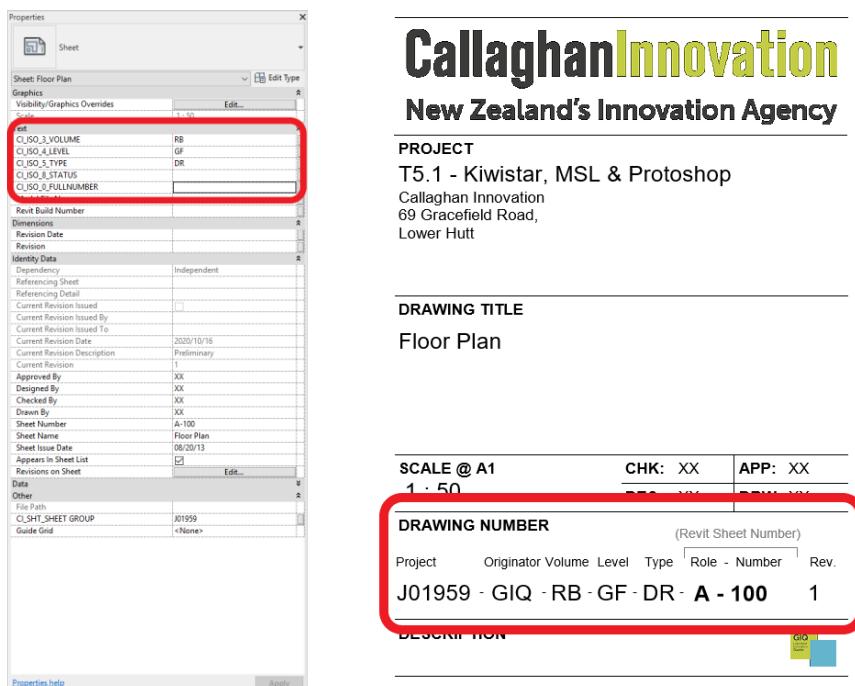
Figure 13. Drawing title block representation

New parameters were applied for "Project", "Originator", "Building", "Level" and document "Type containers", using Revit's standard sheet number parameter to identify the "Role" and "Number" containers. As a result, we were able to use the container information to schedule and filter the sheets.
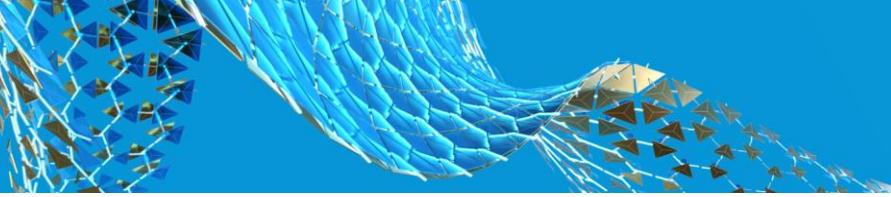
ISO 19650 CONTAINER SHCEDULE							
CI_ISO_1_PROJECT	CI_ISO_2_ORIGINATOR	CI_ISO_3_VOLUME	CI_ISO_4_LEVEL	CI_ISO_5_TYPE	CI_ISO_6-7_ROLE-NUMBER	REV.	SHEET NAME
J01959	GIQ	XX	XX	DR	K-000	1	Cover Sheet
J01959	GIQ	XX	XX	XX	K-001	2	General Legends
J01959	GIQ	XX	XX	DR	K-003	1	Cover Sheet and Drawing Schedule
J01959	GIQ	XX	XX	DR	K-010	1	Location Plan
J01959	GIQ	XX	XX	DR	K-011	1	Site Plan
J01959	GIQ	RB	GF	DR	K-100	1	Floor Plan
J01959	GIQ	RB	ZZ	DR	K-200	1	Elevations
J01959	GIQ	RB	ZZ	DR	K-300	1	Sections
J01959	GIQ				K-301		Unnamed
J01959	GIQ	RB	GF	DR	K-400	1	Details
J01959	GIQ	RB	ZZ	DR	K-500	1	Door and Window Schedule

Figure 14. Schedule of Field Containers

Now only the "Role" and "Number" information are present on the view references, offering a cleaner, more legible, presentation for elevations and section view references.

Figure 15. Resolved field representation

To finalise the integration the Revit Specialist built a Dynamo graph that aggregates all these parameter values and combines them into an "ISO_FULL NUMBER" text parameter.
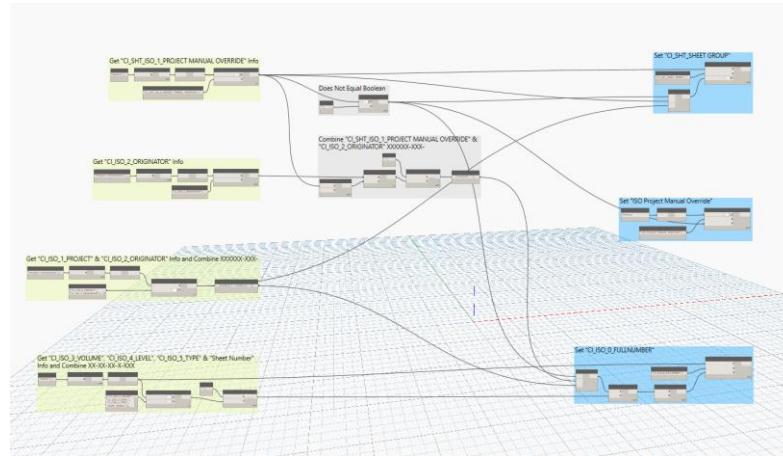

Figure 16. Resolved field representation

The "ISO_FULL NUMBER" parameter is then appended to the "role" and "drawing number"; refer below for an example drawing list.
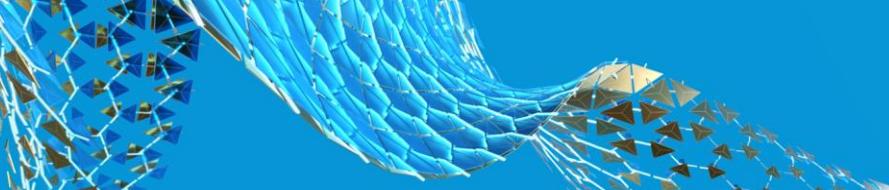
DRAWING LIST			
ISO 19650 DRAWING NO.	SHEET NAME	REV.	REV. DATE
J01959-GIQ-XX-XX-DR-A-000	Cover Sheet	1	2020/10/16
J01959-GIQ-XX-XX-XX-A-001	General Legends	2	2020/10/19
J01959-GIQ-XX-XX-DR-A-003	Cover Sheet and Drawing Schedule	1	2020/10/16
J01959-GIQ-XX-XX-DR-A-010	Location Plan	1	2020/10/16
J01959-GIQ-XX-XX-DR-A-011	Site Plan	1	2020/10/16
J01959-GIQ-RB-GF-DR-A-100	Floor Plan	1	2020/10/16
J01959-GIQ-RB-ZZ-DR-A-200	Elevations	1	2020/10/16
J01959-GIQ-RB-ZZ-DR-A-300	Sections	1	2020/10/16
J01959-GIQ-RB-GF-DR-A-400	Details	1	2020/10/16
J01959-GIQ-RB-ZZ-DR-A-500	Door and Window Schedule	1	2020/10/16

Figure 17. Example Drawing List View

Investing in BIM (and ISO 19650)

All parties need to invest in, and support the adoption of the standard; this a considerable investment (in time and resources) that requires a clear commitment from the appointing party to enable the AEC sector to proactively adapt to working in a high-trust "live" environment.

With ISO 19650 this is perhaps best achieved by clear mandate at national level (e.g. United Kingdom), or a collaborative cross-sector approach.

The GIQ Programme aligns to New Zealand Building Information Modelling (BIM) Construction Procurement Guidelines and adopts BIM to aid the design, construction, and maintenance of assets, in accordance with the New Zealand BIM Handbook. GIQ projects integrate new processes to improve construction efficiencies and through the design, deliver and operate stages of an asset.

Lighthouse moment

To W+M this overall approach posed a "lighthouse" moment, with the opportunity for working with New Zealand's Innovation Agency, in a client hosted "high-trust" environment, with clear project requirements and clarity of all roles in the Project Team.

Another factor that stood out was the site and project(s) are directly comparable to university campuses, health care facilities, and the project was smaller than that typically associated with the type of BIM approaches proposed.

The project offers an insight to the BIM journey for improving the delivery of small to medium size projects.

Figure 18. Lighthouse source Unsplash.com

Working in a High-Trust (Cloud-based) environment

This section covers some of the considerations with working in a high-trust (cloud-based) environment and with BIM 360 hosted by the client/building owner.

3D Model Element Authoring

In undertaking the review of Model Element Authoring software it was recognised that, in order to achieve a fully coordinated design, it was essential to ensure full interoperability for an exchange of information between architects and engineers, from base build to fit-out, and vice versa.

Autodesk Revit was nominated in the EIR for all disciplines for modelling undertaken through detailed design. This was not because of any limitations with the Industry Foundation Classes (IFC) standard per se, but to ensure the optimal interoperability and coordination amongst all task team disciplines.

Common Data Environment

The Common Data Environment (CDE) uses solutions to support processes which ensure information is managed, and available, for those who need it, when they need it. A suitable CDE solution is fundamental to the adoption of ISO 19650, with a preference for cloud-based software platforms to enable real-time collaboration across different organisations, allowing information to progress through the "Shared", "Published" and "Archived" stages.
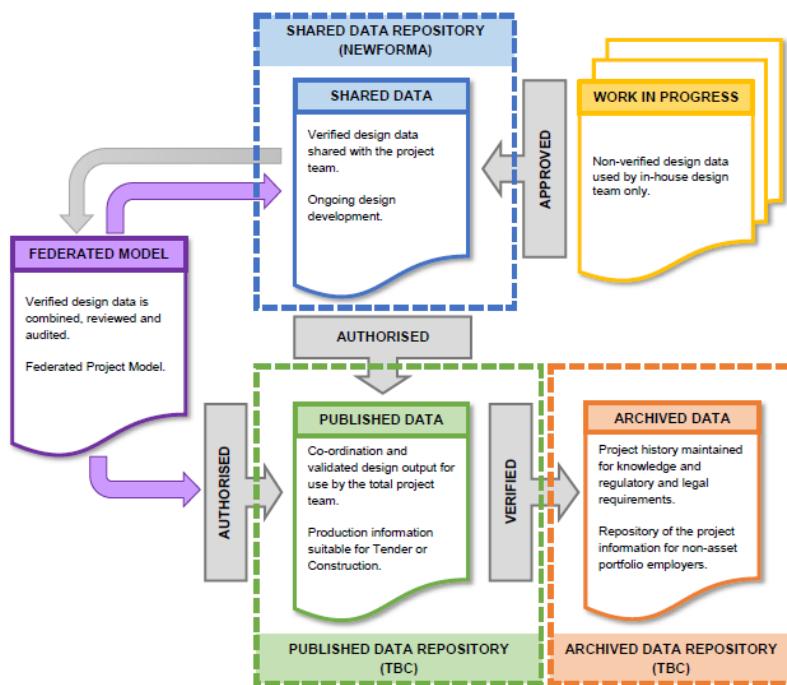

Figure 19. ISO 19650: Common Data Environment

3D Model CDE

Autodesk BIM 360 (BIM 360 Docs and BIM 360 Design) was chosen as the preferred CDE for model element data, to allow collaboration in "an open and high trust environment" for the coordinated authoring of 3D models.

In our review key components assessed included:

- Managed 'Open' Collaboration of all appointed parties BIM data.
- The ability to have 'Live' (on Save to Central) model sharing.
- Simplified administration of the CDE.
- Transparent history of model sharing with the built-in 'swim lanes'.
- 2D and 3D Model viewing capabilities.
- Compliant data security measures (Cloud Security Assessment).
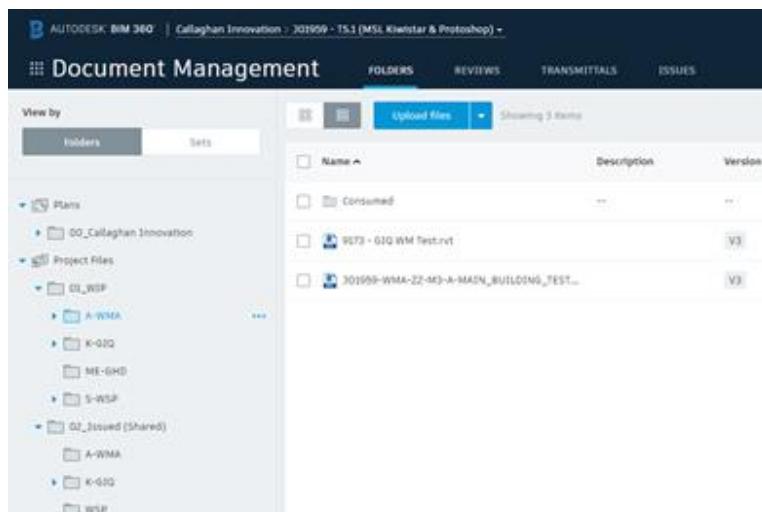
Figure 20. BIM 360 Document Management

Callaghan Innovation chose BIM 360 as the model CDE and decided to also undertake to host the platform.

Taking this approach to BIM 360 enabled continuity across all projects in the programme, and with the simplified administration that allowed for ease of granting administration to a project team.
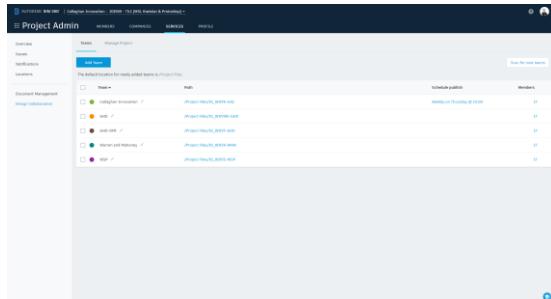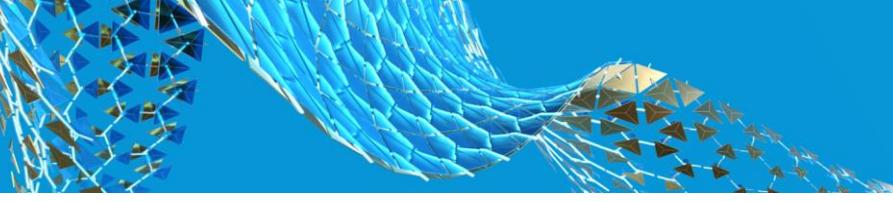
Figure 21. Simplified administration
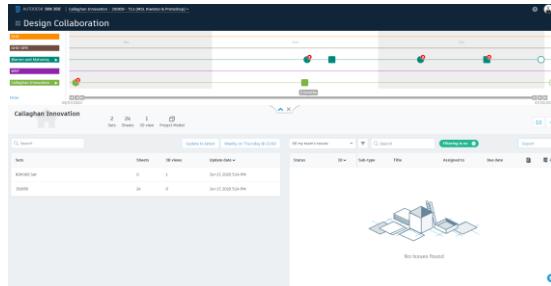
Figure 22. Tracked formal information exchange
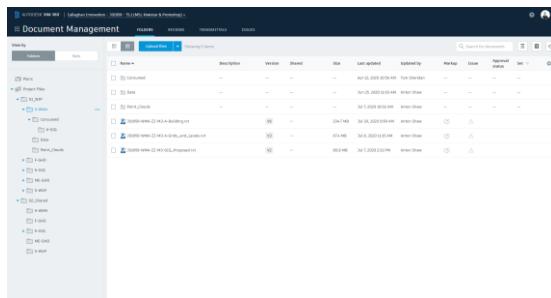

Figure 23. Structured collaboration

Figure 24. Greater visibility and insights
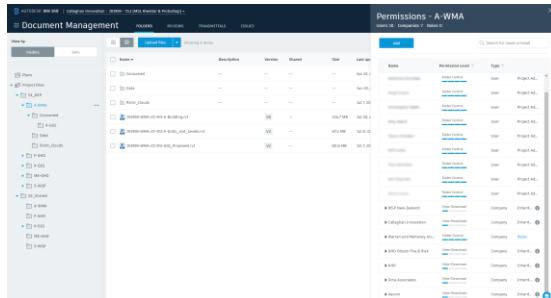
Figure 25. Open access to project data
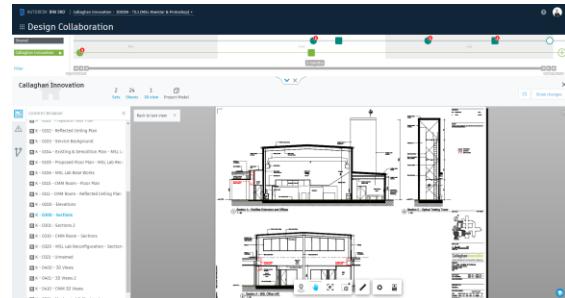
Figure 26. Single source of truth

Considerations associated with making a decision to host the platform include:
- Cloud-based security assessment is fully the client's responsibility.
- Client teams are generally less likely to have the same level of organisation connection, or familiarity with Autodesk support services than consultants and organisations with larger subscription bases.

Benefits of a client hosted are:
- Consistent approach, captured in the EIR, with policies and procedures developed to align (including cloud-based security assessments).
- BIM 360 can be client hosted but configured to be managed by the appointed delivery team.
- Information for all projects is on the same platform, and not "scattered" across multiple systems.
- Ease with which to share and consume model information, allowing a client team to view and share with project stakeholders.

This client hosted approach, for BIM 360, requires an understanding of the administration controls, consideration for legal aspects of hosting for multiple parties

across a high-trust environment (model sharing, IP licensing) and appointed parties experienced with the platform.

Non-graphical CDE

Google Drive was utilised as the CDE for non-graphical data, leveraging a Callaghan Innovation transition to G Suite that enables project specific Google Share Drives to form the basis of the CDE. The 'non-graphical' CDE has been set up with alignment to ISO 19650 information containers. With all but the "Work in Progress" provisioned for as this is the Task Team's folder, typically located within their domain.

Folders

| 📁 Shared | 📁 Published | 📁 Archived |
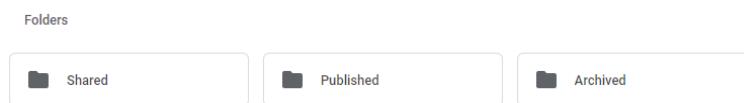
Figure 27. Example Containers (excludes Work in Progress)

The Shared container is allocated by Discipline Task Team, and aligns to the GIQ field naming conventions.

Folders   Name ↑

| 📁 A - Architect | 📁 C - Civil | 📁 F - Fire | 📁 GT - Geotechnical | 📁 J - Asset-Facilities Manager |
| 📁 K - Client | 📁 ME - Building Services | 📁 P - Project Manager | 📁 Q - Quantity Surveyor | 📁 S - Structural |

Figure 28. Example Shared Container

The Published container is the repository for formally issued documents, such as Detailed Design, Building Consent and Tender documents for appointment of Delivery Lead Appointed Party (Contractor).

Unexpected Benefits

This section addresses the unexpected client and stakeholder successes from adopting a high-trust, cloud-based collaborative environment.

Global pandemic and Working from Home
The project team was appointed immediately prior to New Zealand requiring to suddenly move to New Zealand COVID-19 Alert Level 3 - Restrict, with only 48-hours' notice to prepare for COVID-19 Alert Level 4 - Lockdown.
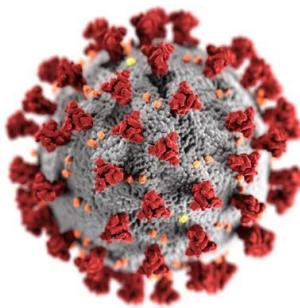
Figure 29. COVID-19. Image: CDC/Alissa Eckert

The result was that the entire project team found themselves thrust into Working from Home (WFH), and what had seemed like a sensible (cloud-based) approach for the CDE became an essential and integral part of the project delivery.

The digital strategy for the project quickly became our 'new normal' as we grappled with a new way of working. Autodesk BIM 360, with Google Meet (and other cloud-based technology), is just how we do projects now, enabling flexible working, combined with the ease of more regular collaboration.

The New Normal
New Zealand has successfully pursued a COVID-19 elimination strategy, with very strong emphasis on border management to keep the SARS-CoV-2 virus (that causes COVID-19) out of the country. Due to the success of this strategy we are using a combination of in-person and remote working capabilities.

The new normal now involves collaborating within the workplace and flexible working, with an overall reliance on 'working via the cloud'.

Note: Whilst finalising this handout the United Kingdom government has announced that the Medicines and Healthcare Products Regulatory Agency (MHRA) has approved the use of mRNA COVID-19 BNT162b2 vaccine – developed by Pfizer and BioNTech – potentially providing a pathway to the beginning of the end of the global pandemic.

3D Model Coordination and VR

BIM 360 opened up a new way of working in a remote environment. After returning to our primary places of work these tools were continued to be used by the team to increase engagement in the virtual environment.

Virtual Reality and interactive 3D model coordination sessions are examples where the team are augmenting their day to day with what was previously considered 'nice to have' digital workflows.

The result is improved engagement, better collaboration, and higher-quality design deliverables, allowing for a more agile approach to project delivery.

Figure 30. VR approaches on various GIQ projects
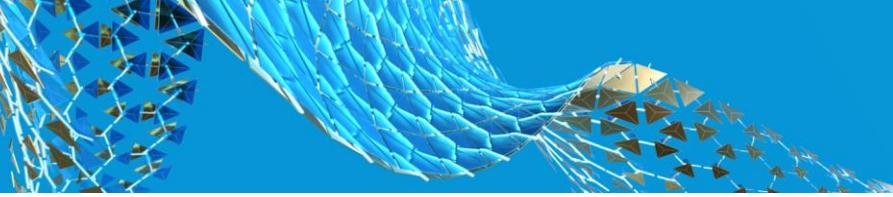
Future Vision

The team is committed to progressing and building on the foundations laid to date.

Future focus

Areas of future focus include:

- Further use of integrated BIM (and geospatial) in the full lifecycle for Operational and Facilities management processes, health, safety and hazard identification, and to make better and more informed design decisions (e.g. embodied carbon analysis).
- Asset information management using BIM with open standards and a Digital Twin.
- Integration of IoT, sensors and Industry 4.0 with the Digital Twin.
- Researching the use of 3D printing and the use of 'smart' devices in the active monitoring and enabling preventative maintenance of critical building services and site wide infrastructure.
- Enabling the use of the 3D Model on campus via 'game technology' and mobile devices, providing operations & maintenance staff 'superpowers' to see through walls, explore the past and see into the future digitally.
- Enhanced seismic (non-structural elements) and passive fire modelling.

Figure 31. Seismic restraining (non-structural elements) in the model
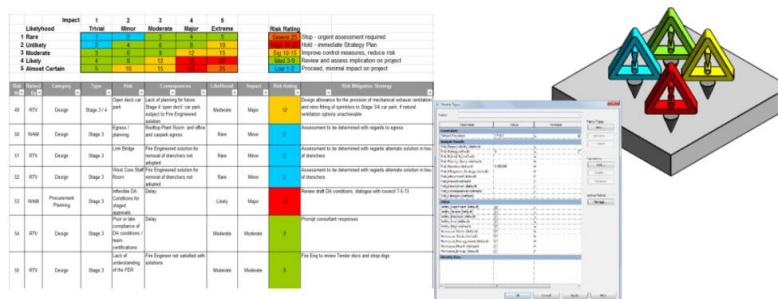
Figure 32. Safety-in-Design represented in the model

Conclusion

The use of ISO 19650 and BIM 360 as a high-trust Common Data Environment has proven to be an ideal solution to allow for collaboration amongst the Project Team, one that is equally suited to all sizes of projects and an approach that is ideally suited to support new workflows and a more flexible approach to project collaboration.

The GIQ team will continue to explore BIM (and Geospatial) approaches to continue to align the project with the asset requirements and to take advantage of new systems and technologies to support the BIM journey. This work is establishing a framework for the procurement and delivery of future projects on the GIQ campus, creating a long-term digital legacy that will continue beyond this initial project.

Abbreviations

Summary of abbreviations used in the presentation and, or, this handout.

AEC	Architecture, Engineering & Construction
AIM	Asset Information Model
AIR	Asset Information Requirements
AU	Autodesk University
BAC	BIM Acceleration Committee (New Zealand)
BCA	Building Consent Authority
BEP	BIM Execution Plan
BIM	Building Information Modelling
BS	British Standard
CAN	Consultants Advice Notices
CDE	Common Data Environment
CM	Construction Monitoring
COVID-19	Coronavirus Disease 2019
CPEng	Chartered Professional Engineer
EIR	Exchange Information Requirements
GIQ	Gracefield Innovation Quarter
GPG	Government Property Group
HCC	Hutt City Council
HVMS	High Value Manufacturing Services
IFC	Industry Foundation Classes
IoT	Internet of Things
ISO	International Standards Organization
LAP	Lead Appointed Party
LOD	Level of Development
MEA	Model Element Author
MIDP	Master Information Delivery Plan
MPDT	Model Production Delivery Table
MSP	Managing Successful Programmes
NZ	New Zealand
NZCIC	New Zealand Construction Industry Council
OIR	Organisational Information Requirements
PAS	Publicly Available Specification
PIM	Project Information Model
PIR	Project Information Requirements
PS	Producer Statements
R&D	Research & Development
RFP	Request for Proposal
ROI	Registration of Interest
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
SiD	Safety-in-Design
TCO	Total Cost of Ownership
TIDP	Task Information Delivery Plan
UK	United Kingdom
VR	Virtual Reality
WFH	Working from Home
WIP	Work in Progress

Appendices

Appendix 1 – EIR

Exchange Information Requirements for Building Information Modelling

Project No: **Template**
Project Name: **Project Number & Name**
Document Ref No: **NNNNNN-GIQ-BN-SP-K-001-EIR-WIP**

People		Organisation
Prepared By	Hugh Evans	Callaghan Innovation

Document Reference No: J01959-GIQ-XX-XX-SP-K-WIP				
Revision	Date	Summary of Revision	Prepared	Reviewed

1. Purpose of document

The intent of this document is to provide an outline definition of Exchange Information Requirements (EIR) to support the implementation of Building Information Modelling (BIM) on Callaghan Innovation GIQ Programme projects. It is provided in good faith, for information purposes, on the understanding that the Appointed Parties are responsible for verifying inputs, assumptions and requirements.

This EIR specifically outlines the requirement of information exchange for Project Number [J0XXXX], [Project Name], and represents the scenario of specifications for information exchange envisaged on the Project.

The Project Team for [Project Name] is to consist of the Callaghan Innovation GIQ Programme (e.g. GIQ Project Manager), appointed Project Manager, Architect (typically to be the Design & BIM Lead), along with Structural, Geotechnical, Mechanical, Electrical, Hydraulics and Civil Engineers and Cost Estimator. Other disciplines (e.g. Acoustician, Landscaping Architects, Façade Engineers, and Structural Engineers for seismic restraint of partition walls, ceiling, and sprinklers) may also be appointed.

The requirements stated in this document shall be used by the Architect in their preparation of a BIM Execution Plan (BEP) and refers to information deliverables and software intentions for the Project. This document may be reviewed, and superseded, in agreement with the Architect.

This document, and the BEP, will also inform the appointment of the Constructor (Main Contractor) and their sub-contracted Trades.

No part of this document shall be construed as preventing any team member from sharing BIM information if this is to benefit the project progress and coordination.

2. Project Information

Table 1 – Project Information

Appointing Party	Callaghan Innovation, herein referred to as Callaghan Innovation or GIQ Programme.
Project name	[Project Name]
Short project description	e.g. single-story double height portal frame structures to be added to existing buildings, with works to include Civil rerouting of services, excavation & foundation design, architectural and structural framing and building services.
Project address	Gracefield Innovation Quarter 69 Gracefield Road, Seaview Lower Hutt 5040

Correspondence address	Callaghan Innovation PO Box 31310 Lower Hutt 5010.

3. Strategic Priorities – BIM Vision and Objectives

It is the vision that the use of BIM on this project will enable the Project Team to receive the required information deliverables (models, documents & data) at the appropriate time in the right formats in order to:

- Achieve project delivery of the highest quality and value.
- Engage with the appropriate stakeholders and allow optimisation of construction phases & sequencing, via visual communication of the design intent.
- Improved accuracy and consistency of design information.
- Improved health & safety on site and during operation.
- Supply appropriate information at handover to operate, maintain and assess the performance of the delivered asset.
- Align with the GIQ Programme objective of building a vibrant connected and supportive innovation community.

4. Applicable Reference Standards

The purpose of this section is to define the BIM Standards that are incorporated into the Information Requirements. The core documents and standards that GIQ Programme will adopt for its projects are:

- ISO 19650-1 Organisation and digitisation of information about buildings and civil engineering works, Part 1 Concepts and Principles.
- ISO 19650-1 Organisation and digitisation of information about buildings and civil engineering works, Part 1 Delivery Phase of the Assets.
- PAS 1192-3:2014 Specification for information management for the operational phase of assets using building information.
- PAS 1192-5:2015 Specification for security -minded building information modelling, digital built environments and smart asset management.
- ISO 9001:2015 Quality Management Systems.
- ISO 21500 Guidance on Project Management.
- Callaghan Innovation Privacy Act Policy and Procedures.
- Callaghan Innovation Information Security Policy.
- Callaghan Innovation Intellectual Property Policy and Procedures.
- Managing Successful Programmes, UK Cabinet Office 2011 (MSP).
- New Zealand BIM Handbook Third Edition - 2019 Appendix D – BIM Uses Definitions.
- UK's National Annex describes the naming standard for information containers within a common data environment (CDE) and is based on the same convention set out in superseded BS 1192:2007.

5. Technical

This section establishes technical information requirements, including software, data drop

contents and Levels of Detail (LOD) and Level of Information (LOI).

5.1. BIM Authoring Software Platforms

The agreed software for the delivery of the BIM requirements will be listed in the Information Exchange Schedule of the BEP and is to be based on the following list documented in Table 2. This list should not be viewed as definitive or restrictive. Callaghan Innovation may request software versions to be updated at any point during this project. Any update or change in software versions will consider the impact on all disciplines impacted.

Table 2 - List of Project software [Modify to suit project requirements]

Discipline	Modelling Software	File Extension
Architecture	Autodesk Revit	*.rvt (also *.ifc, *.dwg and *.pdf)
Civil	Autodesk Civil 3D	*.dwg (also *.pdf)
Electrical	Autodesk Revit	*.rvt (also *.ifc, *.dwg and *.pdf)
Fire protection	Autodesk Revit	*.rvt (also *.ifc, *.dwg and *.pdf)
Geological	Leapfrog Platform	*.dwg, *.dxf
Geospatial	ESRI Arc GIS Pro ESRI Arc Map ESRI Arc GIS online (AGOL)	*.shp, FGDB
Hydraulics	Autodesk Revit	*.rvt (also *.ifc, *.dwg and *.pdf)
Mechanical	Autodesk Revit	*.rvt (also *.ifc, *.dwg and *.pdf)
Structural	Autodesk Revit	*.rvt (also *.ifc, *.dwg and *.pdf)
VR	InSiteVR ("instantaneous" VR via BIM 360). Appointing Party: Enscape for Revit Autodesk Maya V-ray for Maya Autodesk 3ds Max Unreal Engine	Lead appointed party to ensure compatible headset(s) available during Design Team Meetings (*e.g. Quest headset*).
Model Federation	Autodesk Navisworks Manage	*.nwd, *.dwf
Point Cloud Data Federation	Autodesk Recap Project	

BIM Collaboration Software	Autodesk BIM 360 Design, and BIMTrack/Revizto (to complement Navisworks), Revit and BIM360 for task management & collaboration.	Note: allows for additional users beyond Navisworks/Revit users to view clashes or areas for discussion.
3D/BIM & 2D Cost-takeoff	Exactal CostX	*.ifc, *.dwf
Project Management Information Systems	Viewpoint for Projects (VfP). Autodesk PlanGrid. Aconex, Procore, ITwoCX are being considered.	*.ifc, other.
Project Management software	MS Project	*.mpi
Asset Management software	SPM Autodesk BIM360 Assets	UniForm data classification to be adopted.
Facilities Management software	BEIMS Facility Asset Management & Maintenance Autodesk BIM360 OPS	UniForm data classification to be adopted.

5.2. Data exchange protocols

The use and responsibility, format and frequency of shared information, should be understood by all Project Team members.

5.3. Asset Information Model (AIM)

To support the development of an AIM, it is mandatory that an asset information model following be provided at post completion handover. UniForm data classification standards are to be used, with additional information to be provided by the GIQ Asset Manager prior to Contractor appointment.

The Project Team is to model the correct elements or systems to enable data to be included at a later point, during the life cycle of the project, in accordance with the model production and delivery table. To achieve Asset Management data readiness the emphasis is required to be less on a high LOD (in terms of geometry), with LOD350 for detailed design elements (where required) and as-built, site verified LOD500 data at practical completion.

5.4. Level of Detail (LOD) and Level of Information (LOI)

Requirements for the development of geometrical definition and model usability need to be mapped against project work stages to support the project deliverables and support BIM uses. These requirements are to be understood by the Project Team and incorporated in the BEP. Interpretation and meaning of Level of Information needed.

The purpose of this section is to define requirements for graphical information submissions / Data Drops at project stages.

This information is used to populate a Model Production and Delivery Table (MPDT). The MPDT defines the scope of the models (graphical = Level of Detail and non-graphical = Level

of Information) for the purposes of the contract.

It is important that the MPDT is comprehensive and regularly updated.

Levels of Development (LOD), which refer to Graphical and Non-graphical Information, are defined per NZ BIM Handbook referenced standard.

Models developed to a required LOD, in addition to other forms of information, will be assessed at key stages throughout the design and construction phases. Requirements for the development of geometrical definition and model usability need to be mapped against project work stages to support the project deliverables.

The Project Team shall ensure that LOI (for specific items embedded in models and exported, as required in the MPDT) align with the NZ BIM Handbook definitions for that specific element.

Table 3. Design Stages and LOD/LOI requirements.

Design Stage	Description
Design Brief / Preliminary **LOD 100 (NZ)**	The Model Element may be graphically represented in the Model with a symbol or other generic representation but does not satisfy the requirements for LOD 200. Information related to the Model Element can be derived from other Model Elements.
Concept Design **LOD 200 (NZ)**	The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
Developed Design **LOD 300 (NZ)**	The Model Element is graphically represented within the Model as a design specified system, object or assembly in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
Detailed Design **("Building Consent", "Tender" and "For Construction")** **LOD 350 (NZ)***	The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the Model Element. Providing models to an LOD above LOD350 is not in scope for the design phases, but will be a requirement for Practical Completion, as-built documentation; for which the Project Team is to allow to participate in the Model development and review.
Practical Completion **LOD 500 (NZ)**	The Model Element is a field verified representation in terms of size, shape, location, quantity, and orientation. Non-graphic information may also be attached to the Model Elements. Note: The main requirements for the project are for Scan to BIM verification and for Models to be structured to allow linkage with AM data to recognised AM standards.

* Key construction elements, such as low tolerance steel fabrication, cast-ins, mechanical ventilation ductwork and non-structural element seismic restraint may be considered in this context.

6. Competence & training

6.1. BIM specific Capability Assessment for Appointed Party - Architects

During the RFP stage design team responders will be assessed based on their performance during a presentation and interview session. For short-listed Architects we welcome Pre-Contract BEP (refer to section 8.1), drafted to align with the EIR requirements and BIM Objectives of the project (e.g. in a similar format to the example provided during the RFI stage).

6.2. Knowledge and Skill Requirements

The Project Team shall demonstrate knowledge of the underlying processes required to support BIM uses. This will involve communicating and recording intended methodology which should be shared with the BIM Lead for confirmation prior to implementation.

6.3. Software

Experience, knowledge and skill of the Project Team must be sufficient to competently undertake processes required to achieve the required BIM uses. If the Project Team fails to meet these requirements, they undertake to improve skill sets or recruit additional technical staff before implementing processes. Callaghan Innovation is not responsible for providing training with regards to the BIM authoring tools used by the Project Team.

7. Management

7.1. Planning of work and data segregation

Information should be managed in accordance with the processes described standards referenced in this document and for the work stages as detailed in NZCIC.

The Architect is to work with the Project Team to establish project segregation, with the agreed approach to be documented in the Building Information Modelling Execution Plan (BEP).

Each discipline within the Project Team should develop and fully understand the method for developing BIMs to coordinate and support the outputs required. It is advised that models are segregated into multiple linked models, and the strategy for this is to be incorporated into the BEP.

7.2. Roles and responsibilities

The following roles in connection with BIM will be taken on directly by the appointed parties:

- The Architect (as "lead" or "principal" appointed party) is to be designated responsible to lead the process of design coordination in 3D.
- The Architect is responsible (as the author of the BEP) to ensure a Master Information Delivery Plan (MIDP) be included within the BEP, identifying what and when geometrical and alphanumerical information is required and who is responsible.
- All disciplines shall utilise BIM information distributed via the Common Data Environment (CDE) to validate the BIM at key project stages.

The following, but not limited to, should be reported to the Architect immediately upon discovery:

- Discrepancies in the Model(s) which may cause inaccuracies.
- Instances where out-of-date information is contained within Model(s).

7.3. Drawing/Model File Naming Convention

Drawing/Model naming conventions should be generally in accordance with ISO 19650-2:2018, the following format, and the GIQ Programme File Naming and Field Display Conventions.

Table 4 – Drawing Field Conventions

1	2	3	4	5	6	7	8	9
Project Number	Originator	Volume/ Building	Level/ Location	Type	Role	Drawing Number	Drawing Revision	Description
J01959	GIQ	RB	XX	DR	K	001	RevA	<if required>

E.g. "J01959-GIQ-00-XX-DR-K-0001-RevA- Tranche 5.1 Conceptual Drawing", or "J01959-GIQ-00-XX-DR-K-0001-WIP-Tranche 5.1 Conceptual Drawing YYYY-MM-DD"

1. Project Number: The GIQ Programme project number. E.g. "J01959".

2. Originator: A 3-digit summary of appointed / appointing party. E.g. "GIQ". Can be longer (6-digits, if necessary) to avoid confusion with other appointed parties.

3. Volume: Appointed party optional Volume/Building. E.g. RB for Robertson Building.

4. Location: As defined in the File Naming and Field Display Conventions. "XX" if omitted.

5. Type: As defined in the File Naming and Field Display Conventions. E.g. "DR" for Drawing.

6. Role: as defined in the File Naming and Field Display Conventions. E.g. "K" is used for Client.

7. Drawing Number: Appointed party assigned, unique & sequential alphanumeric document number (allows for inclusion of the consultant's assigned project code and a 4-digit sequential number to be appended). For documents where the GIQ Programme is the originator a 4-digit document number applies, e.g. "0001".
   Note: appointed parties can prefix with unique project code, e.g. "ZZZZZ_0001".

8. Document Revision: as defined in the File Naming and Field Display Conventions. E.g. "RevA".

9. Description: Appointed party assigned and optional free text, descriptive title or name, e.g. "Tranche 5.1 EIR".
   Note: for "WIP" append the date, "YYYY-MM-DD".

Note: the above excludes inclusion of a Status/Purpose of Issue field, which if applied would capture the purpose of the document (WIP, Shared and Published). It is anticipated that the relevant suitability and revision codes will not feature in the document naming protocol, however it is an option to include should it be considered beneficial.

7.4. Document, File Naming Convention

There will be a single non-graphical document name convention for the entire Project Team (based on ISO 19650-2:2018), to be in accordance with GIQ Programme File Naming and Field Display Conventions.

Table 4 - Field Conventions

1	2	3	5	6	7	8	9
Project Number	Originator	Volume	Type	Role	Document Number	Document Revision	Description
J01959	GIQ	00	SP	K	0001	RevA	<if required>

E.g. J01959-GIQ-00-XX-SP-K-0001-A-Tranche_5.1_EIR.

1. Project Number: The GIQ Programme project number. E.g. "J01959".

2. Originator: A 3-digit summary of appointed / appointing party. E.g. "GIQ".
   Can be longer (6-digits, if necessary) to avoid confusion with other appointed parties.

3. Volume: Appointed party optional Volume/Zone; to be "00" or not applied, unless deemed necessary.

4. Location: As defined in the File Naming and Field Display Conventions. "XX" if omitted.

5. Type: As defined in the File Naming and Field Display Conventions. E.g. "SP" for specification (or "PP" to designate presentation file).

6. Role: as defined in the File Naming and Field Display Conventions. "K" is used to designate the Client (e.g. Callaghan Innovation or GIQ Programme).

7. Document Number: Appointed party assigned, unique & sequential alphanumeric document number (allows for inclusion of the consultant's assigned project code and a 4-digit sequential number to be appended). For documents where the GIQ Programme is the originator a 4-digit document number applies, e.g. "0001".

   Note: appointed parties can prefix with unique project code, e.g. "ZZZZZ_0001".

8. Document Revision: as defined in the File Naming and Field Display Conventions. E.g. "RevA".

9. Description: Appointed party assigned and optional free text, descriptive title, or name, e.g. "Tranche 5.1 EIR".

   Note: for "WIP" append the date, "YYYY-MM-DD".

Note: the above excludes inclusion of a Status/Purpose of Issue field, which if applied would capture the purpose of the document (WIP, Shared and Published). It is anticipated that the relevant suitability and revision codes will not feature in the document naming protocol, however it is an option to include should it be considered beneficial.

7.5. Common data environment (CDE)

GIQ Programme is responsible for storing and maintaining a copy of all project information in a secure stable location within their own organisation, and it is proposed that the platform for making this information available to the project team, over the Common Data Environment (CDE), will be as per section '5.1. BIM Authoring Software Platforms'.

Callaghan Innovation (GIQ Programme) will have unfettered access to native and exchange BIM files at any point.

The Common Data Environment (CDE) for this project, file naming and location structure will be confirmed within the Building Information Modelling Execution Plan (BEP). The folder structure within the Common Data Environment (CDE) will be in line with that detailed in PAS1192-2:2013. The CDE platform is to be Autodesk BIM 360, and complemented using G-Suite (Google Drive).

7.6. Mobilisation Plan

Mobilisation plan shall be detailed once appointment has been awarded to the respective appointed parties.

7.7. Information delivery Risk Assessment

Each prospective lead appointed party is responsible for conducting an information delivery risk assessment.

8. Commercial

8.1. BIM Execution Plan

The Architect shall prepare, deliver, and maintain BEP for the project that responds to this Exchange Information Requirements. The Architect shall review their BEP regularly and additionally when there is any change to their contract.

Pre-contract BEPs are to be provided in response to the EIR, identifying the Architect proposals clause by clause. The Pre-contract BIM Execution Plan will be assessed as part of the RFP.

8.2. BIM Specific Competence Requirements - responding to this document

Architects, or BIM Specialists, short-listed during the ROI, and responding to the RFP, are required to provide an indicative BEP in the form of a 'Pre-Contract BEP'.

Responses are to describe the processes and procedures that make up the bidder's BIM and information management toolkit, specifically where this is in accordance with the standards cited in this EIR.

The pre-contract BEP should be specific to this EIR, with commentary where deliverables are over (or under) specified, or impractical to deliver (with alternatives proposed).

Tenderers should include the detail on procedures aligned with core project stages as follows:
● ISO 19650-1:2018.
● ISO 19650-2:2018.
● PAS 1192-3:2014.
● BS1192-4:2014.
● Other bespoke processes and technical tools.

9. Glossary of Abbreviations and Terms

9.1. Abbreviations

BEP   BIM Execution Plan.

BIM   Building Information Modelling.

CDE   Common Data Environment.

COBie   Construction Operations Building Information Exchange.

EIR   Exchange Information Requirements.

LOD   Level of Detail.

LOI   Level of Information.

MPDT   Model Production Delivery Table.

WIP   Work in Progress.

9.2. Glossary of Terms

4D	A 3D representation with the element of time included to enable simulations.
5D	The fifth dimension (5D) is the implementation of Quantity Surveying within a BIM project and provides a representation of the element of time and cost to enable simulations, commercial management and earned value tracking to take place.
Asset Information Model (AIM)	All the information that is needed to support the management and operation of the built asset (infrastructure or building). This can be formed partly from the PIM at the handover stage of a project. It differs from the PIM in that it consists only of the information that is needed to support the management and operation of the asset. The AIM will continually be updated and developed throughout the life of the asset as information is fed into the model during the asset's management.
Building information modelling execution plan (BEP)	Broken up into pre and post-appointment outputs, this document defines how the project's information management will be carried out by the delivery team relating directly to the project's EIR. It includes, amongst other things, who is responsible for providing information, what the processes will be, and provides common terminology to be adopted as well as job titles and responsibilities

within the delivery team.

Building information modelling (BIM)	Process of designing, constructing or operating a building or infrastructure asset using electronic object-oriented information
COBie (Construction Operation Building information exchange)	A spreadsheet data format that contains digital information about maintainable assets in as complete and as useful a form as possible. This spreadsheet has a predefined structure that is used to both store and index information transferred within the CDE. A COBie file contains only information that is needed and is stored in such a way that the recipient knows exactly where to find any given information (allowing automation of this process).
Common data environment (CDE)	A single source of information for any given project or asset, used to collect, manage and disseminate all relevant approved project/asset information. Stored digitally, this is where information is shared collaboratively in a logical and accessible way to allow the appointing party and help all appointed parties readily gain access to information, using universal naming conventions, avoiding duplication and retaining ownership. An information manager, to be part of the Architect's design team, is to be responsible for the set up and management of CDE to ensure that it follows the agreed protocols and that the data is secure. However, they are not a BIM coordinator; they do not have direct design responsibility and are not responsible for clash detection or model coordination.
Data	Information stored but not yet interpreted or analysed.
Design intent model	Initial version of the project information model (PIM) developed by the design team.

Design Team's Risk Register	This details the Design team's risk associated with the timely delivery of information deliverables in accordance with the appointing party's EIR. Considered risks include (amongst others), meeting the information delivery milestones and adoption of the project's information Standard.
Document	Information for use in the briefing, design, construction, operation, maintenance or decommissioning of a construction project, including but not limited to correspondence, drawings, schedules, specifications, calculations, spreadsheets.
Drawing	Static, printed, graphical representation of part or all have a project or asset.
Appointing Party	Individual or organisation named in an appointment or building contract as the employer.
Exchange information requirements (EIR)	Pre-tender document setting out the information to be delivered, and the standards and processes to be adopted by the appointed party as part of the project delivery process.
Graphical data	Data conveyed using shape and arrangement in space
Level of Information Need	Collective term used for and including "level of model detail" and the "level of information detail". Described within the OIR, PIR, AIR and EIR, the level of information needed defines the granularity of both graphical and alphanumerical information of an information deliverable. This should be defined as the minimum granularity to avoid over-production of information leading to waste and so consideration should be made on the purpose of any produced information.
Master information delivery plan (MIDP)	Primary plan for when project information is to be prepared, by whom and using what protocols and procedures, incorporating all relevant task information delivery plans.
Pre-contract (appointment) BEP	The pre-contract, or pre-appointment, BEP is to demonstrate the LAP's proposed approach, capability, capacity and competence to meet the EIR (can be utilised prior to the appointment of any supplier).

Post-appointment BEP	The post-appointment BEP is the document defining standard methods and procedures adopted during the appointment in order to meet the objectives and requirements set forth in the EIR. It is utilised following the appointment of project stakeholders and in particular the main contractor.
Project implementation plan (PIP)	Statement relating to the Design team's capability to deliver the EIR.
Project Information Model (PIM)	This is the term for the information (graphical, alphanumerical, documentation) which is developed during the design/construction phase of the project. Information that forms the PIM is created by the project team and sits within the CDE. As the project develops so too will the PIM, which will increase in both size and accuracy; starting as a design intent model progressing to an as-built model after construction is complete.
Standard method and procedure (SMP)	Set of standard methods and procedures covering the way information is named, expressed, and referenced.
Security Breach/Incident Strategy (SB/IMP)	The Security Breach/Incident Management Plan forms part of the BASMP and should provide detail on how and the impact of failure and/or disruption is minimised ensuring business continuity is maintained and the security is upheld.
Task Information Delivery Plan (TIDP)	Task Information Delivery Plans are produced for/by each task team from their viewpoint. They are collated into the Master Information Delivery Plan and are based on the deliverables as agreed within their contract.
Federation Strategy	Manageable spatial subdivision of a project, defined by the project team as a subdivision of the overall project that allows more than one person to work on project model simultaneously and consistent with the analysis and design process.

GIQ Programme
J01959 (T5.1) Project Specific Naming Conventions - Documents

Overview

This document describes the GIQ Programme project file naming convention *within* project files for all documents prepared, issued, and consumed on J01959 (T5.1) project.

Note: except for graphic based files that originate from Revit and are captured under a different specification.

Document's Constituents

This document includes:

- Application of conventions.
- File naming convention – working files.
- File naming convention – issued files.
- Appendix 1 – standard field codes.

Application of Conventions

The file naming and field display conventions described by this document apply to both the Appointing Party (Callaghan Innovation - GIQ Programme) and Appointed Parties. With the project conventions to be further captured by the project's BIM execution plan (BEP).

It is a requirement that appointed parties comply with these file naming and field display conventions and that they be referenced or stated in project BEPs.

File Naming Convention

A working file has a unique name comprised of several mandatory fields. For example, the working file named J01959-GIQ-K-SP-002-Doc File Naming-WIP_2020-06-17 is comprised of the following fields.

Project Number	Originator	Role	Type	Document Number	Document Name	Document Revision	Date of Issue
J01959	GIQ	K	SP	001 - NNN	file naming for documents	- WIP - RevA - Rev1	_YYYY-MM-DD

The following summary describes the function of each field, separation of fields, clarifications, and exceptions.

Refer to Appendix 1 for standard field codes (some of which may at times require project specific customisation).

Project:

Three to six-digit alphanumeric proposed and to be based upon the GIQ Programme project code.

Originator:

Three-digit field identifying the Party that created the file. Can be up to six-digits if appropriate.
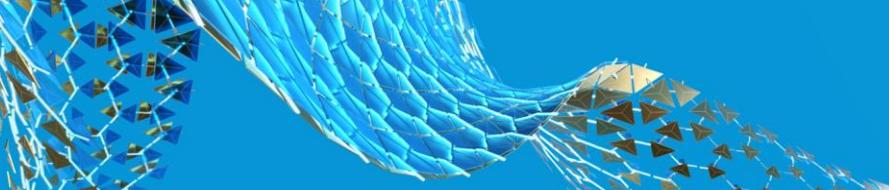
Role:

One or two-digit alpha field identifying the role responsible for the file's creation and ownership. Sub-role codes are available to further subdivide a role code (if required, typically for ME drawings only). Refer to Appendix A, section 1 – Field Codes.

Type:

Two-digit alpha field identifying the file type (for example specifications, models, drawings and document control – issue & change registers).

Document Number:

Three-digit numeric field that identifies the file's individuality.
- Document Number: Appointed party assigned, unique & sequential alphanumeric document number (allows for inclusion of the consultant's assigned project code). For documents where GIQ Programme is the originator a 3-digit document number applies, e.g. "001".
- Provides an opportunity for an appointed party to insert their internal project number (append as a prefix to the 3-digit number).
- Use NNN for Draft WIP as it will not be a formal document.
- Use sequential numbering and track on a document register or transmittal (to be stored in the Published folder on the Google Shared Drive).

Revision:

Document Revision: The field can vary from 1 to 3-digit alphanumeric, with "RevA, RevB, RevC, etc." sequences for 'pre-Construction' issues and "Rev1, Rev2, Rev3, etc." sequences as applicable to "For Construction" versions. Draft Work in Progress (WIP) issues are to be marked "WIP" in the Revision field and a date appended to the end of the file name for Draft WIP.
- Refer Appendix 1, Revision Field Codes section for more information.
- Date fields are to be appended to the end of the file name using _YYYYMMDD format.

Files are shared as either "*Draft WIP"* or *formal issues* per the following distinction.

- *Draft issue* - issue for *developmental purposes,* such as coordination, review, and comment etc., *between* formal issues.
- *Formal issue* - issue in its authorised final form of a project stage for example Developed Design, Detailed Design etc (and formal amendments thereof).

Description:

This field is optional and applicable where the file cannot be adequately recognised by the preceding fields alone. If used, the description shall be title case, and not include content defined by the preceding fields.

Separation of Fields:

File names shall have the mandatory fields separated by hyphens ("-").

For revision the inclusion of the date (*if required*) shall follow the Description field and be separated with an underscore ("_"). The use of any other wildcard characters, or "ó", "ú", "ñ" is prohibited.

Clarifications:
- Files that *directly generate* issued output shall comply with the file naming convention, for example a Word specification, a Revit model, an Excel issue register etc.
- Files that may not necessarily generate or that indirectly generate issued output that are also required to comply with the file naming convention include:
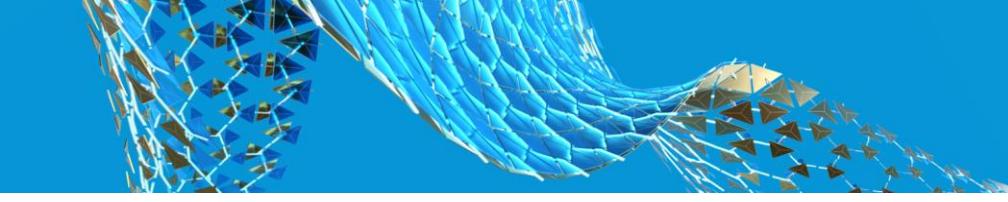
- o Technical review and verification records.
- o Templates.

- Files that *do not generate or that indirectly generate* issued output are not necessarily required to comply with the file naming convention, for example a schedule contributing content to a report.
- Files that *undergo no further development once they have been issued* are not necessarily required to contain a revision field and typically include:

  - o Consultants advice notices (CAN's).
  - o Correspondence files.
  - o Meeting minutes (specific type of correspondence file).
  - o Memorandums (specific type of correspondence file).
  - o Notices to tenderers (NTT's).
  - o Photos.
  - o Requests for information (RFI's).
  - o Site visit records.

- Files downloaded from the internet (product literature for example) are not necessarily required to contain a revision field.
- Graphical model files are not necessarily required to contain a revision field.
- Revit families, AutoCAD blocks etc. are not required to contain a revision field.

Appendix 2 – Standard Field Codes

Project Field Codes

Code	Project
NNNNNN	Six-digit alphanumeric Callaghan Innovation project number.

Originator Field Codes

Code	Originator
NNN	Three to six digits (typically three) alphanumeric.
GIQ	GIQ Programme team – Appointing Party on behalf of Callaghan Innovation
WMA	Warren and Mahoney - Lead Appointed Party
WSP	WSP NZ – Structures, Civil & Geotech
GHD	GHD – Building Services & Fire
OCT	Octa Associates
AEC	Aecom – Cost Estimators

Field Codes – Documents

Code	Document Type
BQ	Bill of quantities.
CA	Calculations.
CN	Consultant's advice notice.
CO	Correspondence.
CP	Cost plan.
DB	Database.
DC	Document control *(issue registers and change registers)*.
FN	File note.
HS	Health and safety.
IE	Information exchange file *(metadata information)*.
MI	Minutes/action notes *(specific type of correspondence file)*.
MM	Memorandum *(specific type of correspondence file)*.
MS	Method statement.
NT	Notice to tenderers.
PH	Photograph.
PP	Presentation.
PR	Programme.
PS	Producer statement.
RD	Room data sheet.
RI	Request for information.

RP	Report.
SA	Schedule of accommodation.
SH	Schedule.
SK	Sketch (*or mark-up issued as a sketch*).
SN	Snagging list.
SP	Specification.
SR	Site visit record.
TE	Template.
TR	Technical review record.
VR	Verification record.

Role Field Codes

Code	Primary Role
A	Architect.
B	-
C	Civil.
D	Digital Engineer.
E	Electrical.
F	Fire.
G	Geospatial *(surveyor).*
GT	Geotechnical.
H	Hydraulics (Plumbing & Drainage).
I	Interior Designer.
J	Asset-Facilities Manager.
K	Client.
L	Landscape Architect.
M	Mechanical.
ME	Combined Building Services *(any combination of M, E, H and N).*
N	Security *(if separated from Electrical).*
O	Environmental *(environmental impact consultant).*
P	Project Manager.
Q	Quantity Surveyor.
RA*	Peer Reviewer Architectural.
RME*	Peer Reviewer ME.
RS*	Peer Reviewer Structural.
S	Structural.
T	Transport Planner.
U	Urban Planner.
V*	Specialist Designer.
W*	Contractor.
X*	Subcontractor.
Y	-
Z	General (non-disciplinary).

* When there is more than one distinct *type* of stakeholder participating within a specific role code, the code can be appended with a further letter. For example, distinct types of Specialist Designer stakeholders could be assigned: VA Acoustic Designer VF Façade Designer.

Number Field Codes

Code	Number

001	Four-digit code identifying the file's individuality.
Combined	The file contains more than one document of the same type – e.g. a Zip folder.

Revision Field Codes

Code	Revision
WIP	*Draft WIP issues* for *developmental purposes* such as coordination, review and comment etc. *between* formal issues (and preceding the first formal issue). Append Date in _YYYYMMDD format to the end of the file name.
A, B etc.	*Pre-construction formal issues* for example Developed Design, Detailed Design etc. (and formal amendments thereof) *alpha* code updated sequentially at subsequent *formal issues.* Option to append Date in _YYYYMMDD format to the end of the file name.
1, 2 etc.*	*Construction and beyond formal issues* (and formal amendments thereof) *numeric* code updated sequentially at subsequent *formal issues.* Option to append Date in _YYYYMMDD format to the end of the file name.

* At times, files *previously formally issued for construction* may undergo a development necessitating reversion to a pre-construction state (for example building consent) at the next formal issue. In such cases, numeric revision codes shall be perpetuated.

Appendix 3 – Project Scope of Works (pre-appointment)

Architect's Brief – Design & BIM Lead

Callaghan Innovation, through the GIQ Programme, is seeking proposals to provide Architectural Services through the design and construction of the project. The Architects will be required to fully design and document the building and provide construction observation services during construction.

Scope of Works

Deliverables are to be as defined within NZCIC Guidelines and with reference to the Exchange Information Requirements (EIR), refer Section 2.10.4, and resulting BIM Execution Plan (BEP) documentation (refer to separately provided Pre-Appointment BEP template).

Scope of work includes, but is not limited to, the following requirements.
- Design documentation, calculations, and reports for the various stages of the project to be in accordance with New Zealand Construction Industry Council (NZCIC) Design Guidelines.
- Liaison with all other Project Team members to deliver a functioning, reliable facility.
- Lead "Safety in Design" (SiD) workshops throughout the project and ensure involvement of Project Team in preparing and maintaining a project risk register.
- Architect is to be the primary author of the SiD register and arrange workshop(s) with the Project Team and then the Contractor as part of a coordinated hand-over.
- The design is to consider staged construction to minimise disruption affecting the existing spaces and users of same.
- Carry out sufficient site investigations of the existing Building to fully inform the design.
- Modifications to the existing structure to suit the new build areas and considerations of light-weight façade alternative to current pre-cast concrete spandrels.
- Connections between the existing building and the new build areas.
- Calculate/Design for toilet fixture numbers based on whole of Building occupancy.
- Calculate/Design for bike parking, and carparks with EV charging stations, per occupancy.
  - Inputs from Building Services – Electrical Engineer.
- Calculate and prepare H1 (Energy Efficiency) for the Building Consent Authority (BCA), Hutt City Council (HCC).
  - Inputs from Building Services – Mechanical Engineer.
- Prepare an accessibility report for Robertson Building reconfiguration as results from the Project.
  - Fire Engineer inputs and with reference to previous documentation for the Building.
- Act as the design lead and coordinate with the engineering disciplines.
- Meet with the BCA and undertake a Pre-Application for Building Consent; advise the Project Team of findings.
- Lodge the Building Consent Application, and with Project Manager, coordinate RFI responses.
- Produce Room Data Sheets and undertake stakeholder consultation to fully develop/populate.
- Produce full Masterspec Specification of architectural works.
- Design to be rationalised against existing building (either sympathetic or contrasting).
- Acoustic design to be undertaken, either within the architecture brief or coordinated with external consultant. Allow importance to be placed on acoustic considerations within the MSL Office.
- Meeting rooms to be design in conjunction with Google Room Design Guidelines and

Google 'Hangouts' Room Design Guide.
- Alignment to relevant NZBC (Building Code) and relevant NZS standards.
- Alignment/reference to Government Property Group (GPG) guidelines for the office component (excl. labs, workshops & bulk store) including but not limited to:
  - GPG Workplace guidelines.
  - GPG National Property Strategies.
  - GPG Building Performance Specification (BPS).
  - GPG Space Budget Calculator.
  - GPG Meeting Room Guidelines, read in conjunction with Google Room Design Guides
  - GPG Working Environment Survey tool.
  - GPG Protective Security Requirements (PSR) to be read in conjunction with Callaghan Innovation specific security guidelines.
  - Callaghan Innovation - GIQ Programme Sustainability Design Guide (work in progress).
- The design is to be modelled in 3D in Revit to LOD350. The Architect is to provide a fully coordinated 3D Revit model of the building to the Contractor for the preparation of their "shop drawings" and associated 3D Model.
- Nominate a BIM Manager to:
  - Lead and facilitate the development of the BEP in conjunction with Project Team.
  - Facilitate the use of the BEP for their discipline.
  - Undertake management and maintenance of Model files.
  - Schedule regular Model exchanges.
  - Validate Model LOD and detail at each stage.
  - Validate Model content during each stage and naming/numbering/references.
  - Implement internal documentation, Architecture model coordination reviews with MEP and Structure Models and with Fire Protection.
  - Ensure that clash detection methods are correctly implemented/
  - Determine within the appropriate Level of Detail (LOD) and Level of Information (LOI) at each project stage.
  - Lead Design Team meetings and plan with Project Manager.
- Modelling is to be sufficiently accurate and include sufficient details to allow the Quantities Consultant to generate schedules and quantity take-offs from the model, to assist with budget preparation. This is to be in the form of 3D/BIM takeoffs.
- The Revit Architecture Model is to be configured with asset management fields to enable population with equipment details. As the GIQ Programme asset management strategy is developed the Architect is to be involved in specifying metadata requirements for the project.
- Allow for attendance and participation at fortnightly design team meetings during the design stages, including in a lead-role with potential hosting of DTMs at Architect's offices.
- Provision of detailed design documentation packages suitable for "Building Consent", "Tender" and "For Construction" purposes.
- Assist with contractor and trade tender evaluations, comment on tender submissions (including confirming suitability of equipment selections) and responding to tender RFIs and tags as appropriate.
- Provide input to the Project Manager for monthly PCG meeting reports and allow for Principal Architect, or equivalent, attendance at these meetings.
- Attend fortnightly site meetings during the construction stages.
- Review contractor supplied shop drawings – responses to be within 10-working days for the initial submission and 5-working days for subsequent reviews.
- Respond to contractor and client queries; work with Project Manager to resolve and respond in timely manner (within 5-workings days of receipt of contractor and client queries / RFIs). If "mark-ups" are provided to 2D drawings these are to be undertaken in a suitable package (e.g. Bluebeam, or Adobe Acrobat Pro) and to be of a concise and legible format.
- Carry out construction monitoring services and reporting to Engineering New Zealand CM3 level.
  - Provide Site Visit Records, corresponding to site visits, in "Draft WIP" form within 2-

working days of site attendance and formal versions within 5-working days. Notify the contractor of any defects whilst onsite.
- o Site Visit Records / observations are to be documented via construction software package (such as PlanGrid, BIM 360 Field, or other as to be defined in the BEP). Consultants attending the Construction site are to be equipped with an electronic tablet device, with an onboard 'hi res' camera (>12MP), for quick and efficient capture of observations.
- o Defects list to be maintained, tracked, and resolved throughout the duration of the construction phase.
- Review as-built documentation and defects at Practical Completion.
- Make an allowance for supporting the Contractor with their scan to Model, for creation of a verified as built Model at Practical Completion. The completed building(s) are to captured in Revit to LOD500.
  - o The Architect is to support the Contractor to provide a fully coordinated 3D Revit model of the building to Callaghan Innovation for inclusion in the GIQ Project Information Model and transfer back to the Digital Twin, and to include the requirements for Asset Management capture for reference in the Asset Information Model.
  - o The Model may be LOD350 with additional information for Asset Management. Lead Appointed Party to fully define requirements in the BEP.

Building Services Engineers' Brief

Callaghan Innovation, through the GIQ Programme, is seeking proposals to provide Building Services professional engineering services through the design and construction of the project. The Building Services Engineers will be required to fully design, coordinate and document the services and provide construction observation services during construction, as Subconsultant to the Architect.

The services required include:
- Mechanical (including HVAC).
- Electrical (including ICT Security).
- Hydraulics (Plumbing & Drainage).
- Seismic restraint design (non-structural elements).

Scope of Works

Deliverables are to be as defined within NZCIC Guidelines and with reference to the Exchange Information Requirements (EIR), refer Section 2.10.4, and resulting BIM Execution Plan (BEP) documentation.

Scope of works items includes, but are not limited to, the following requirements.

General
- Design documentation, calculations, and reports for the various stages of the project to be in accordance with NZCIC Guidelines.
- Liaison with all other Project Team members to deliver a functioning, reliable and energy efficient facility.
- Participate in Safety in Design workshops throughout the project and assist in preparing and maintaining a project risk register.
- The design is to consider staged installation to minimise disruption and services outages affecting the existing spaces and users.
- Carry out sufficient site investigations of the existing building and services to fully inform the design.
- The design is to be modelled in 3D in Revit to LOD 350. The consultant is to provide a fully coordinated 3D Revit model of the services to the Contractor for the preparation of their "shop drawings" and associated 3D Model.
- Make an allowance for supporting the Contractor with their scan to Model for creation of a 3D as built MEP Model at Practical Completion. The completed Building Services are to be modelled in 3D in Revit to LOD500 for inclusion in a Digital Twin Model of GIQ site.
  - Note: The Model may be LOD350 with additional information for Asset Management.
- Nominate a Discipline BIM Manager to:
  - Contribute to development BEP.
  - Facilitate the use of the BEP for their discipline.
  - Undertake management and maintenance of Model files.
  - Validate Model LOD and detail at each stage.
  - Validate Model content during each stage and naming/numbering/references.
  - Implement internal documentation, MEP Model coordination reviews with Architecture and Structure Models and with Fire Protection.
- Modelling is to be sufficiently accurate and include sufficient details to allow the Quantities Consultant to generate schedules and quantity take-offs from the model, to assist with budget preparation. This is to be in the form of 3D/BIM takeoffs.
- The Revit MEP Model is to be configured with asset management fields to enable population with equipment details.

- Allow for attendance and participation at fortnightly design team meetings during the design stages.
- Provision of detailed design documentation packages suitable for "Building Consent", "Tender" and "For Construction" purposes.
- Assist with contractor and trade tender evaluations, comment on tender submissions (including confirming suitability of equipment selections) and responding to tender RFIs and tags as appropriate.
- Provide input to the Project Manager for monthly PCG meeting reports.
- Attend fortnightly site meetings during the construction stages.
- Review contractor supplied shop drawings – responses to be within 10-working days for the initial submission and 5-working days for subsequent reviews.
- Respond to contractor and client queries; work with Project Manager to resolve and respond in timely manner (within 5-workings days of receipt of contractor and client queries / RFIs). If "mark-ups" are provided to 2D drawings these are to be undertaken in a suitable package (e.g. Bluebeam, or Adobe Acrobat Pro) and to be of a concise and legible format.
- Carry out construction monitoring services and reporting to Engineering New Zealand CM3 level.
    - Allow for attendance of Mechanical, Electrical and Hydraulics Engineers to provide construction monitoring services directly for their discipline.
    - Provide Site Visit Records, corresponding to site visits, in "Draft WIP" form within 2-working days of site attendance and formal versions within 5-working days. Notify the contractor of any defects whilst onsite.
    - Site Visit Records / observations are to be documented via construction software package (such as PlanGrid, BIM360 Field, or other as to be defined in the BEP). Consultants attending the Construction site are to be equipped with an electronic tablet device, with an onboard 'hi res' camera (>12MP), for quick and efficient capture of observations.
    - Defects list to be maintained, tracked, and resolved throughout the duration of the construction phase.
- Review as-built documentation, manuals, and commissioning results at Practical Completion.
- Provision of PS1 and PS4 Producer Statements, and H1 calculations, to be as per requirements of the BCA (HCC) and to be advised after a Pre-Application Meeting.

Mechanical (HVAC) - Specific

Design and documentation of an efficient and reliable systems for the new build and refurbished areas of work including:

- Appoint a Mechanical Model Element Author – Revit modeler (can be the Discipline BIM Manager). Responsible to facilitate use of BIM and BIM Goals of the Project; this may include, but is not limited to:
- Model elements as determined within the BEP, including to the appropriate Level of Detail (LOD) and Level of Information (LOI) at each project stage.
- Air conditioning to all areas. The system is to maintain 22°C±1°C in all spaces. It is expected that the system will consist of EC FCUs and AHUs with heating and chilled water coils.
- Outdoor air ventilation systems to meet the occupants' and make up air requirements using heat recovery technology to maximise efficiency.
- General extract, ducted return.
- Specialised extract systems for machinery and processes requiring extract including the fume cupboard and fume hoods.
- Heating and chilled water is available from the central boilers and chillers in the Robertson Building plantroom. Review the existing chilled water and heating water system to confirm that sufficient capacity is available for this project.
- Heating and chilled water reticulation from the existing plantroom, including a new secondary pumping system and reticulation to be designed.

- Automatic Controls for the various systems including integration with the existing sitewide BMS system.
- Natural gas, vacuum and compressed air reticulation from the existing sitewide systems
- Nitrogen, helium, argon gas etc. reticulation including storage and manifold systems using stand-alone cylinders.
- Seismic restraint design of non-engineered systems (and provision of PS1 and PS4 by CPEng Structural Engineer, or equivalent as accepted by BCA, for the coordinated LOD350 design).

Electrical/Comms/Data/Security - Specific

Design and documentation of an efficient and reliable electrical/IT/Comms/Security system for the area of the works including new build and refurbished areas including:

- Appoint an Electrical Model Element Author – Revit modeler. Responsible to facilitate use of BIM and BIM Goals of the Project; this may include, but is not limited to:
  - o Model elements as determined within the BEP, including to the appropriate Level of Detail (LOD) and Level of Information (LOI) at each project stage.
- General and task lighting systems throughout including energy efficient fittings and controls.
- Integrate luminaire level lighting control technology to achieve an optimal balance between natural light and compensated lighting in the MSL Office.
- Emergency lighting and exit signage throughout the workshop, plant spaces, and office spaces as required.
- External lighting with daylight controls at access points to the building in the area of the works.
- Illuminated exit signage where required.
- Callaghan Innovation - GIQ Programme Sustainability Design Guidelines (WIP) are to apply once developed, in lieu of this document the following apply:
  - o Where appropriate LEDs to be selected over Fluorescents and to be mercury-free.
  - o EV charging stations to be integrated into the design, work with Architects and provide design for DBs and power reticulation to support requirements.
  - o Consider integration of Solar PV panels on the roofing system, with battery storage and reticulation - prepare a whole of life cost/return appraisal.
- Modifications to the existing MSB to suit the new development.
- Electrical reticulation from the MSB, sub-mains cabling, DBs and outlets where required. Single and three phase outlets will be required.
- New DBs within the new office areas. The existing DBs within the workshops are to be replaced.
- Review the existing transformer capacity and confirm that it is suitable for the additional loads.
- Electronic security is required for all doors.
- Extend the existing Data/Comms systems including cabling and outlets where required.
- Seismic restraint design of non-engineered systems (and provision of PS1 and PS4 by CPEng Structural Engineer, or equivalent as accepted by BCA, for the coordinated LOD350 design).

Hydraulics (Plumbing & Drainage) - Specific

Design and documentation of an efficient and reliable hydraulics system for the area of the works including new build and refurbished areas including:

- Appoint a Hydraulics Model Element Author – Revit modeler. Responsible to facilitate use of BIM and BIM Goals of the Project; this may include, but is not limited to:

- o Model elements as determined within the BEP, including to the appropriate Level of Detail (LOD) and Level of Information (LOI) at each project stage.
- Domestic cold-water reticulation from the existing water supply to fixtures and plant requiring a water supply; including suitable back-flow prevention where required.
- Domestic hot water generation and reticulation.
- Callaghan Innovation - GIQ Programme Sustainability Design Guidelines (WIP) are to apply once developed.
  - o ESD to apply for Domestic hot water – allow for a design that incorporates Heat Pump, or Solar Hot Water Evacuated Tube (design-build specification) as an alternative to an electric hot water cylinder or instantaneous gas boiler.
- Sanitary plumbing and drainage systems from fixtures and plant requiring drainage.
- Stormwater disposal from the gutters to the in-ground stormwater system.
- Seismic restraint design of non-engineered systems (and provision of PS1 and PS4 by CPEng Structural Engineer, or equivalent as accepted by BCA, for the coordinated LOD350 design).

Structural & Geotechnical Engineers' Brief

Callaghan Innovation, through the GIQ Programme, is seeking proposals for the provision of Structural and Geotechnical Engineering professional consulting services through the design and construction of the project. The Engineers will be required to fully design and provide construction observation services during the building stages.

The services required include:
- Structural
- Geotechnical

Scope of Works

Deliverables are to be as defined within NZCIC Guidelines and with reference to the Exchange Information Requirements (EIR) and resulting BIM Execution Plan (BEP) documentation. Scope of works items includes, but are not limited to, the following requirements.

Structural & Geotechnical - General
- Nominate a Structural Discipline BIM Manager to:
  - o Contribute to development of the BEP.
  - o Facilitate the use of the BEP for their discipline.
  - o Undertake management and maintenance of Model files.
  - o Validate Model LOD and detail at each stage.
  - o Validate Model content during each stage and naming/numbering/references.
  - o Implement internal documentation Structure Model coordination reviews, and clashes, with Architecture, Building Services - MEP and Fire Protection.
- Appoint a Structures Model Element Author – Revit specialist. Responsible to facilitate use of BIM and BIM Goals of the Project; this may include, but is not limited to:
  - o Model elements as determined within the BEP, including to the appropriate Level of Detail (LOD) and Level of Information (LOI) at each project stage.
- Design documentation, calculations, and reports for the various stages of the project in accordance with NZCIC Guidelines.
- Liaison with all other Project Team members to deliver a functioning, reliable and energy efficient facility.
- Participate in Safety in Design workshops throughout the project and assist in preparing and maintaining a project risk register.
- The design is to consider staged installation to minimise disruption and services outages affecting the existing spaces and users.
- Carry out sufficient site investigations of the existing building, structure framing and separation to fully inform the design.
- The design is to be modelled in 3D in Revit to LOD350. The consultant is to provide a fully coordinated 3D Revit Model for the Contractor for the preparation of their "shop drawings" and associated 3D Model.
- Assist the Cost Consultant with budget preparation. Modelling is to be sufficiently accurate and include sufficient details to allow the Quantity Surveyor to generate schedules and quantity take-offs from the model. This is to be in the form of 3D/BIM take-offs.
- The Model is to include fields to allow future population with asset metadata for asset management purposes.
- Make an allowance for supporting the Contractor with their scan to Model for creation of a 3D as built Revit Structure Model at Practical Completion. With primary and secondary structural elements to be modelled in 3D in Revit to LOD500 for inclusion in a Digital Twin Model of GIQ site.

- o Note: The Model may be LOD350 with additional information for Asset Management. The Architect will capture in the BEP.
- Attendance and participation at fortnightly design team meetings during the design stages.
- Provision of documentation packages suitable for "Building Consent", "Tender" and "For Construction" purposes.
- Assist with Tender evaluations and comment on tender submissions
- Provide input to the Project Manager for monthly PCG meeting reports
- Attend fortnightly site meetings during the construction stages.
- Review contractor supplied shop drawings – responses to be within 10-working days for the initial submission and 5-working days for subsequent reviews.
- Respond to contractor and client queries; work with Project Manager to resolve and respond in timely manner (within 5-workings days of receipt of contractor and client queries / RFIs). If "mark-ups" are provided to 2D drawings these are to be undertaken in a suitable package (e.g. Bluebeam, or Adobe Acrobat Pro) and to be of a concise and legible format.
- Carry out construction monitoring services and reporting to ACENZ CM3 level.
  - o Provide Site Visit Records corresponding to site visits in draft form within 2-working days of site attendance and formal versions within 5-working days. Notify the contractor of any defects whilst onsite.
  - o Provide Site Visit Records, corresponding to site visits, in "Draft WIP" form within 2-working days of site attendance and formal versions within 5-working days. Notify the contractor of any defects whilst onsite.
  - o Site Visit Records / observations are to be documented via construction software package (such as PlanGrid, BIM 360 Field, or other as to be defined in the BEP). Consultants attending the Construction site are to be equipped with an electronic tablet device, with an onboard 'hi res' camera (>12MP), for quick and efficient capture of observations.
  - o Defects list to be maintained, tracked and resolved throughout the duration of the construction phase.
- Review as built documentation, manuals and commissioning results at completion.
- Provision of PS1 and PS4 Producer Statements, to be as per requirements of the BCA (HCC) and to be advised after a Pre-Application Meeting

Structural & Geotechnical - Specific

Design and documentation of the works required for the new build and refurbished areas of work including:

- Detailed geotechnical investigations to inform the foundation and structural design.
- New structure and detailing for the new build areas.
- Review of the capacity of the existing Robertson Building structure in the vicinity of the new works.
- Robertson Building is considered as having an Importance Level 2 (IL2).
- Modifications to the existing structure to suit the new build areas and considerations of light-weight façade alternative to current pre-cast concrete spandrels panels.
- Connections between the existing building and the new build areas.
- Allow for inclusion of fibre optic cables in the slab for monitoring of temperature (during cement cure) and for Post-Event data.

Civil Engineer's Brief

Callaghan Innovation, through the GIQ Programme, is seeking proposals to provide Civil Engineering consulting services through the design and construction of the project. The Civil Engineers will be required to fully design and document the civil works and provide construction observation services during the building stages, as Subconsultant to the Architect.

Scope of Works

Deliverables are to be as defined within NZCIC Guidelines and with reference to the Exchange Information Requirements (EIR) and resulting BIM Execution Plan (BEP) documentation. Scope of works items includes, but are not limited to, the following requirements.

Civil - General

- Nominate a Structural Discipline BIM Manager to:
  - o Contribute to development of BEP.
  - o Facilitate the use of the BEP for their discipline.
  - o Undertake management and maintenance of Model files.
  - o Validate Model LOD and detail at each stage.
  - o Validate Model content during each stage and naming/numbering/references.
  - o Implement internal documentation Model coordination reviews, and clashes (in particular with Structures and Building Services).
- Appoint a Civil Model Element Author – Revit modeller. Responsible to facilitate use of BIM and BIM Goals of the Project; this may include, but is not limited to:
  - o Model elements as determined within the BEP, including to the appropriate Level of Detail (LOD) and Level of Information (LOI) at each project stage.
- Design documentation, calculations, and reports for the various stages of the project in accordance with NZCIC Guidelines.
- Liaison with all other Project Team members to deliver a functioning, reliable and energy efficient facility.
- Participate in Safety in Design workshops throughout the project and assist in preparing and maintaining a project risk register.
- The design is to consider staged installation to minimise disruption and services outages affecting the existing spaces and users.
- Carry out sufficient site investigations of the existing building and services to fully inform the design.
- The design is to be modelled in 3D. The consultant is to provide a fully coordinated 3D Revit model of the Civil services to the Contractor for the preparation of their "shop drawings".
- Modelling is to be sufficiently accurate and include sufficient details to allow the Quantity Surveyor to generate schedules and quantity take-offs from the model.
- The model is to include fields to allow future population with equipment details for asset management purposes.
- Assist the Cost Consultant with budget preparation.
- Attendance and participation at fortnightly design team meetings during the design stages
- Provision of documentation packages suitable for "Building Consent", "Tender" and "For Construction" purposes.
- Assist with Tender evaluations and comment on tender submissions.
- Provide input to the Project Manager for monthly PCG meeting reports.
- Attend fortnightly site meetings during the construction stages.
- Review contractor supplied shop drawings – responses to be within 10-working days for the initial submission and 5-working days for subsequent reviews.
- Respond to contractor and client queries; work with Project Manager to resolve and respond in timely manner (within 5-workings days of receipt of contractor and client queries / RFIs). If "mark-ups" are provided to 2D drawings these are to be undertaken in a suitable package (e.g. Bluebeam, or Adobe Acrobat Pro) and to be of a concise and legible format.
- Carry out construction monitoring services and reporting to Engineering New Zealand CM3 level.
  - o Provide Site Visit Records, corresponding to site visits, in "Draft WIP" form within 2-working days of site attendance and formal versions within 5-working days. Notify the contractor of any defects whilst onsite.
  - o Site Visit Records / observations are to be documented via construction software

package (such as PlanGrid, BIM 360 Field, or other as to be defined in the BEP). Consultants attending the Construction site are to be equipped with an electronic tablet device, with an onboard 'hi res' camera (>12MP), for quick and efficient capture of observations.
- o Defects list to be maintained, tracked, and resolved throughout the duration of the construction phase.
● Review as built documentation, manuals, and commissioning results at completion.
● Provision of PS1 and PS4 Producer Statements.

Civil Specific

Design and documentation of the civil works required for the new build and refurbished areas of work including:

● Infrastructure capacity analysis, investigate and confirm the location, depth and condition of the existing services affected by the proposed development, including:
  - o Earthworks and ground improvement works.
  - o Ground contamination management.
  - o Utility identification, relocation and/or modification. This will include liaison with various utility providers to obtain plans, design requirements and their programme of proposed upgrade works. Public infrastructure amendments including liaison and negotiation with the local authorities.
● Storm water, drainage (wastewater/sewerage) and water supply design including connections to the new building areas and alterations to existing services affected by the proposed development
● Consideration of treatment of overland flow paths.
● Sediment control.
● Civil engineering integration of building and landscaping including:
  - o Traffic and parking design.
  - o Roads (kerb alignment locations, pedestrian lanes, pedestrian crossings (across driveways) subgrade strengthening, subbase design and surfacing design.
  - o Paved surfaces (sidewalks, shared/community space areas, lanes and gateways).
  - o Pedestrian and cycle access.
  - o Minor engineering landscape structures as necessary (walls, battered excavations, signage and sign supports, steps and fencing).
  - o Hard landscaping works, including paving, walls, steps ramps, etc.

Additional Information

In addition to the RFP Scope of Works we refer to the following documents: these documents form part of this RFP.

● Architectural Drawings (Elevations and Sections)
  - o J01959-GIQ-00-GF-DR-K-Combined Architectural.
● Building Services (Hydraulics) and Civil Drawings
  - o J01959-GIQ-GF-K-0502.
● Building Services (Mechanical & Electrical) Drawings
  - o J01959-GIQ-GF-K-0103
● Exchange Information Requirements & File Naming Conventions
  - o J01959-GIQ-00-XX-SP-K-0001-A- EIR issued for RFP
  - o J01959-GIQ-NN-XX-SP-K-0002-A-File Naming Conventions
● BIM Execution Plan (Pre-Appointment Template)
  - o J01959-GIQ-00-XX-SP-K-0003-A-BEP issued for RFP

- NZCIC Guidelines
  - CIC-2016-Concept Design
  - CIC-2016-Preliminary Design
  - CIC-2016-Developed-Design
  - CIC-2016-Detailed-Design
  - CIC-2016-Procurement
  - CIC-2016-Post-Completion