Creating the Next Generation of Integrated Teams

Construction Clients Group - Wellington

27 JUNE 2012

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Overview

- Introduction
- IPD – Process Outline
- Culture – Change Management
- The Future

What is Integrated Project Delivery?

IPD – is a project delivery approach that:

- **integrates people, systems, business structures and practices** through all phases of design, fabrication, and construction
- **Harnesses talents** and insights of all participants
- **Optimizes project results**:
  - increases value to the owner,
  - reduces waste,
  - maximizes efficiency

What is Integrated Project Delivery?

	Traditional	"IPD-ish"	"Pure" IPD
Team Organization	• Hierarchical • Sequential addition "as needed": architect, then engineer, then contractor, then fabricator, etc	• Collaborative • Earlier hiring / participation of some expertise	• All key expertise on-board at start • Includes "life cycle" stakeholders • Multi-Party Agreement or Single Purpose Entity
Contracts	• Establish liability protection	• Encourage shared information and resources	• Guide team activity • Mandate joint decision making • Eliminate or strictly limit ability to sue
Risk / Reward	• Entities pursue and protect individually	• Optional shared profit/bonus pool	• Pooled profit in; distributed with team success • Based on project value
Decision Control	• Hierarchical	• Team, with final decision by Owner	• Key Project Decisions by Single Purpose Entity
Collaboration Tool	• Meetings	• Charettes	• Detailed process design at star • Pull scheduling • Metro-based, informed decisions
Process	• Linear information • Resides in "silos" controlled per discipline	• Concurrent information • BIM • Charettes	• Integrated information
Estimating	• After design and publication of documents, per phase	• Contractor participation during preconstruction	• Budget first; then design to budget • Target Design Values (TDV)

Managing Time, Cost & Quality

IPD – It's all about Design Management / Strong Leadership

- Design management of **all** stakeholders

- BIM as the repository for:
  a. Information
  b. Collective design decisions - transparency
  c. Constantly testing value
  d. 'Buildability' – Virtual construction

- Constant evaluation of:
  Construction cost – best value incl. quality assessment
  Procurement methodologies / fabrication
  Life cycle costs
  Sustainability

What sort of team can achieve all of this?

Achieving Successful Integrated Project Delivery

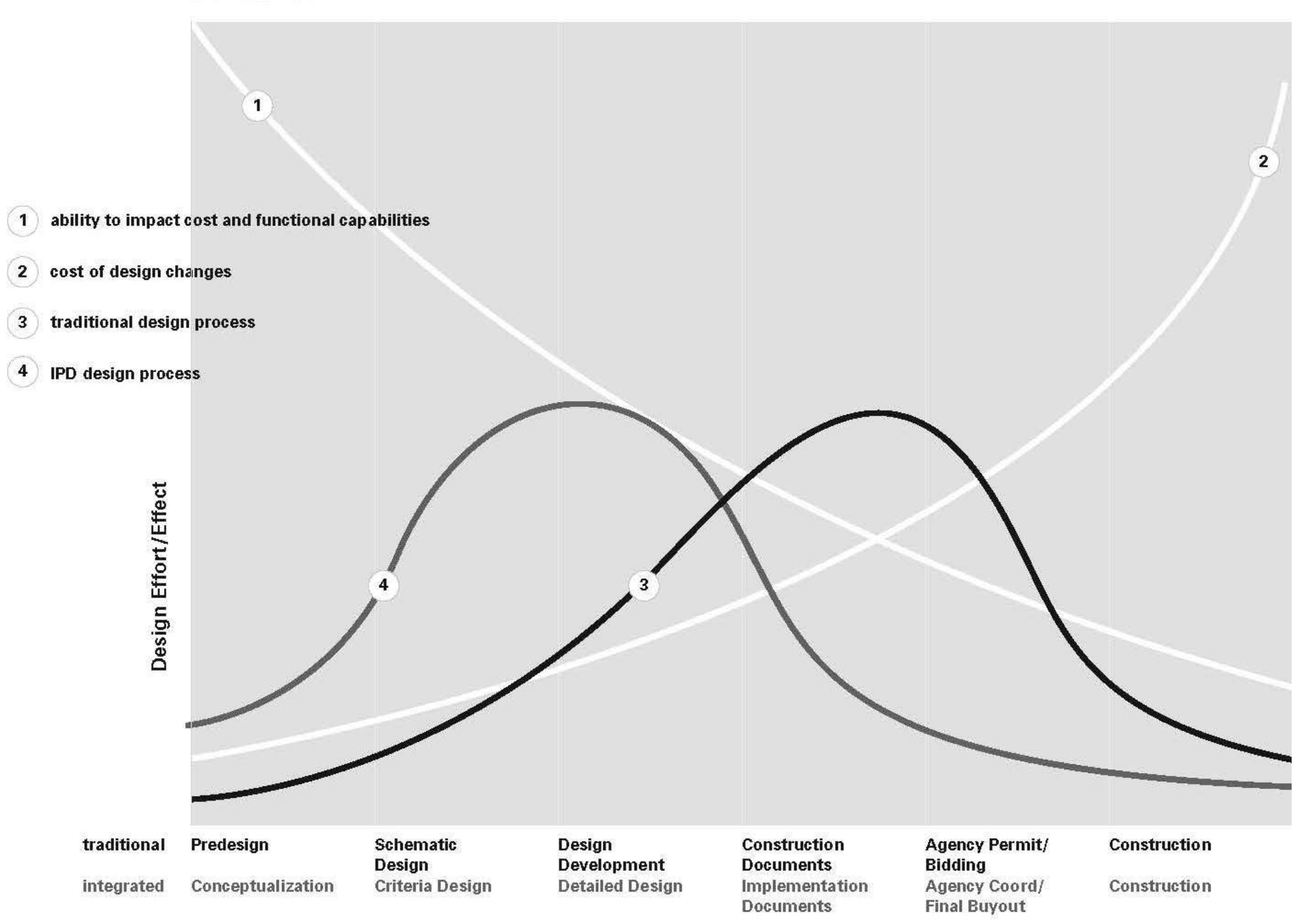
Successful Integrated Project Delivery requires a team that is

- committed to **collaborative processes**
- **capable of working together** effectively

Key steps:

1. Identify most important team roles early
2. Pre-qualify members (firms and individuals)
3. Consider and / or seek involvement of others – e.g. building officials, insurers
4. Clearly define team values, goals and interests
5. Identify organizational and business structure most suited to IPD **and** consistent with team members' needs and constraints
6. Define and agree roles and accountability of team members.

Where is our Design Effort? How is it managed?



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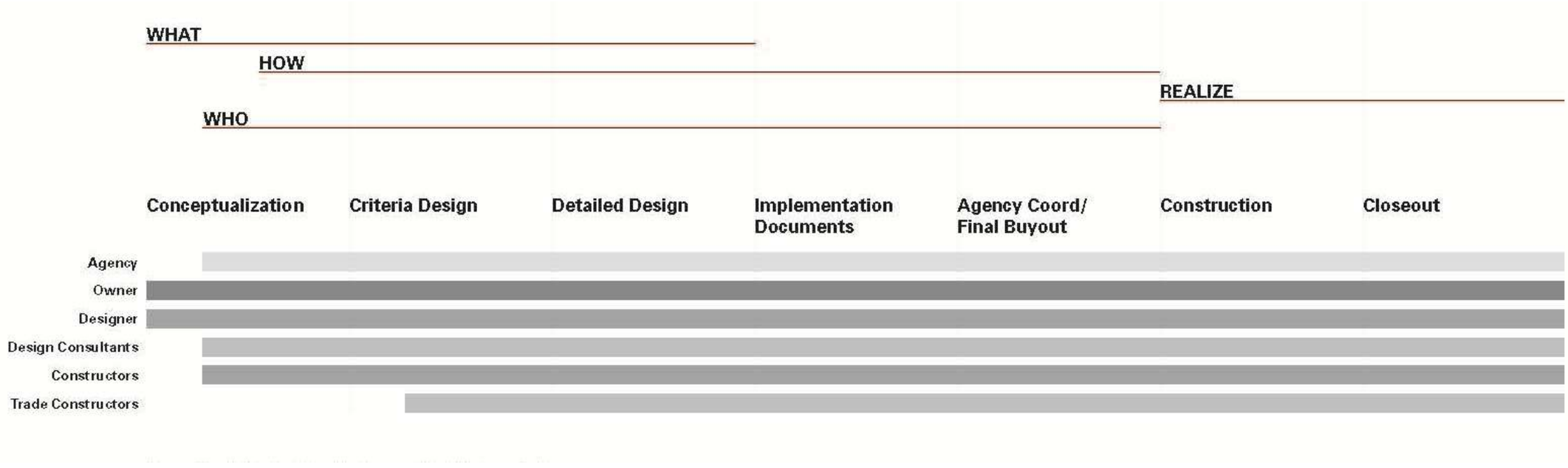
Traditional vs. Integrated Design Processes

Traditional

Integrated



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Who are the participants of an Integrated Team?

Main Parties Involved

- Owner
- Integrated Project Coordinator
- Prime Designer
- Design Consultants
- Prime Constructor
- Trade Contractors
- Suppliers
- Agencies / T.A.s

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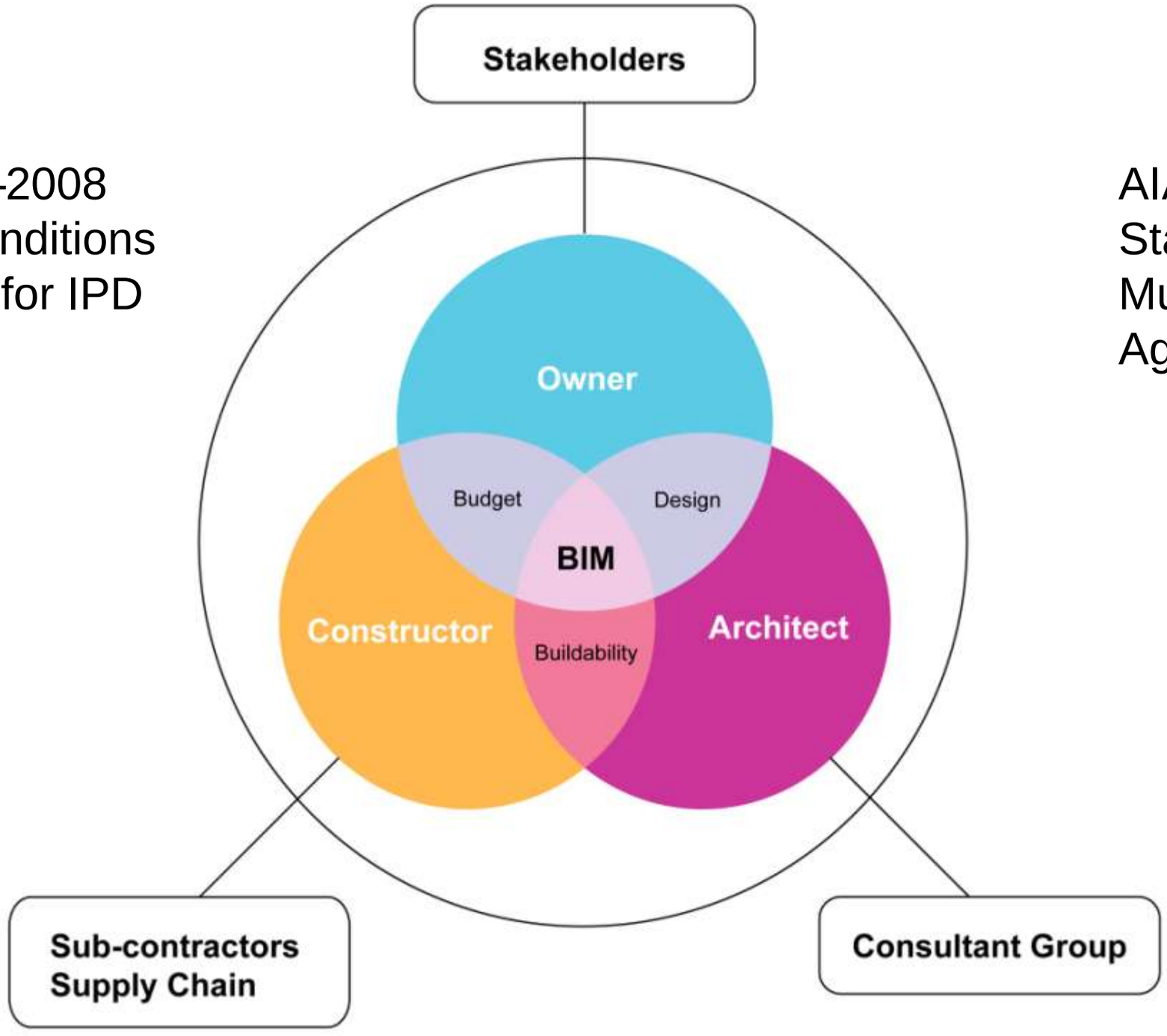
Multi-Party Agreement Contract Relationships

AIA - A295–2008
General Conditions
of Contract for IPD



AIA–C191–2009
Standard Form
Multi-Party
Agreement for IPD

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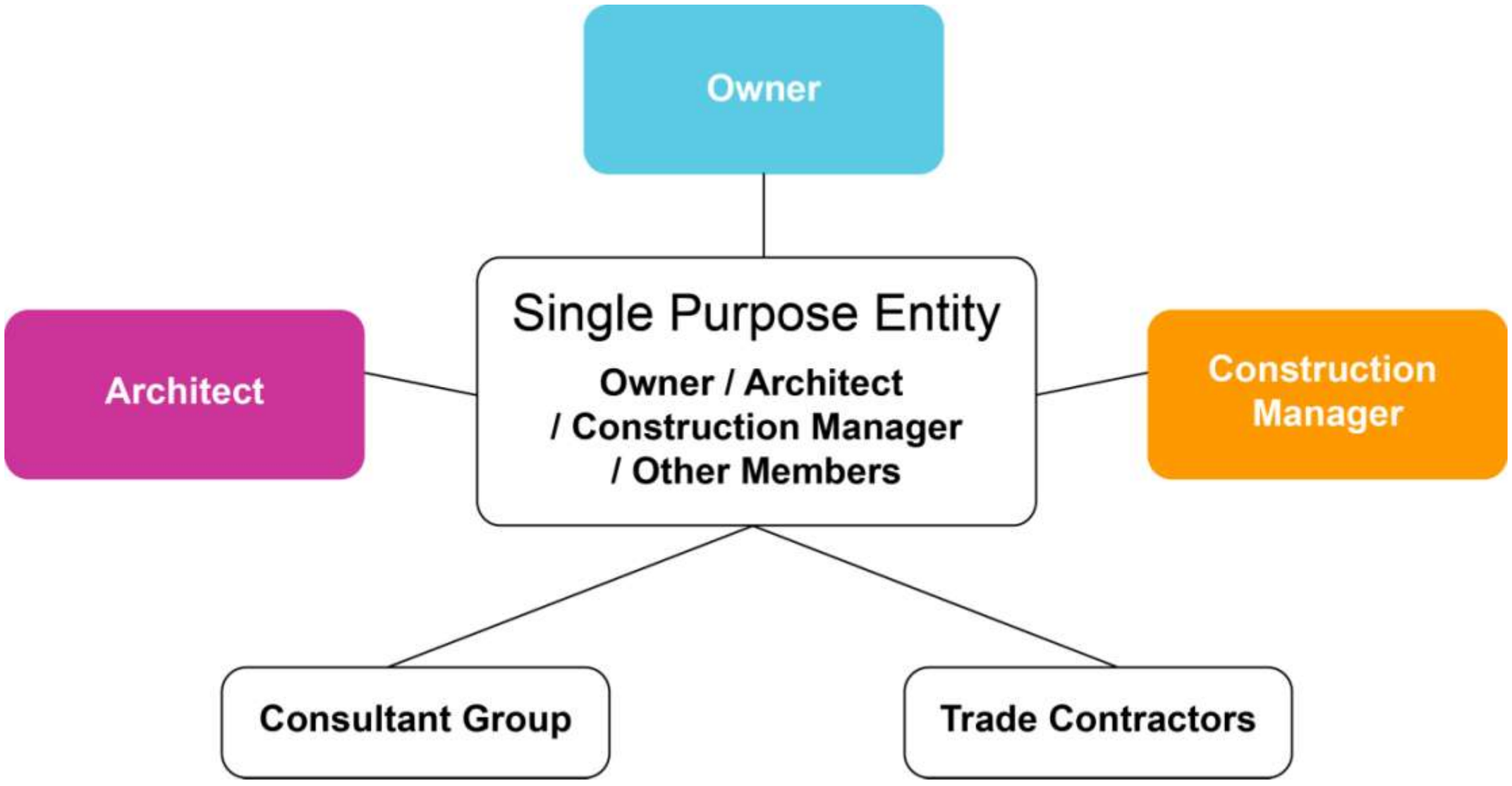
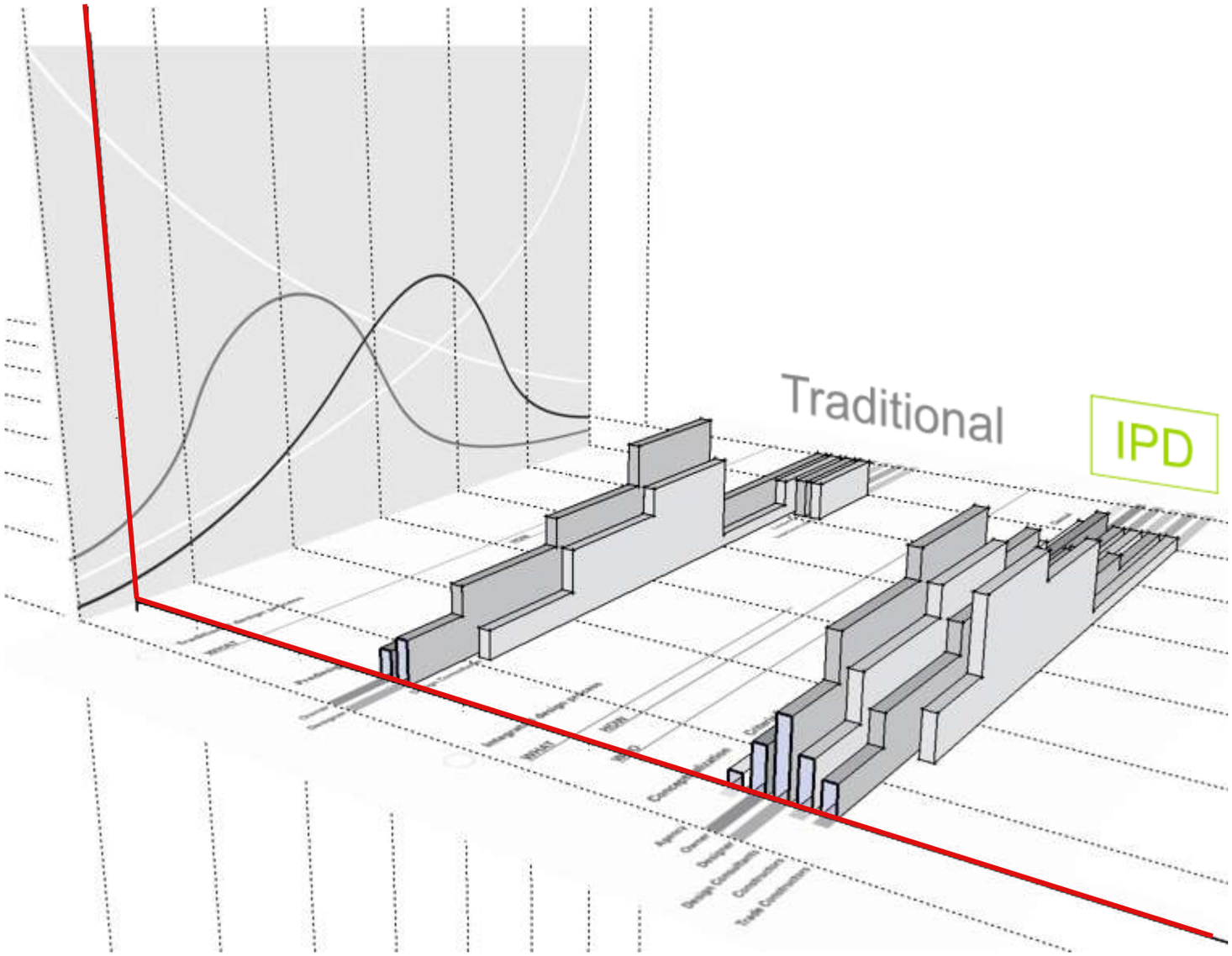
Single Purpose Entity Agreement Contract Relationships



Project holds P.I. insurance – not individual groups

Conceptualization



Conceptualization begins to determine **WHAT** is to be built, **WHO** will build it and **HOW** it will be built…

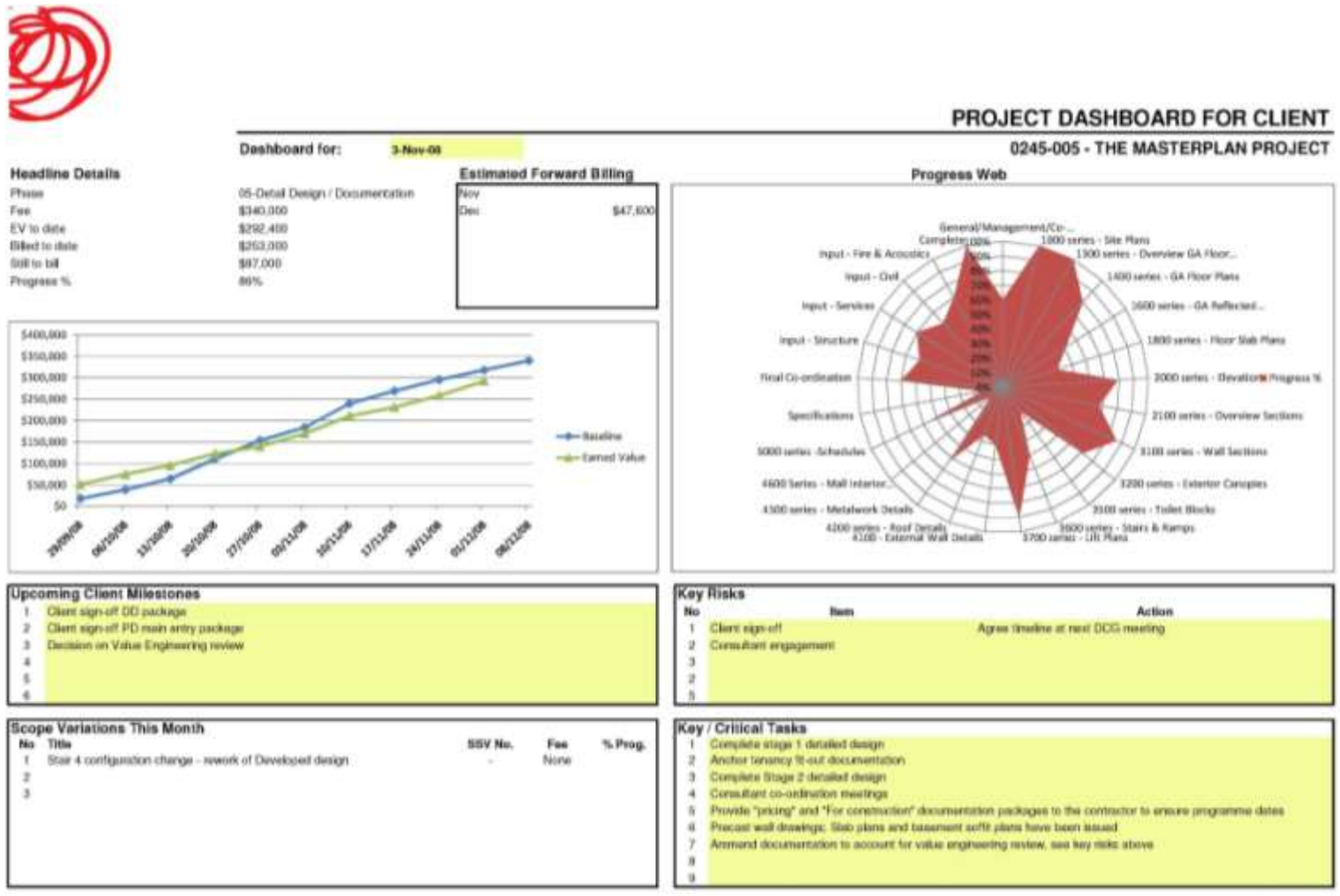
Outcomes

Develop:

- Performance goals
- Cost structure (earlier & in greater detail)
- Preliminary Schedule & link to model
- Communication methods
- LODs 00 & 01

Set up project systems

Conceptualization – Project System Setup



PROJECT DASHBOARD FOR CLIENT

Dashboard for: 3-Nov-08

0245-005 - THE MASTERPLAN PROJECT

Headline Details

Phase	05-Detail Design / Documentation
Fee	$340,000
EV to date	$292,400
Billed to date	$253,000
Still to bill	$87,000
Progress %	86%

Estimated Forward Billing

Nov	
Dec	$47,600

Progress Web

Upcoming Client Milestones

1. Client sign-off DD package
2. Client sign-off PD main entry package
3. Decision on Value Engineering review

Key Risks

No	Item	Action
1	Client sign-off	Agree timeline at next DCG meeting
2	Consultant engagement	

Scope Variations This Month

No	Title	SSV No.	Fee	% Prog.
1	Stair 4 configuration change - rework of Developed design	-	None	

Key / Critical Tasks

1. Complete stage 1 detailed design
2. Anchor tenancy 'fit-out documentation
3. Complete Stage 2 detailed design
4. Consultant co-ordination meetings
5. Provide "pricing" and "For construction" documentation packages to the contractor to ensure programme dates
6. Precast wall drawings: Slab plans and basement soffit plans have been issued
7. Ammend documentation to account for value engineering review, see key risks above

1. **Set up Strong Leadership / Project Governance Team**

- Strong Project Manager
- Strong Design Manager
- Educated Client
- Project Quality Plan
- Project Briefing Document
- Web-based reporting / management
- Set up TDVs

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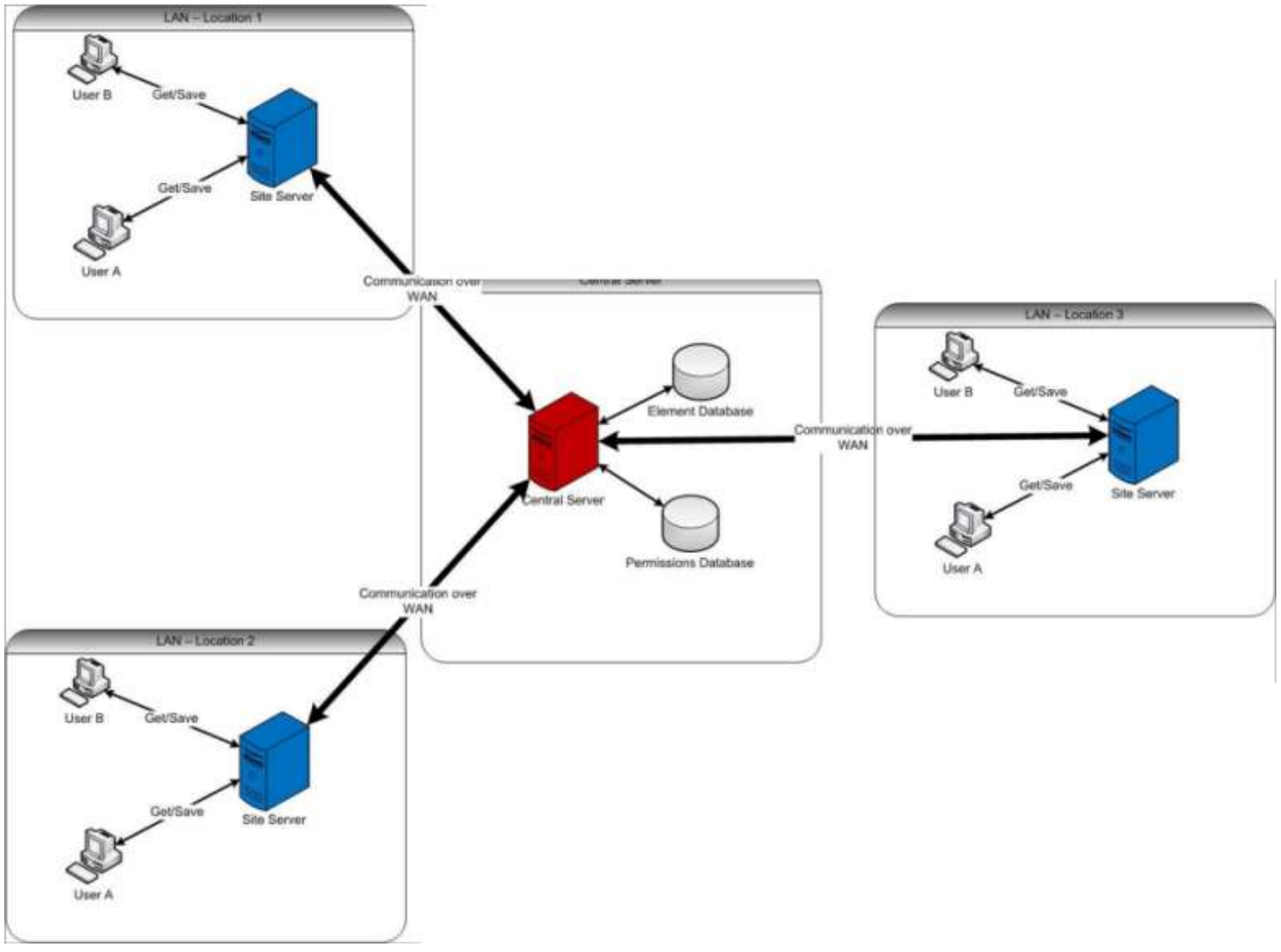
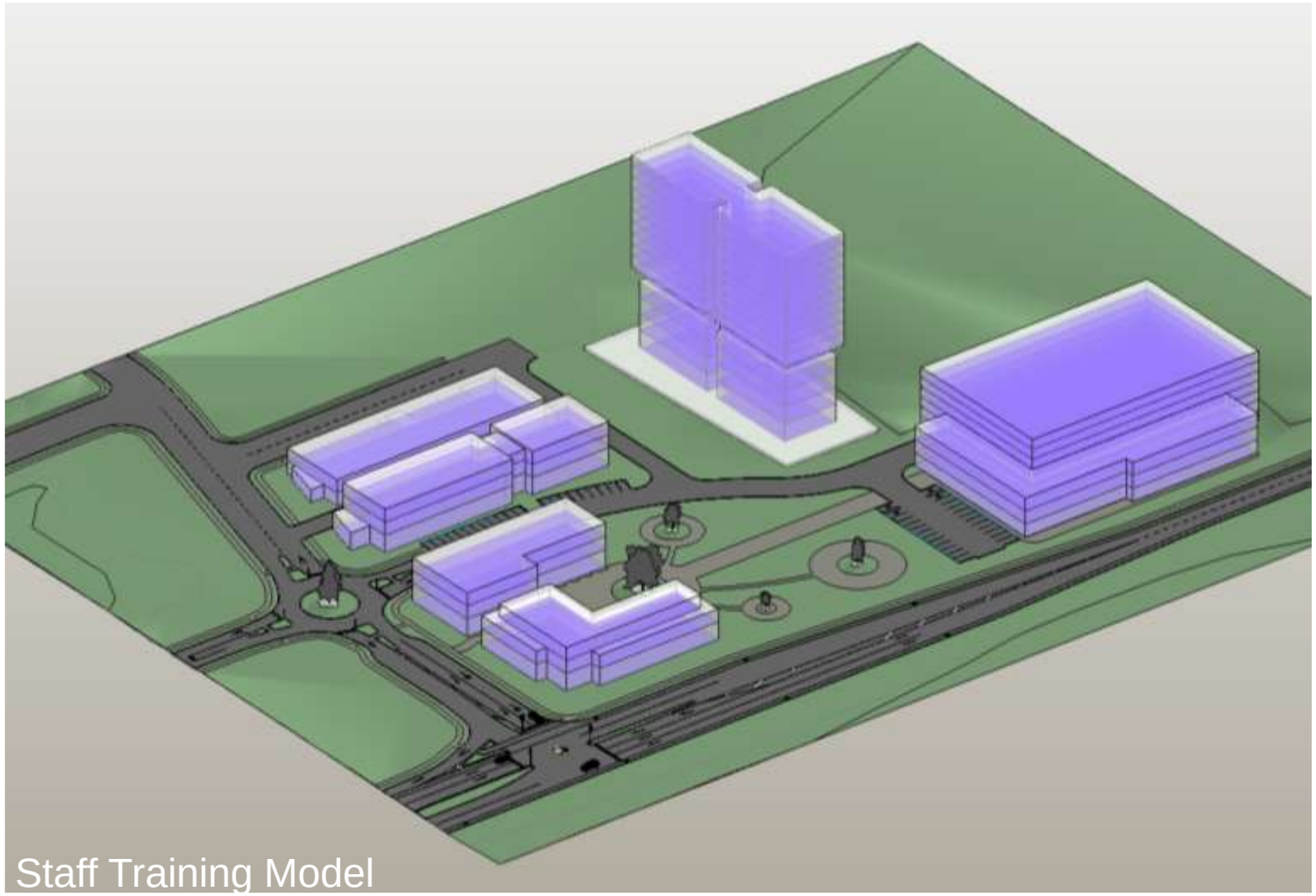
Conceptualization – Project System Setup



2. Set up centralised BIM infrastructure

- Agree model progression specifications (MPS) or Levels of Detail (LOD)

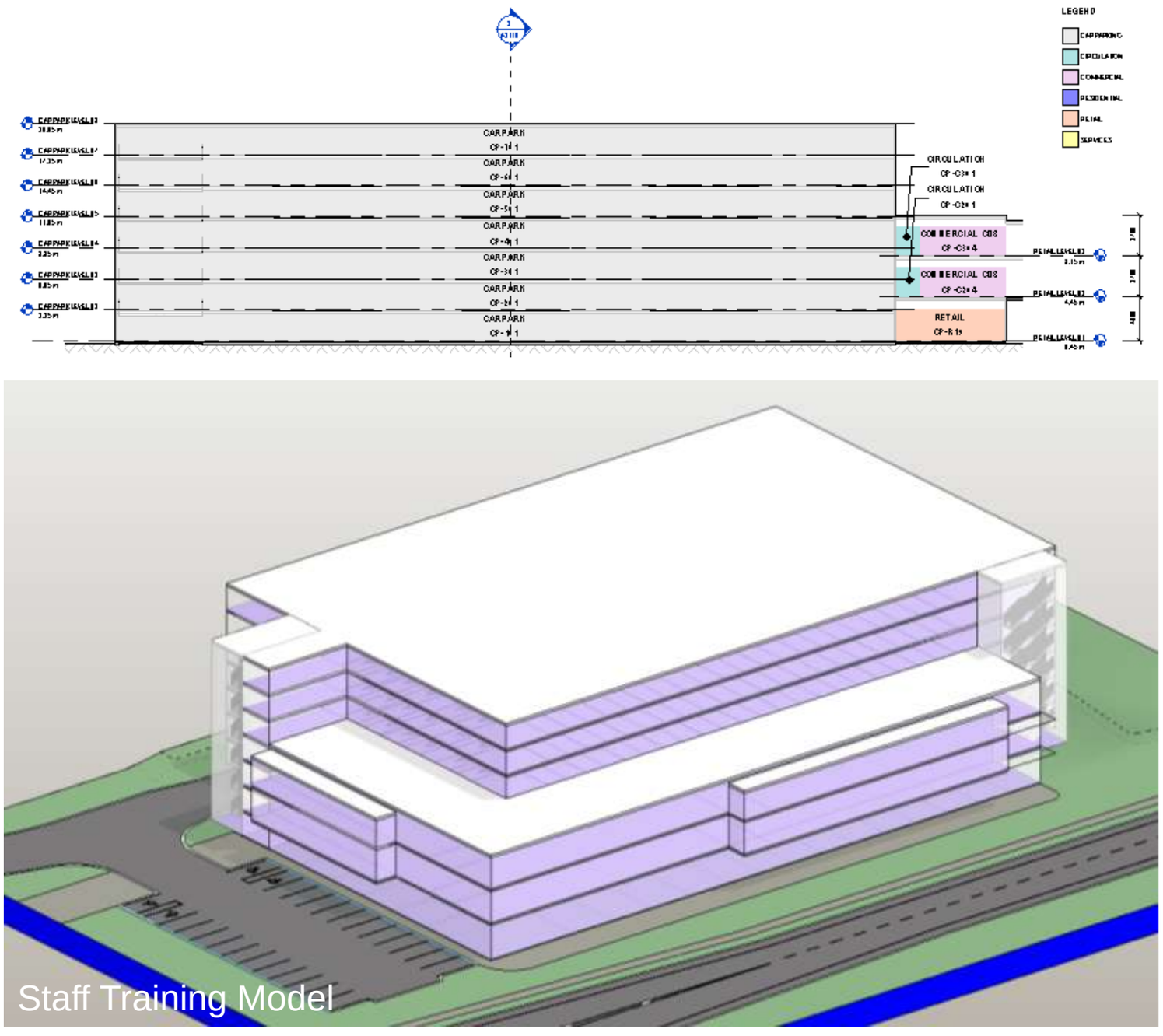
Level of Detail (LOD) 000


Staff Training Model

The Finished Article

- Topography
- Boundaries
- Roads
- Footpaths
- Landscaping Zones
- Boundary Setbacks
- Mass Form Buildings
- Levels
- Mass Floors for Gross Area
- Mass Floor Areas scheduled

Level of Detail (LOD) 100



The Finished Article

- Car parking schedules
- Mass Floor schedules (Gross Floor)
- Room schedules (Net Lettable)
- Typical floor plans
- Sections
- Elevations
- Cores & circulation defined
- Vehicle & pedestrian traffic clearly defined
- Car parking first cut established
- Mass to preliminary architectural form

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Criteria Design

In Criteria Design the project begins to take shape.
Major options are evaluated, tested and selected…

Outcomes

Finalise:

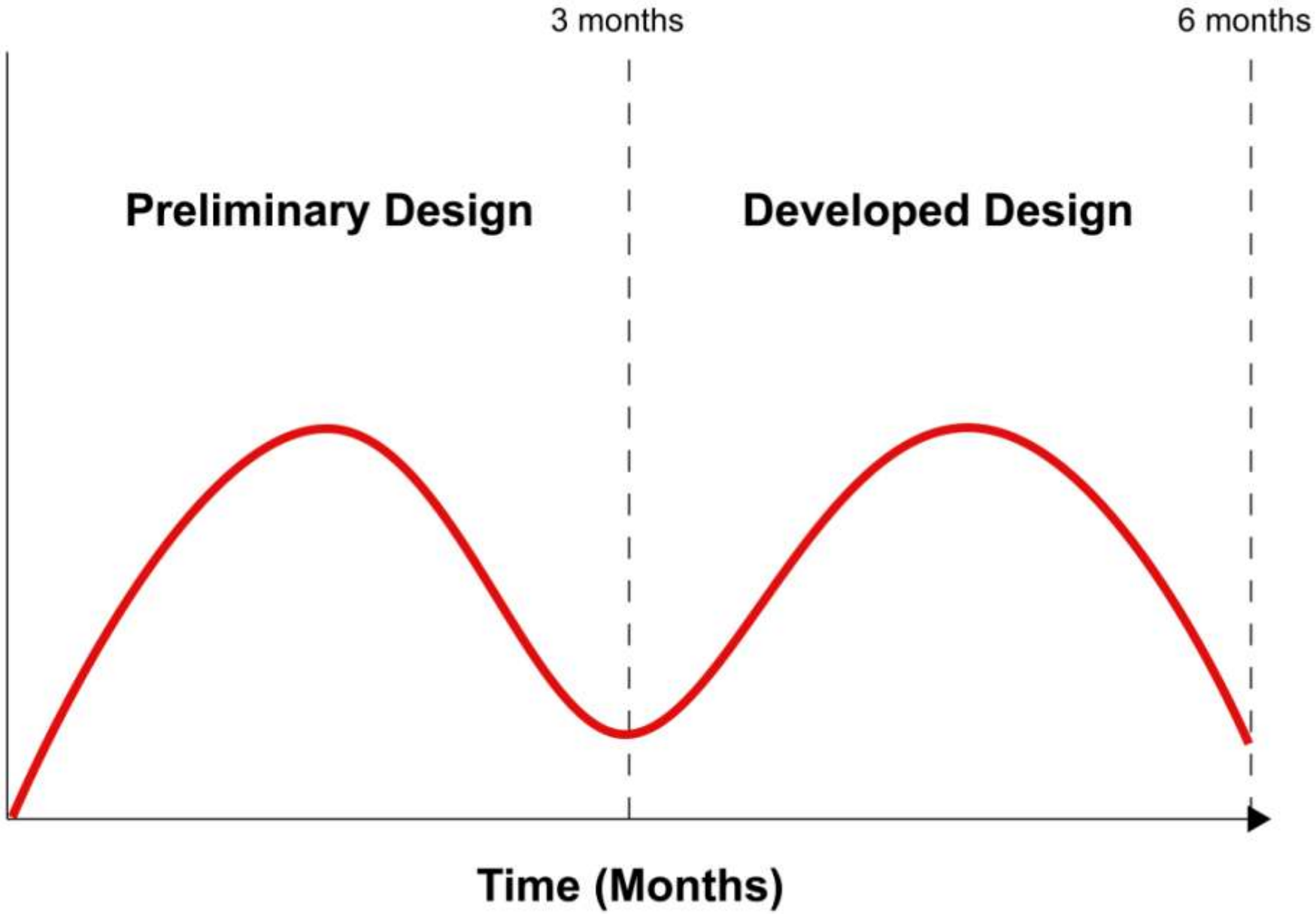
- Scope
- Form
- Initial selection & design of structure, skin, HVAC
- Cost estimate*
- Schedule*

Agree tolerances between trades for prefabrication

*at appropriate precision – TDVs

Traditional VE Cycle

Time impact / Abortive design work



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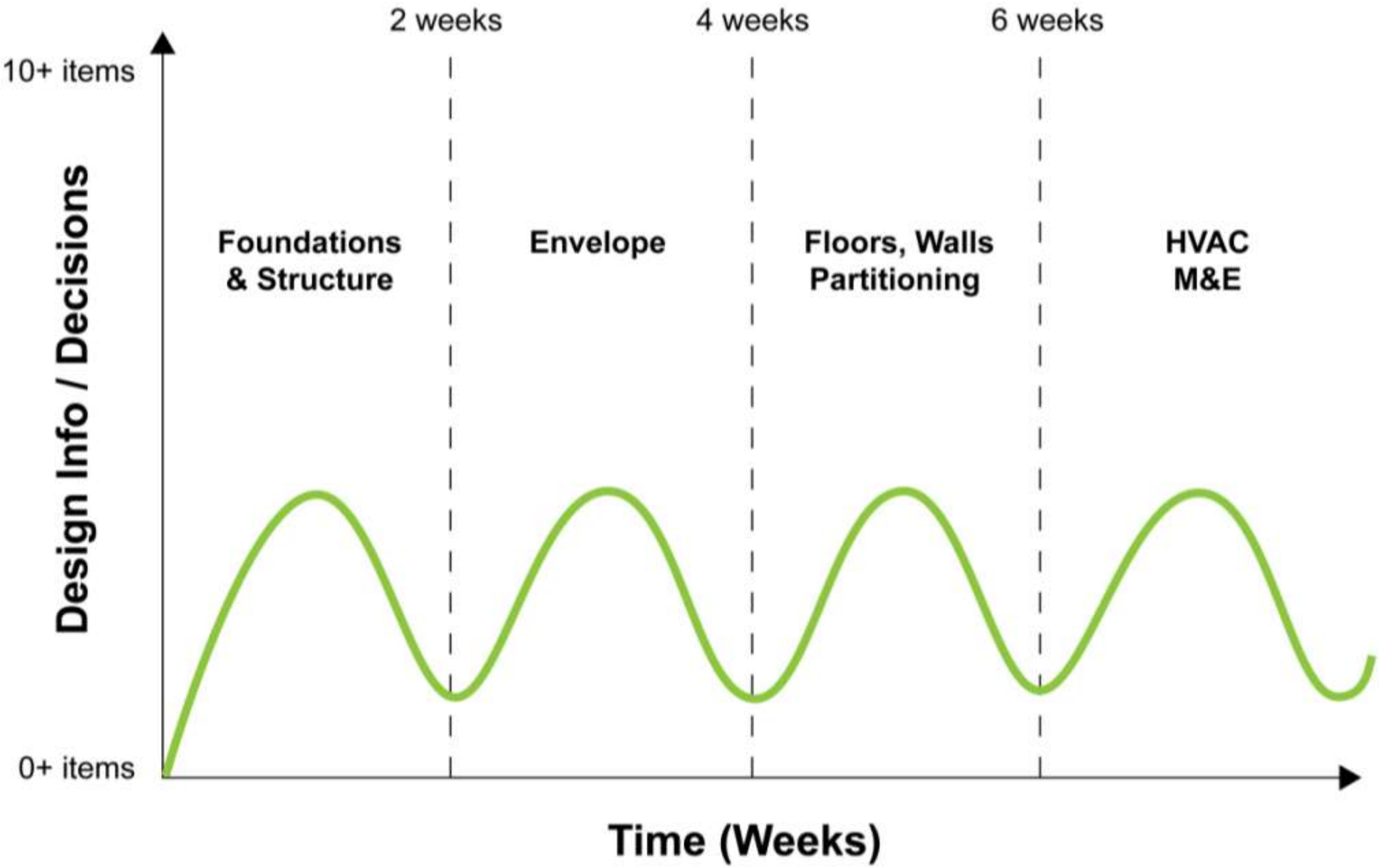
IPD VE Cycle

BIM Model locks in design decisions to TDVs



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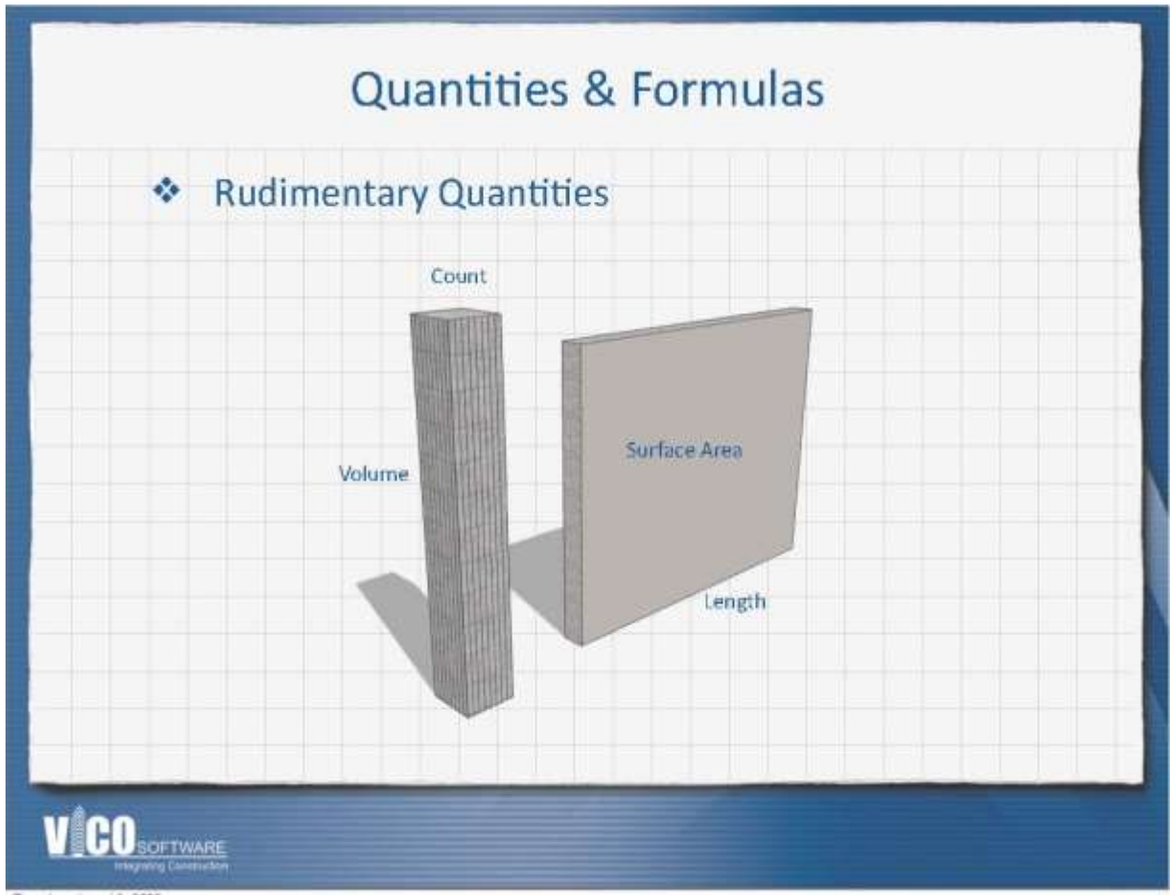
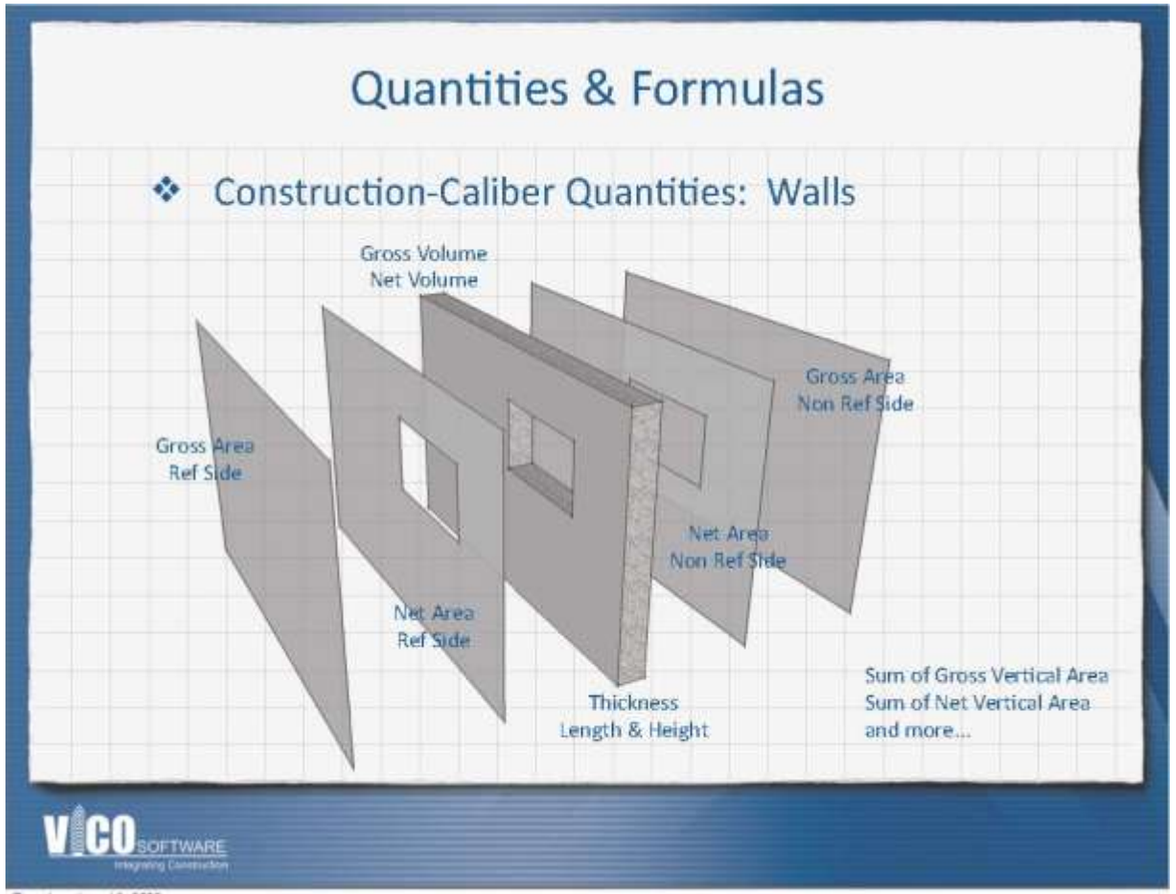
Construction-Calibre Quantities from BIM Model

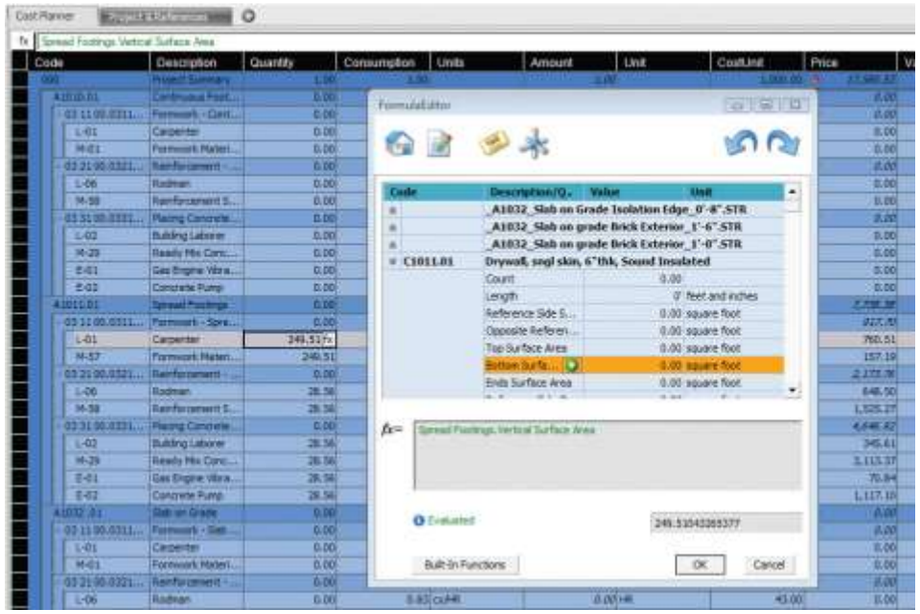
Vico

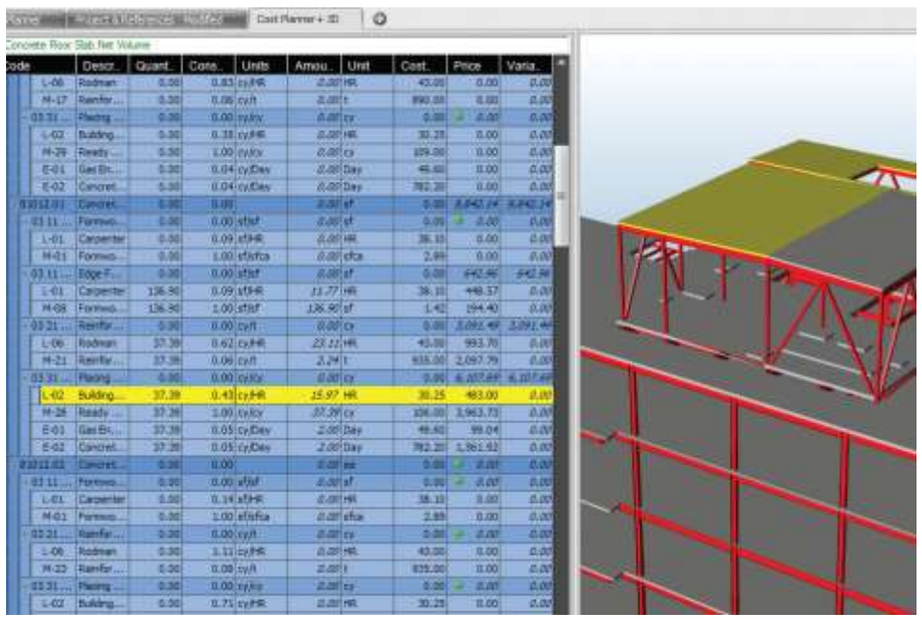




Construction-Calibre Quantities from BIM Model

Vico Cost Planner





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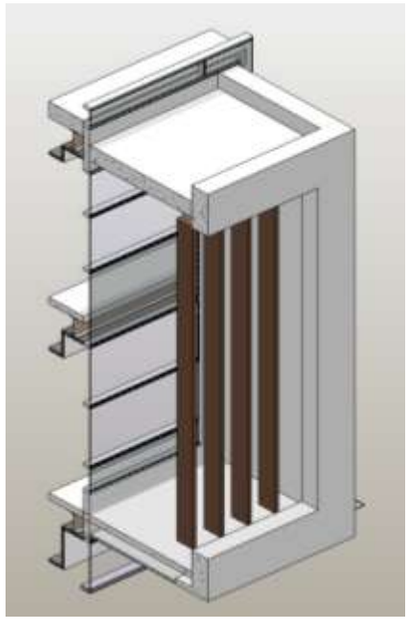
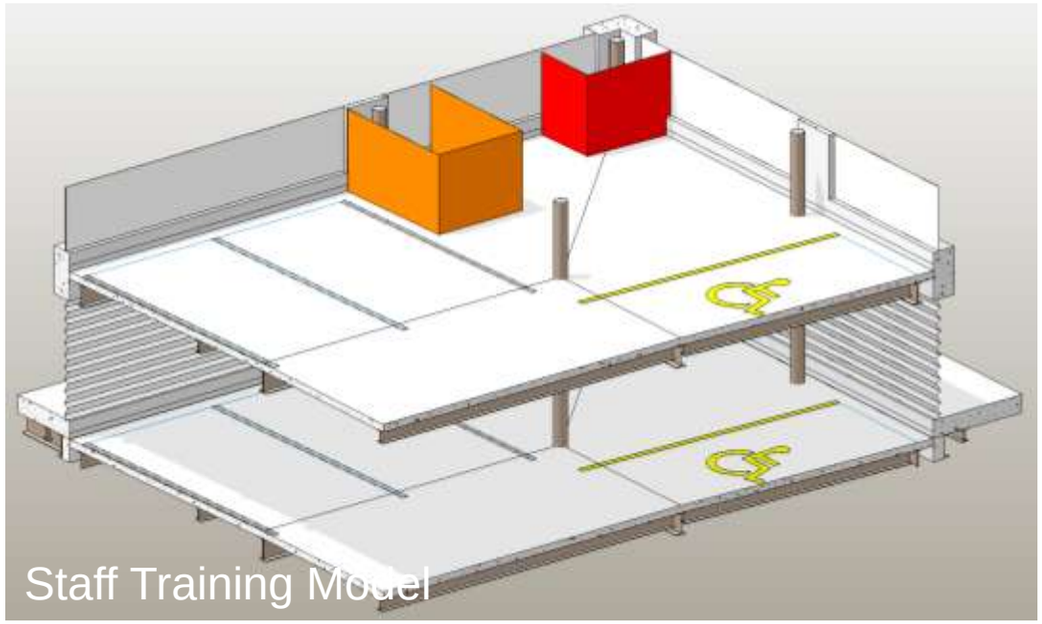
Level of Detail (LOD) 200





Staff Training Model

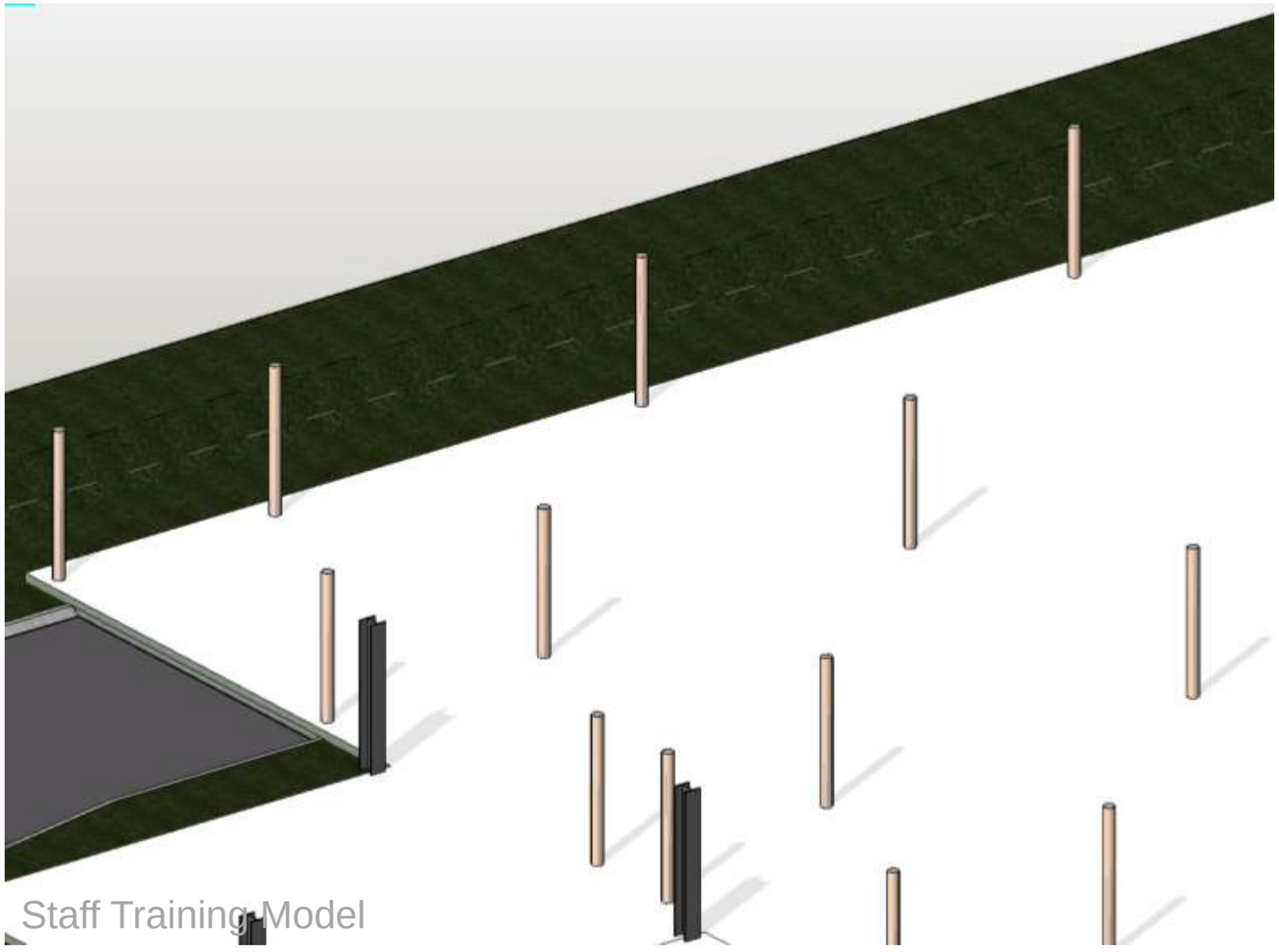
Material Choices

- Made during geometry placement
- Preliminary only
- Keep Generic

A Zonal Approach

- Keep geometry generic
- Use experience to make decisions early
- If you lack experience use others
- More speed less haste

Level of Detail (LOD) 200

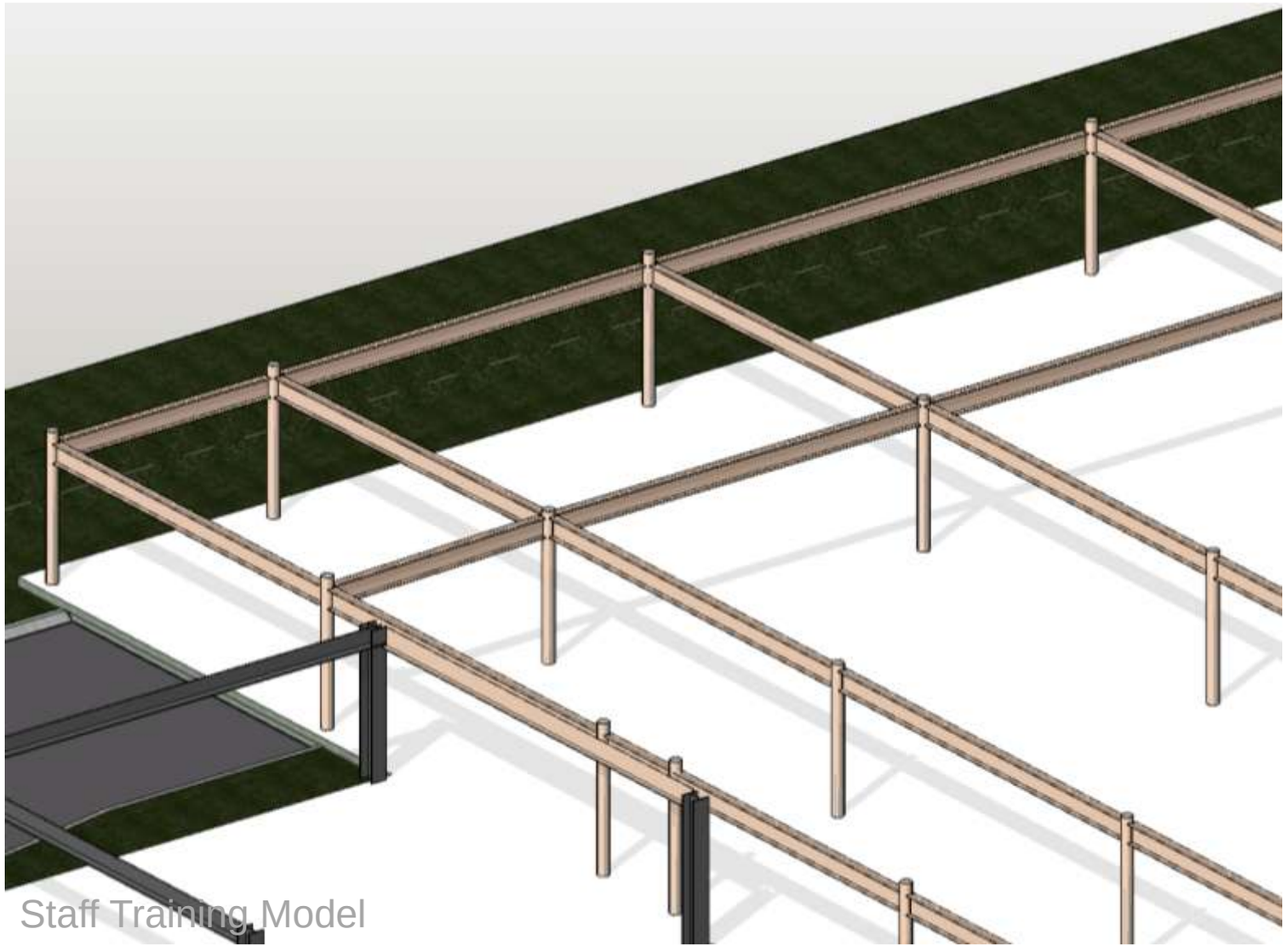


Staff Training Model

Preliminary Structure

- Place grids
- Use grids to place columns
- Move grids not columns
- Careful with constraints

Level of Detail (LOD) 200

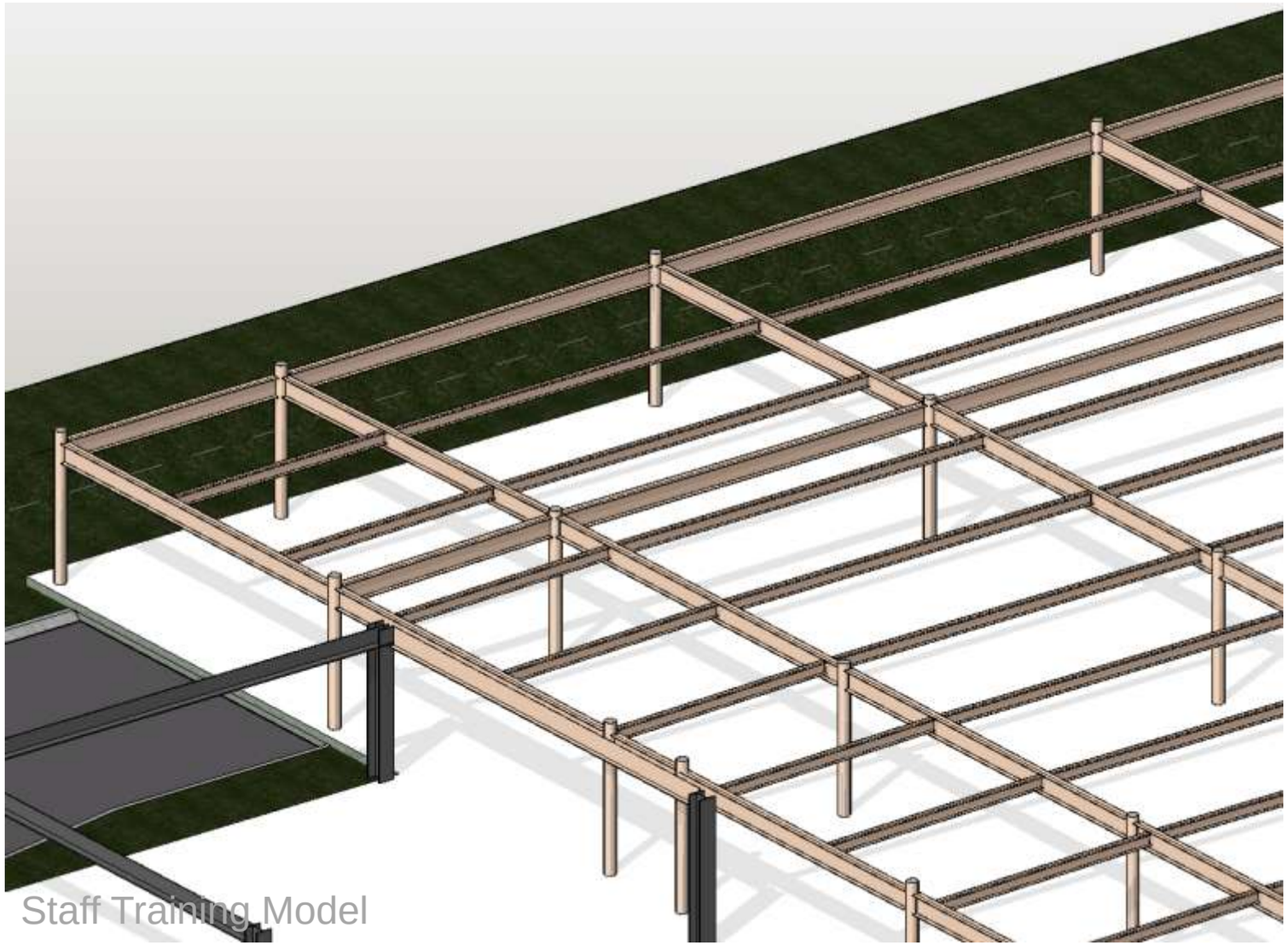


Staff Training Model

Primary Structure

- Use grids to place beams
- Move grids not beams
- Keep generic
- Model primary structure as a worst case scenario

Level of Detail (LOD) 200

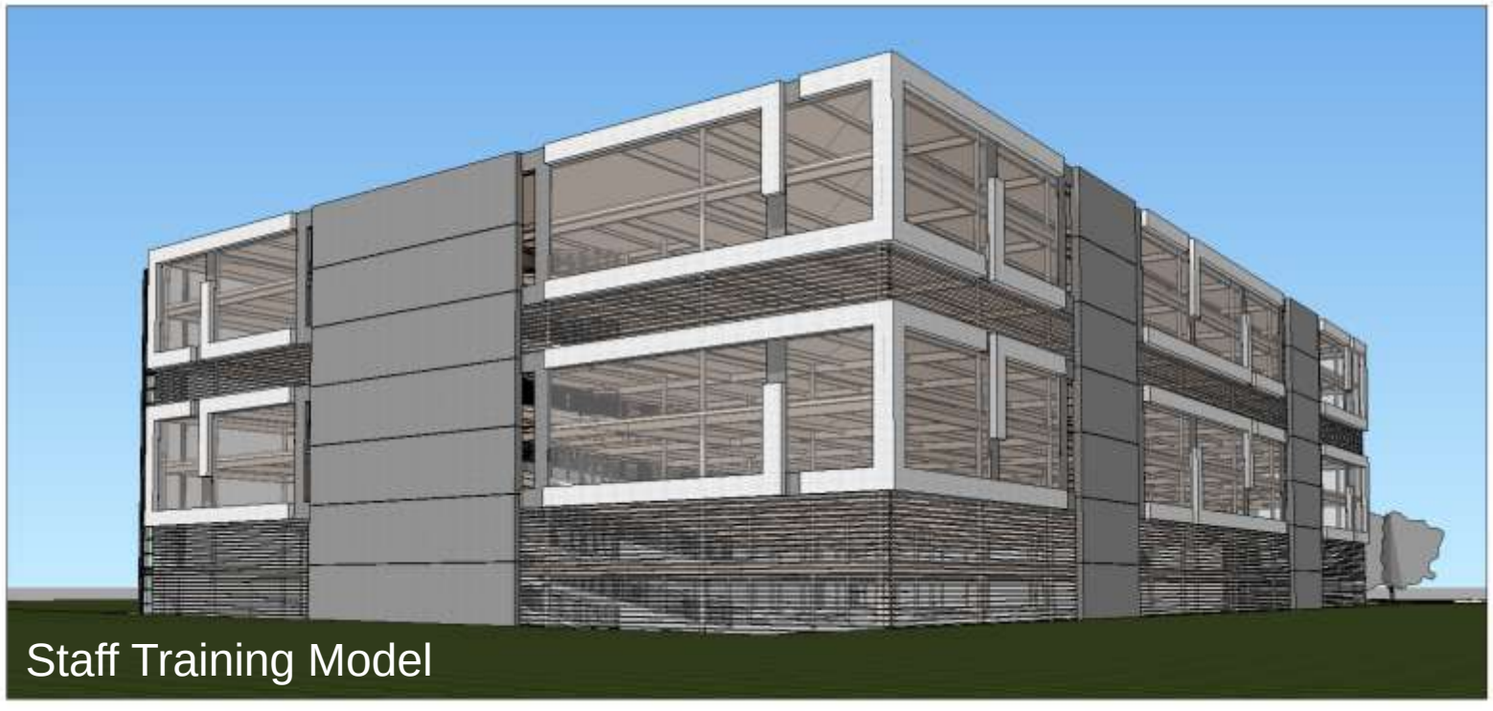


Secondary Structure

- Primary structure as necessary
- Secondary structure optional at this point

Level of Detail (LOD) 200

Staff Training Model

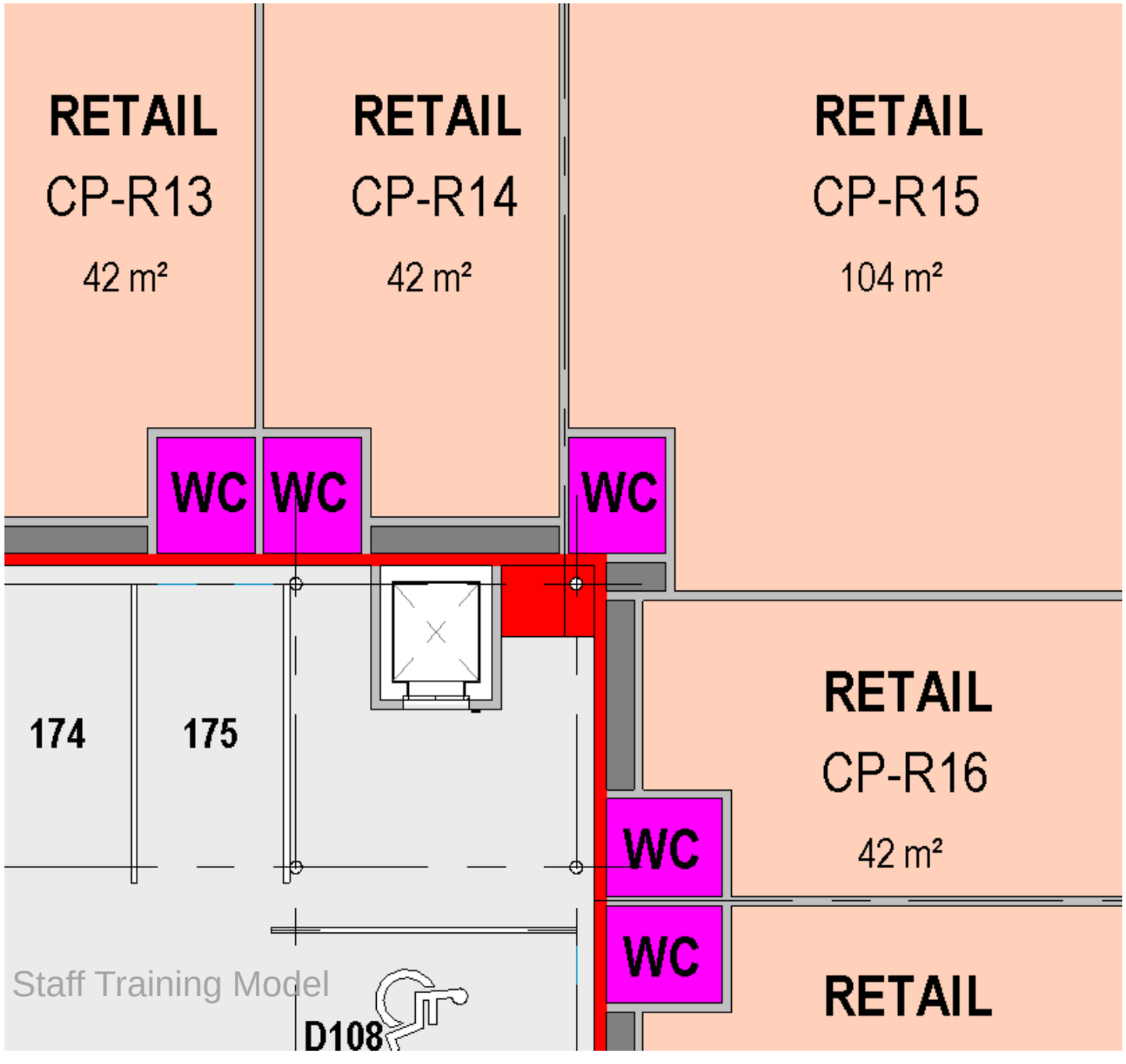


Staff Training Model

Envelope Design

- Keep generic
- Zonal approach
- Make material choices

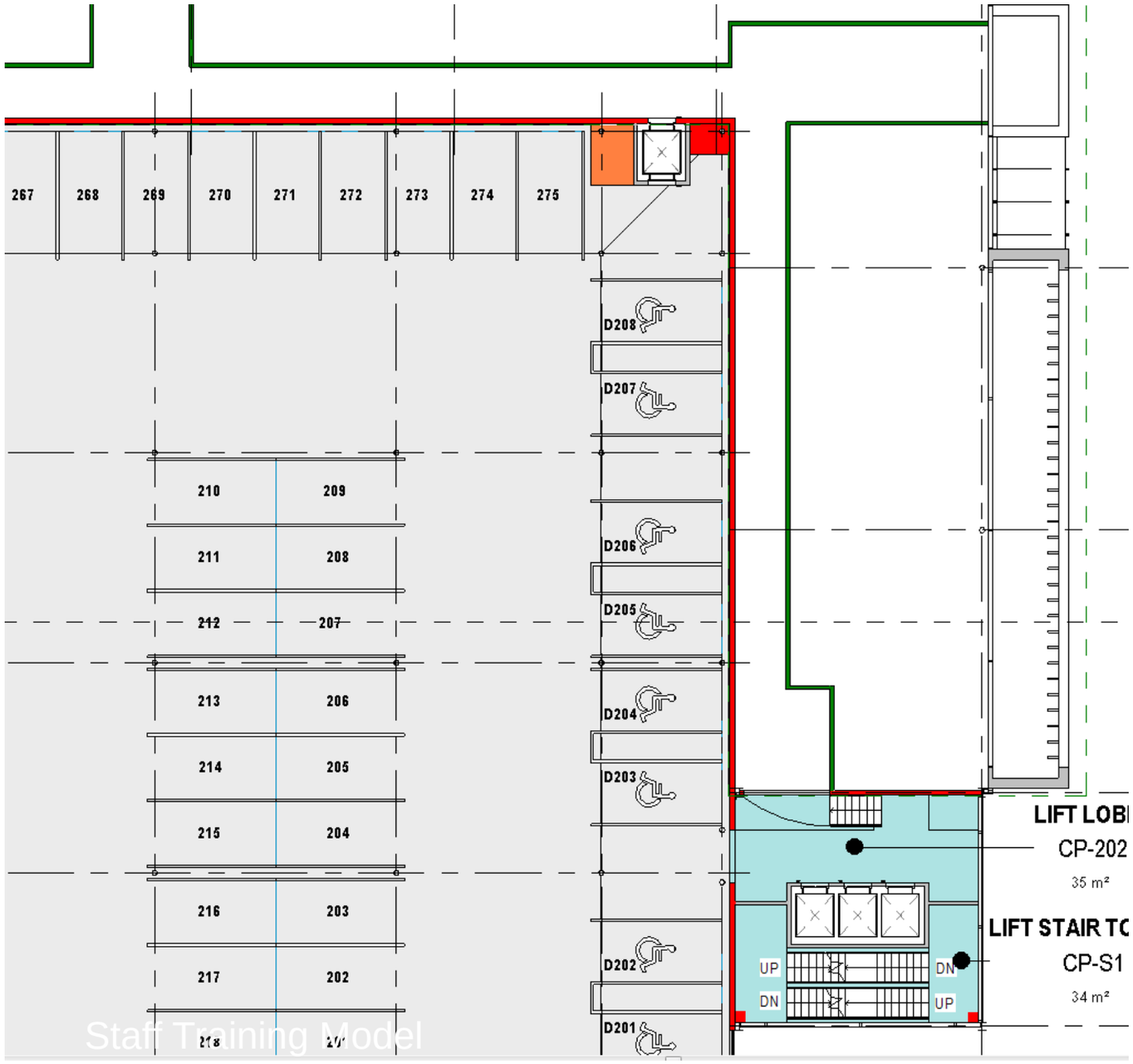
Level of Detail (LOD) 200



Preliminary Services

- Keep generic
- Zonal approach
- Mechanical
- Electrical
- Plumbing
- Fire
- Acoustic
- Consider horizontal as well as vertical

Level of Detail (LOD) 200



The Finished Article

- Circulation assessed and meets brief
- Preliminary Structure complete
- Preliminary Services zones established
- Preliminary Acoustic zones established
- Preliminary Fire zones established
- Consultants schematics complete
- Consultant modelling underway

Detailed Design

Detailed Design concludes the **‘WHAT’** phase. All key design decisions are finalised…

Outcomes

Clearly define, coordinate & validate:

- Major building systems
- All building elements
- Quality levels

Complete specifications

Establish precise cost

Establish precise construction schedule

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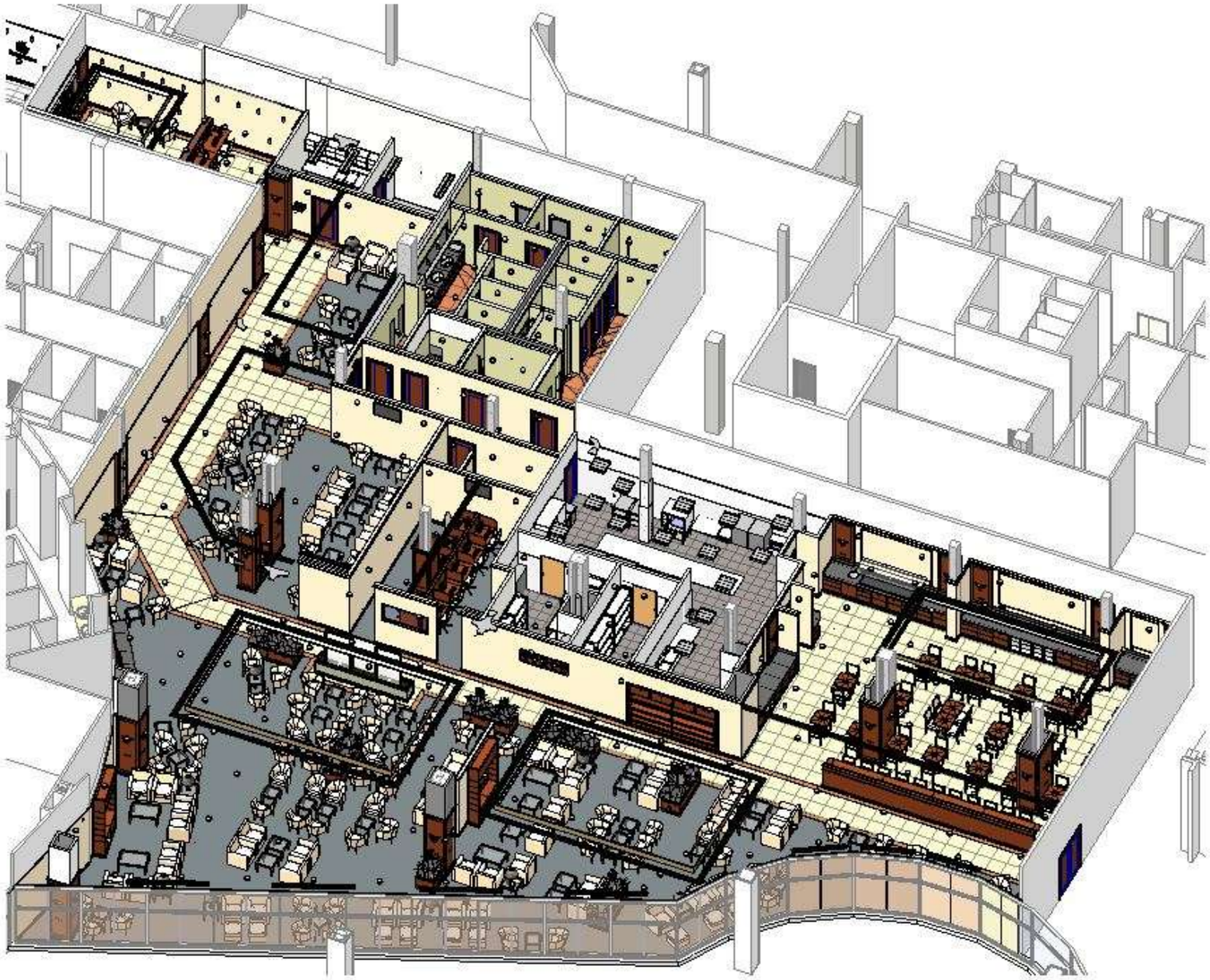
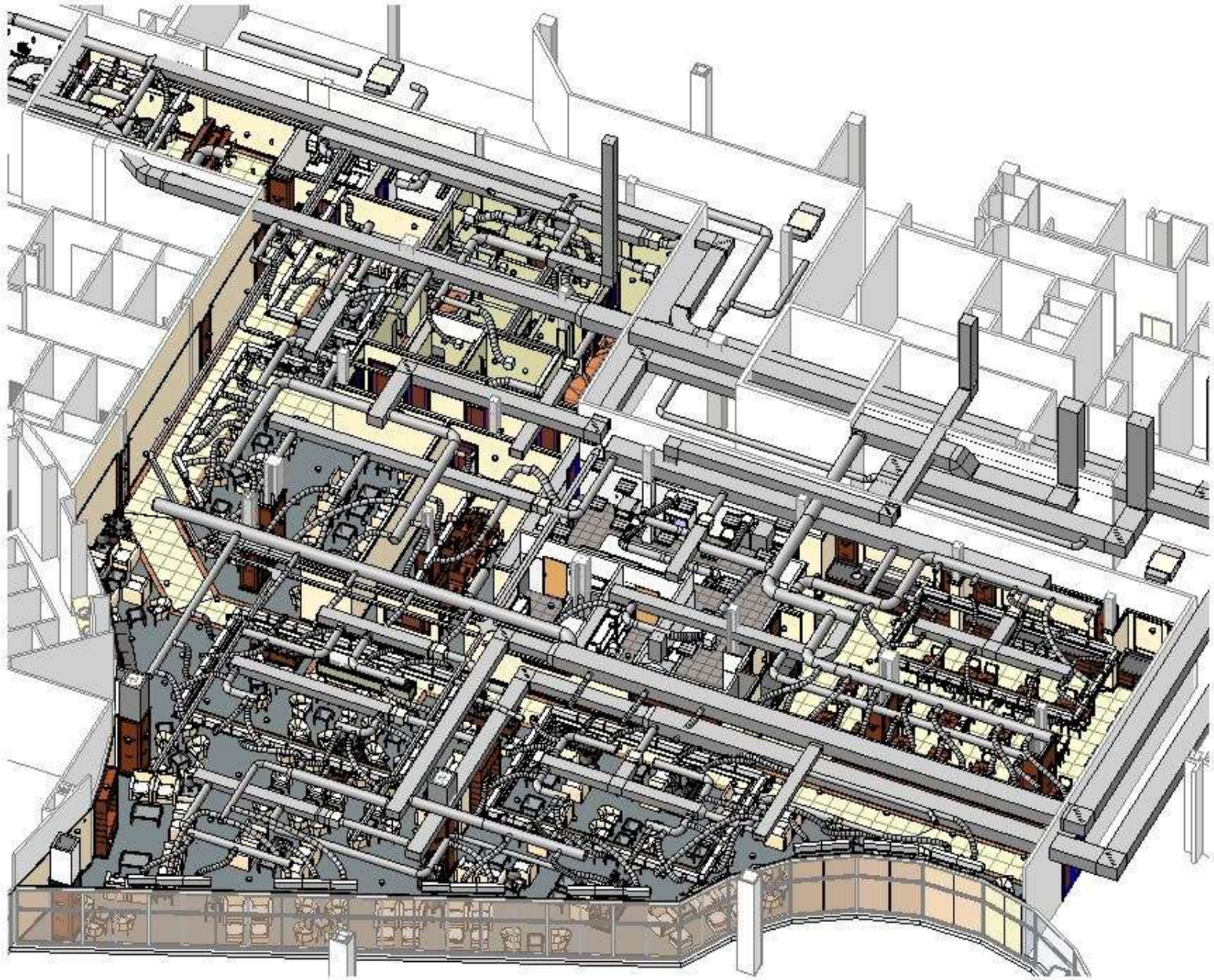
Detailed Design

Emirates Lounge – Auckland International Airport



Detailed Design

Emirates Lounge – Auckland International Airport



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Detailed Design

Emirates Lounge – Auckland International Airport

1 LEVEL 01 - COORD SERV RCP
1 : 100

LIGHTING FIXTURE SCHEDULE

CODE	TYPE	COUNT

CEILING SCHEDULE

CODE	DESCRIPTION	AREA

DIFFUSER SCHEDULE

CODE	TYPE	COUNT

CEILING FIXTURES SCHEDULE

CODE	DESCRIPTION	COUNT

REVISIONS

AS BUILT

IGNITE

Emirates

EMIRATES LOUNGE AUCKLAND

AUCKLAND AIRPORT

COORDINATED SERVICES RCP

1009-002 | A1003 | B

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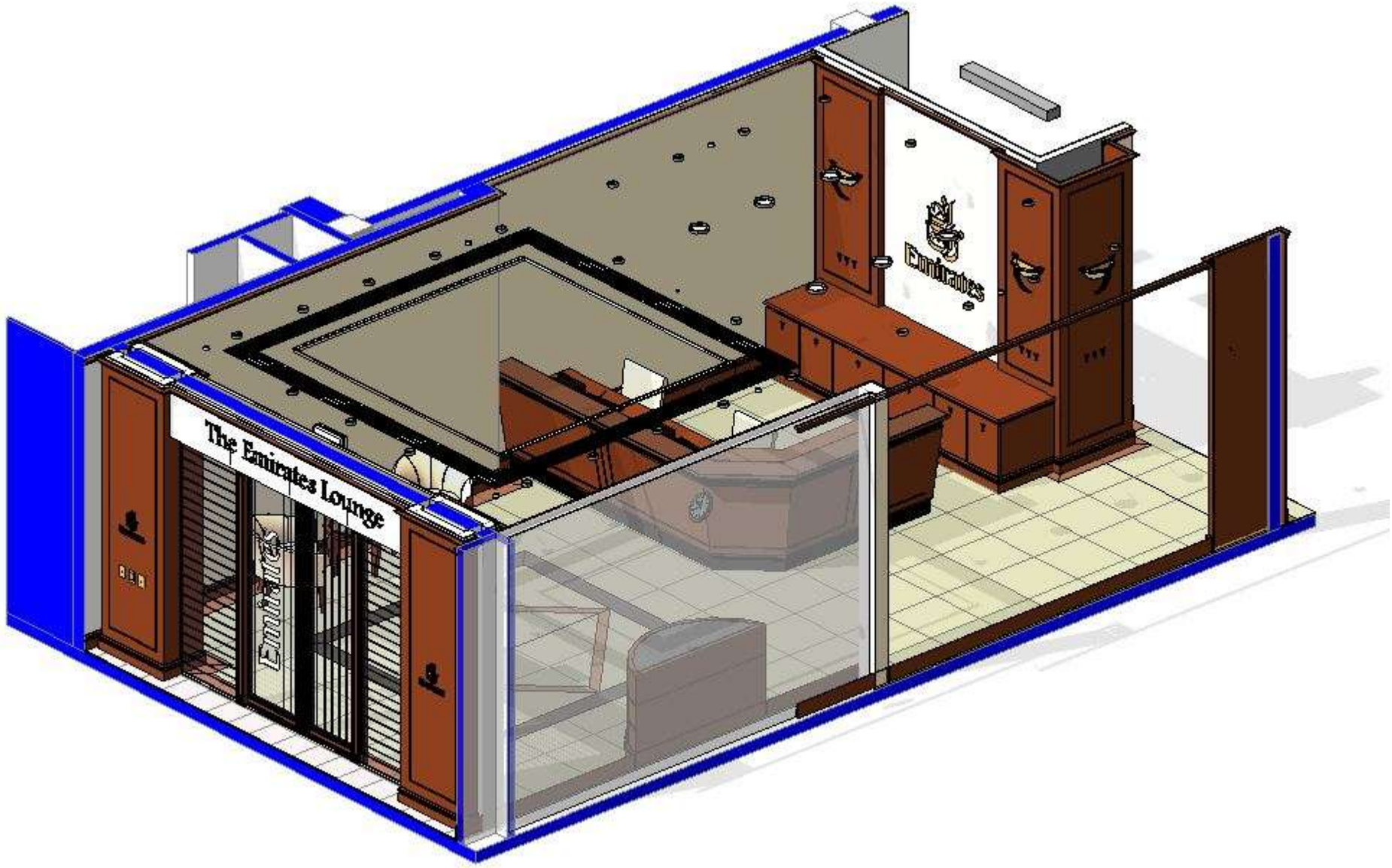
Detailed Design

Emirates Lounge – Auckland International Airport



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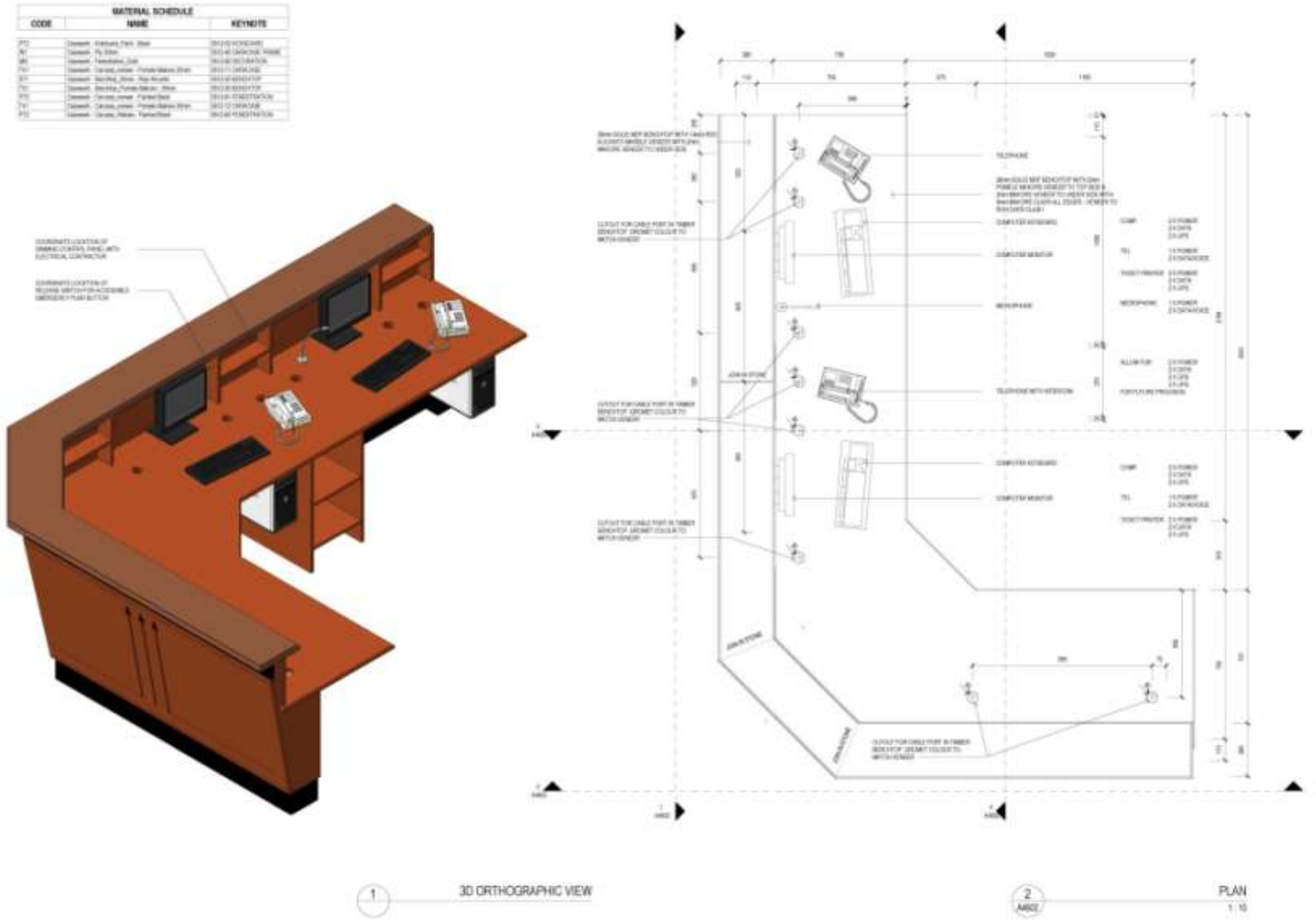

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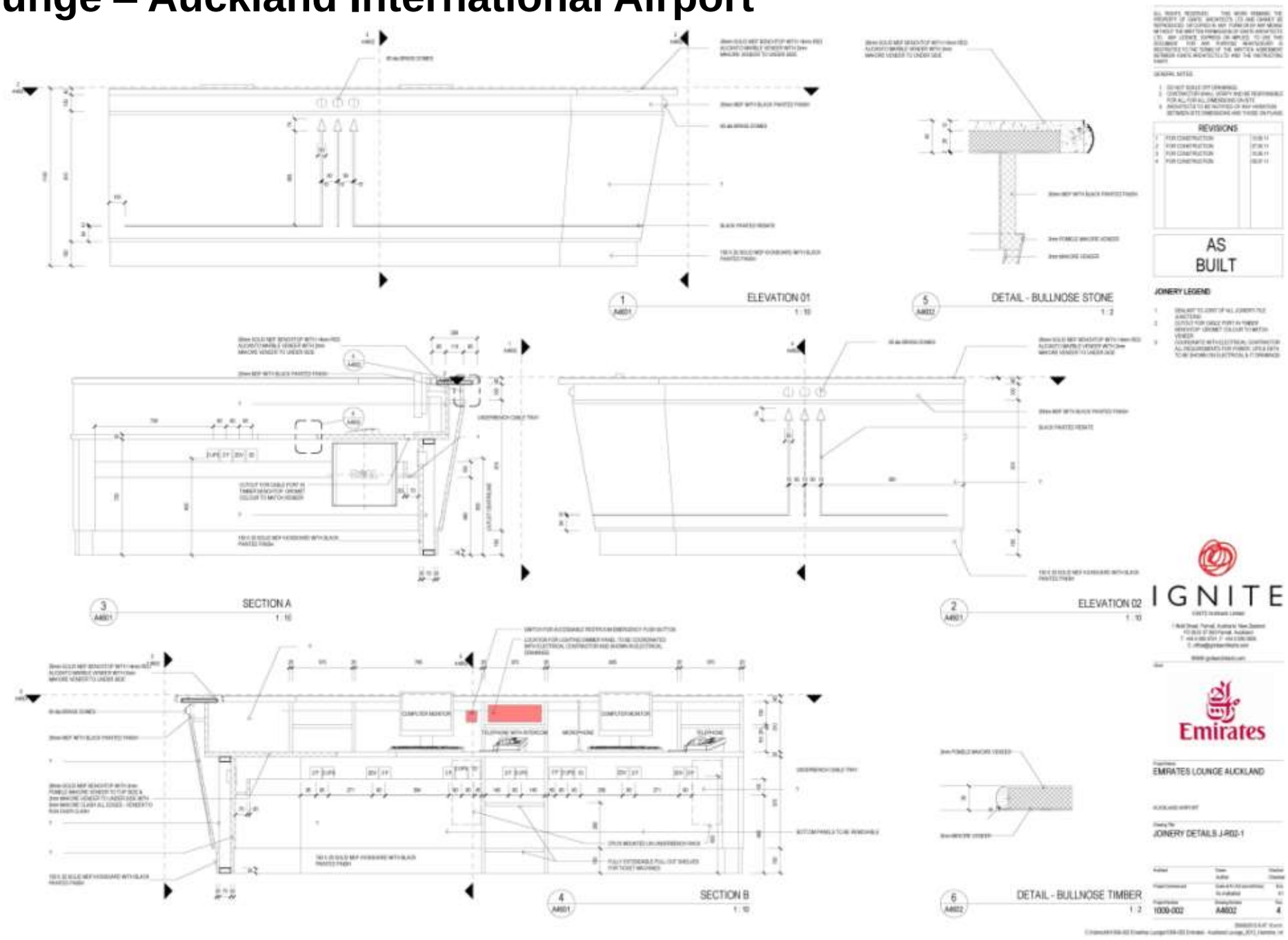

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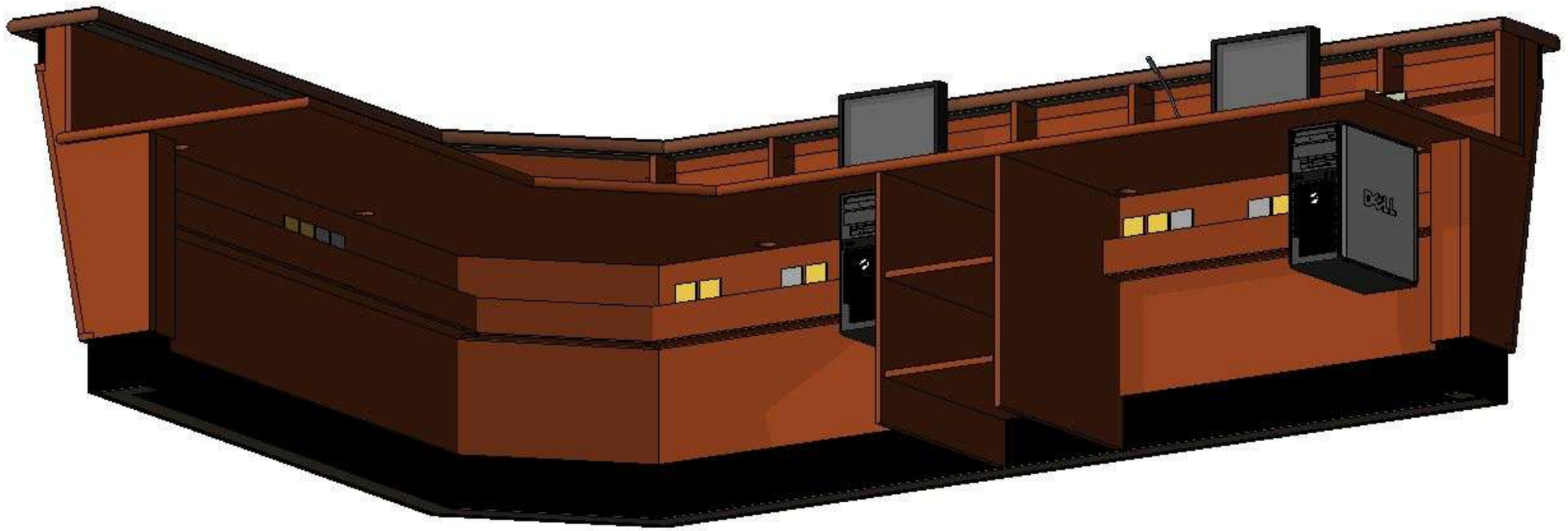
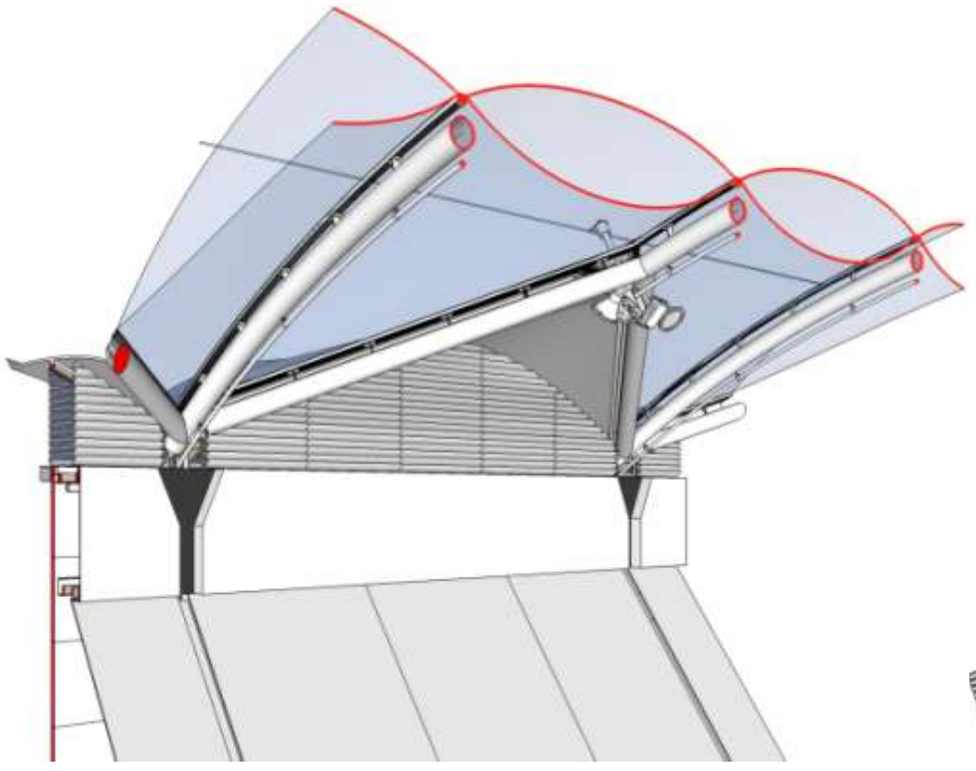


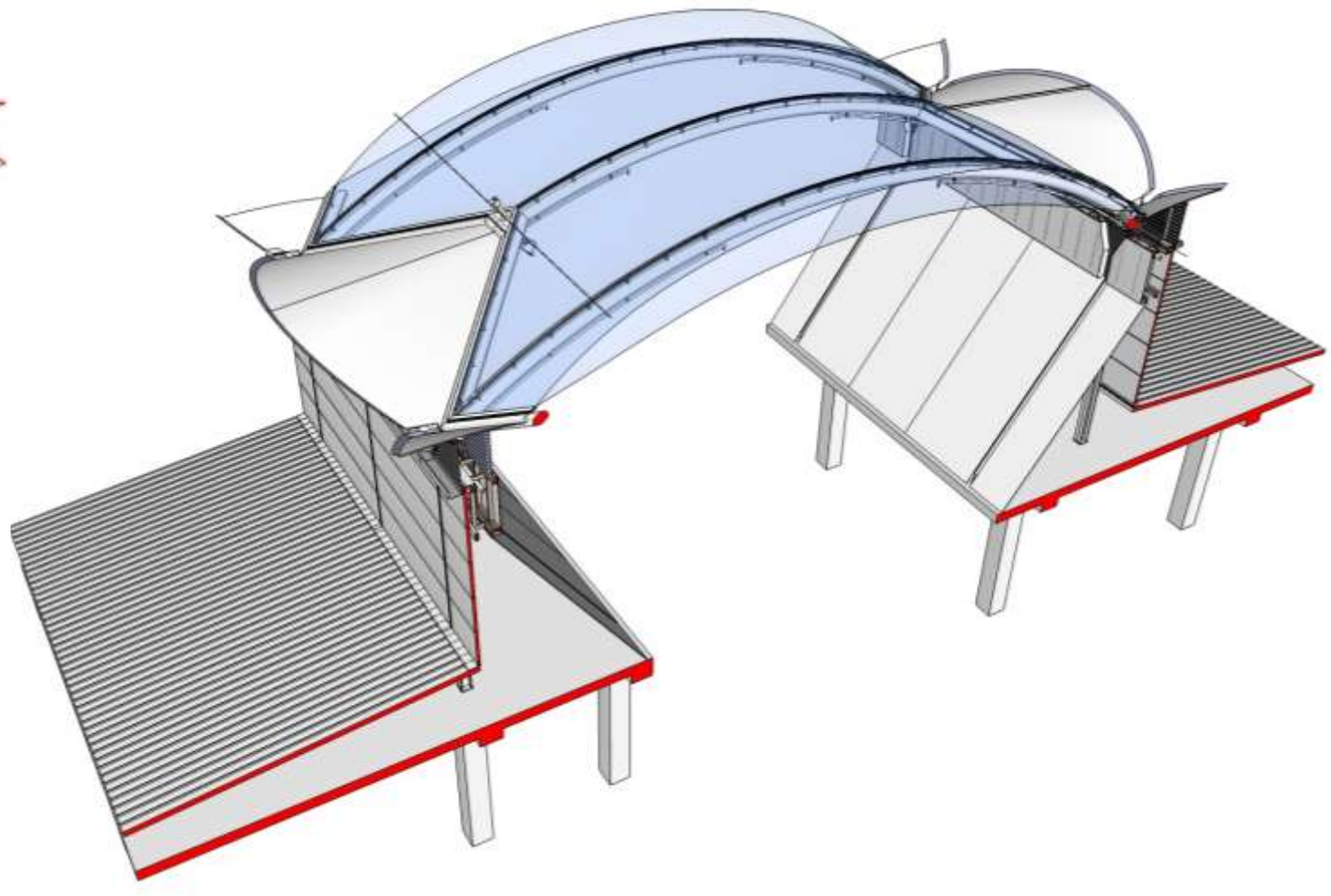
Detailed Design

Emirates Lounge – Auckland International Airport

Detailed Design

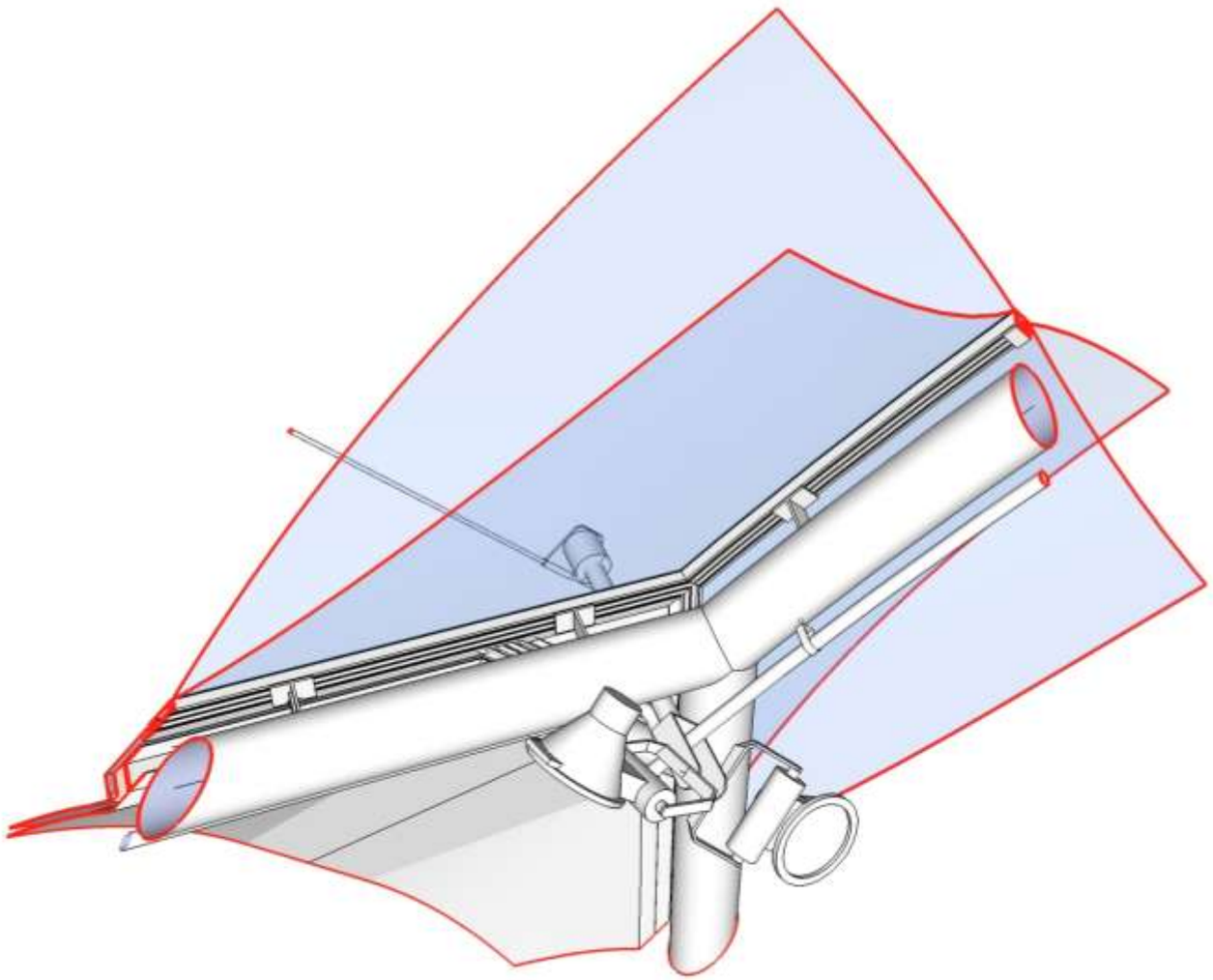
Te AWA, The Base - ETFE Roof

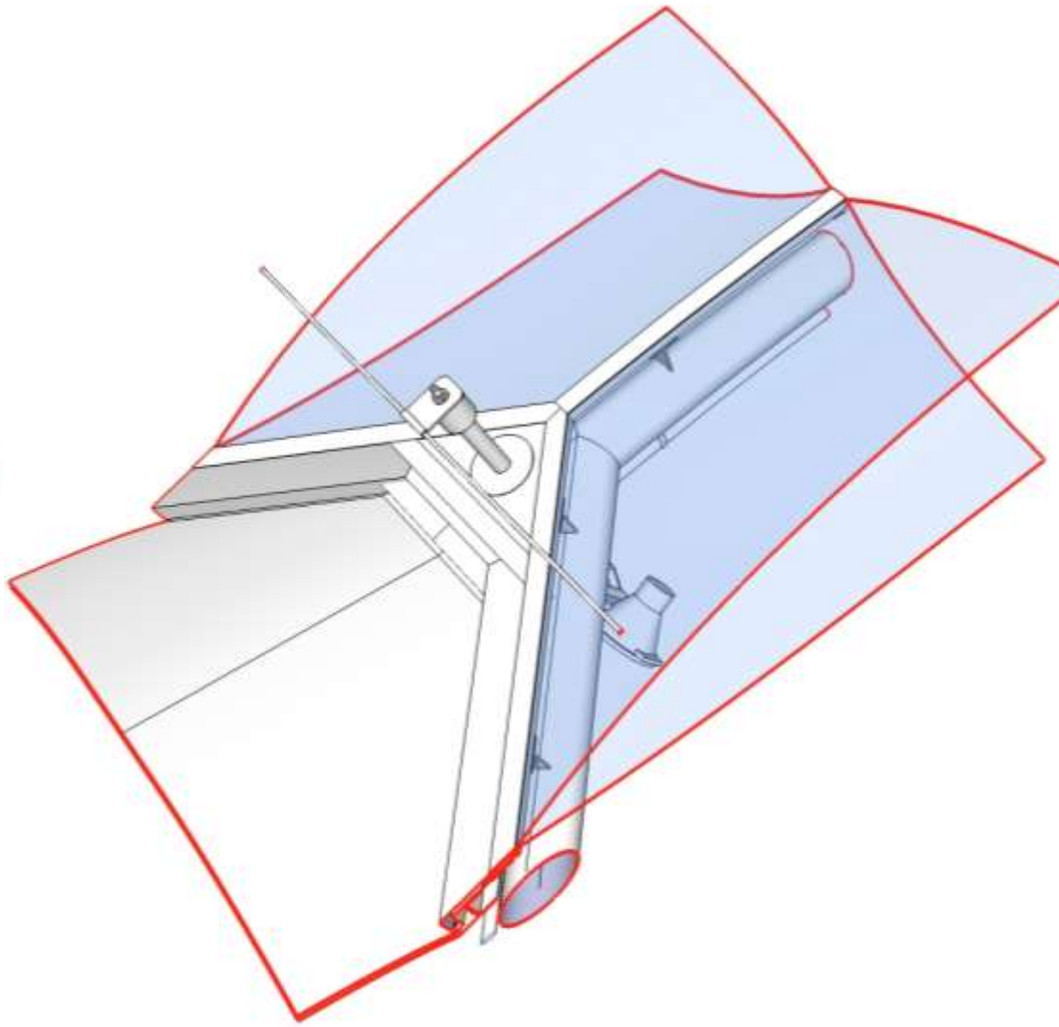




Detailed Design

Te AWA, The Base - ETFE Roof





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Te AWA, The Base - ETFE Roof

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Te AWA, The Base - ETFE Roof

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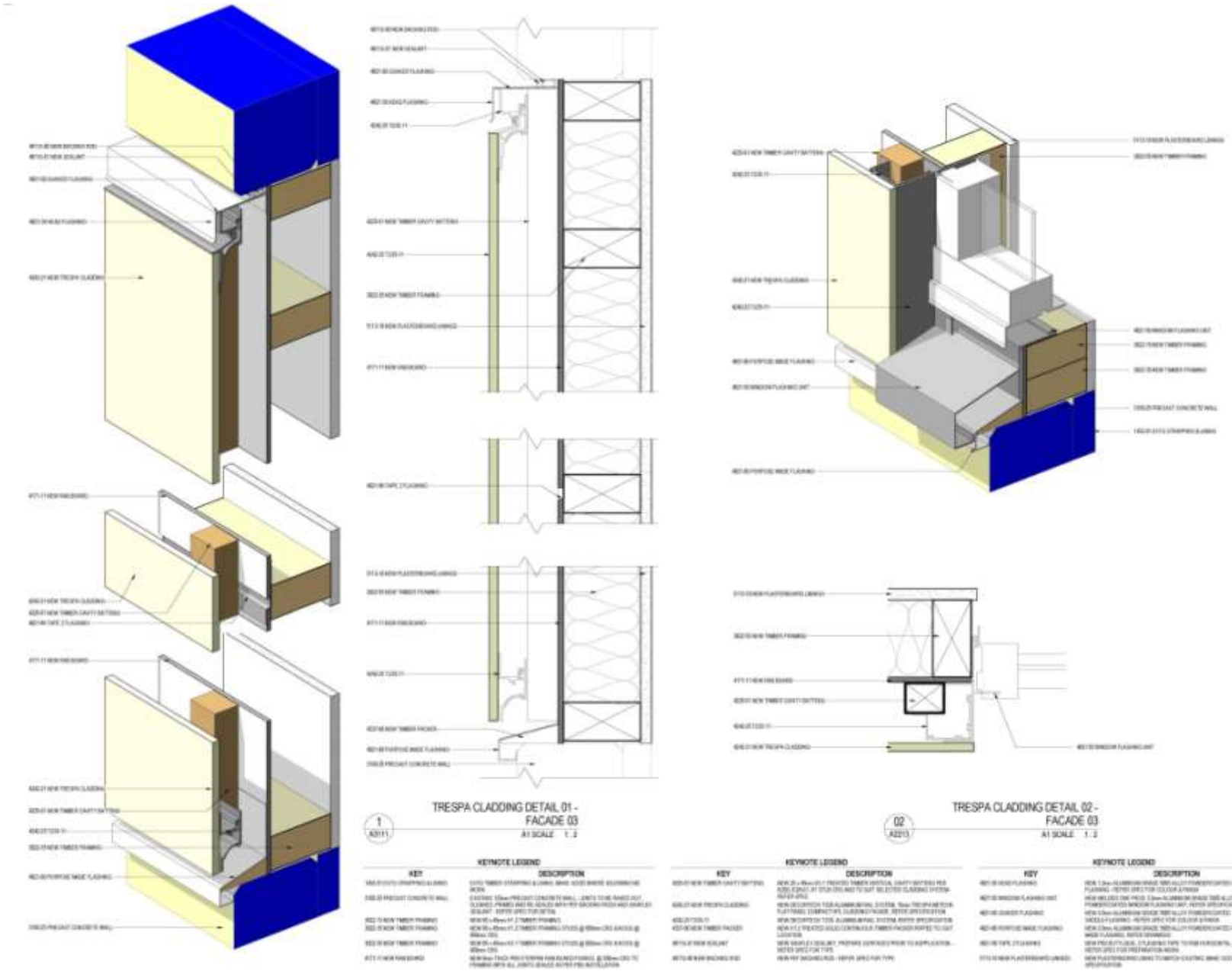
Detailed Design

Presentation of Information



TRESPA CLADDING DETAIL 01 - FACADE 03
1 A2111 A1 SCALE 1 : 2

TRESPA CLADDING DETAIL 02 - FACADE 03
02 A2213 A1 SCALE 1 : 2

KEYNOTE LEGEND

KEY	DESCRIPTION

KEYNOTE LEGEND

KEY	DESCRIPTION

KEYNOTE LEGEND

KEY	DESCRIPTION

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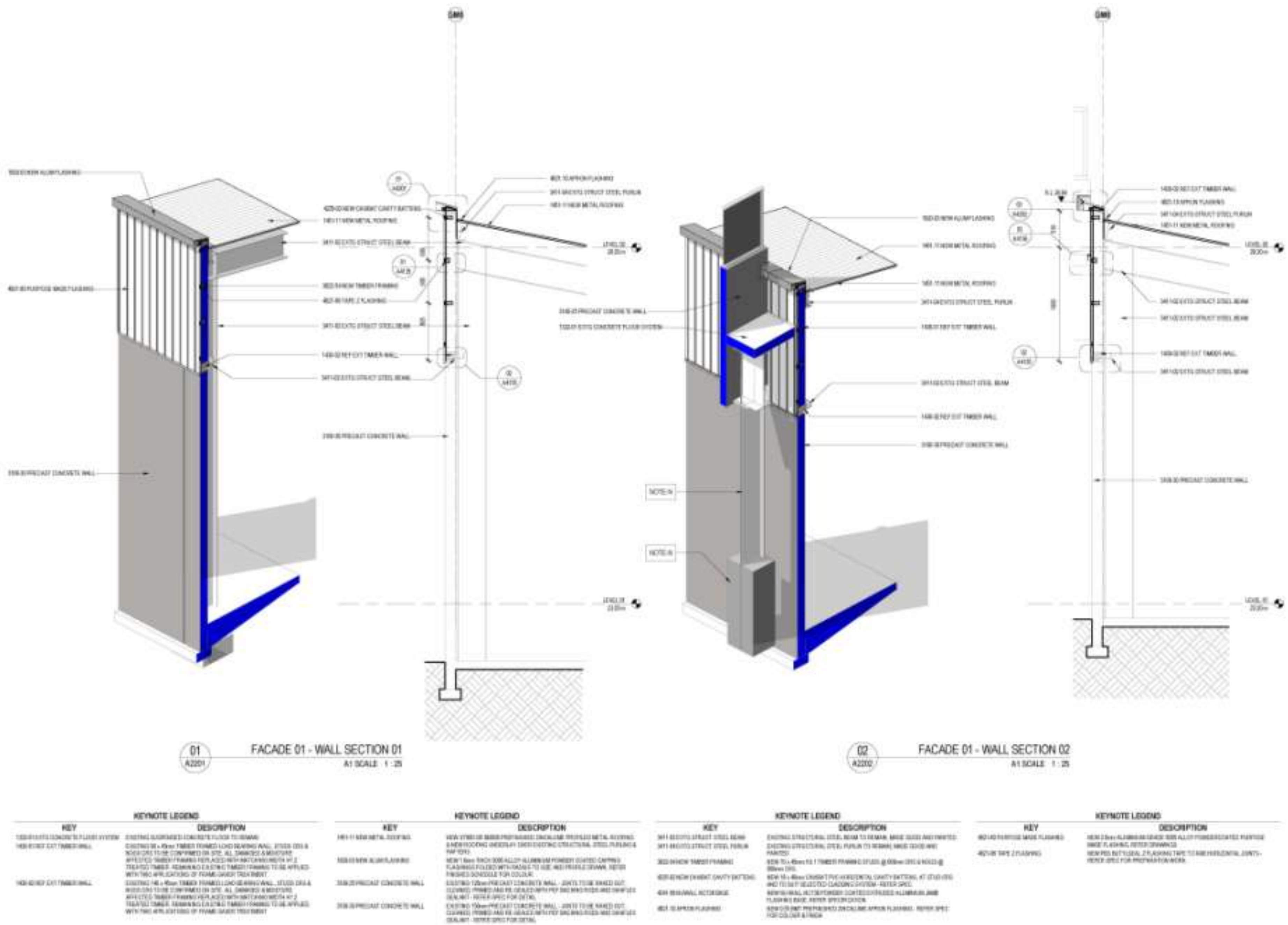
Detailed Design

Presentation of Information



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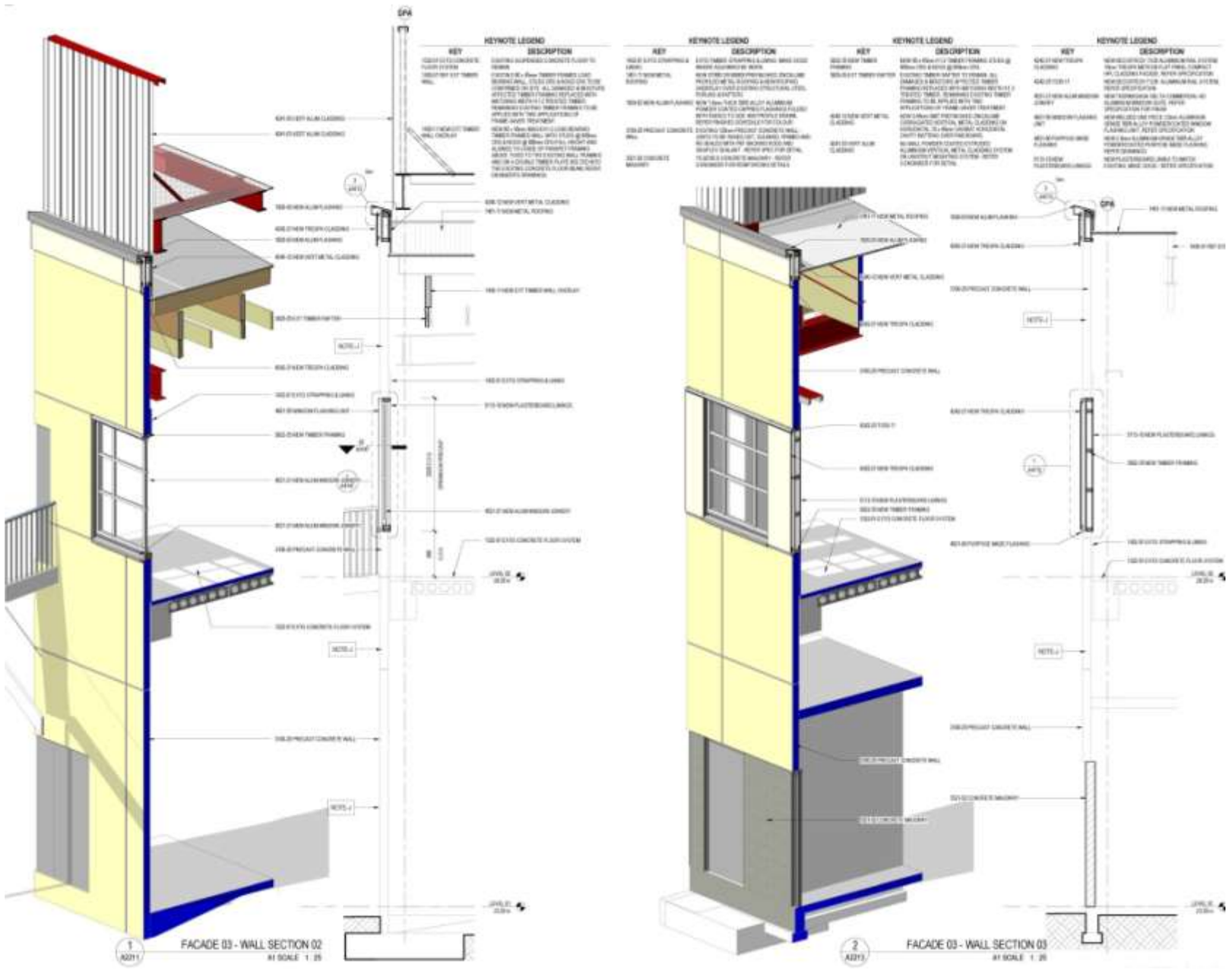

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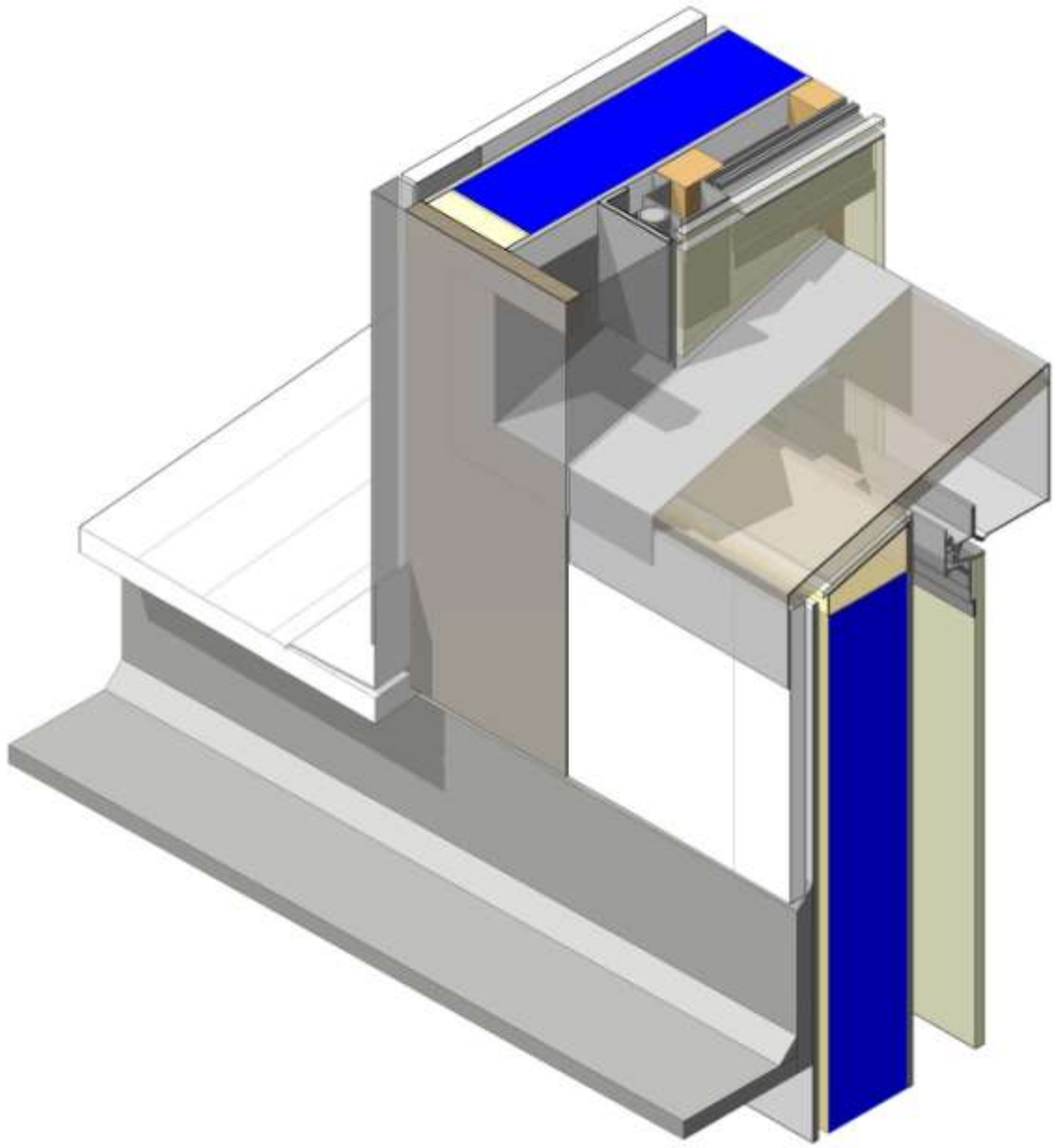
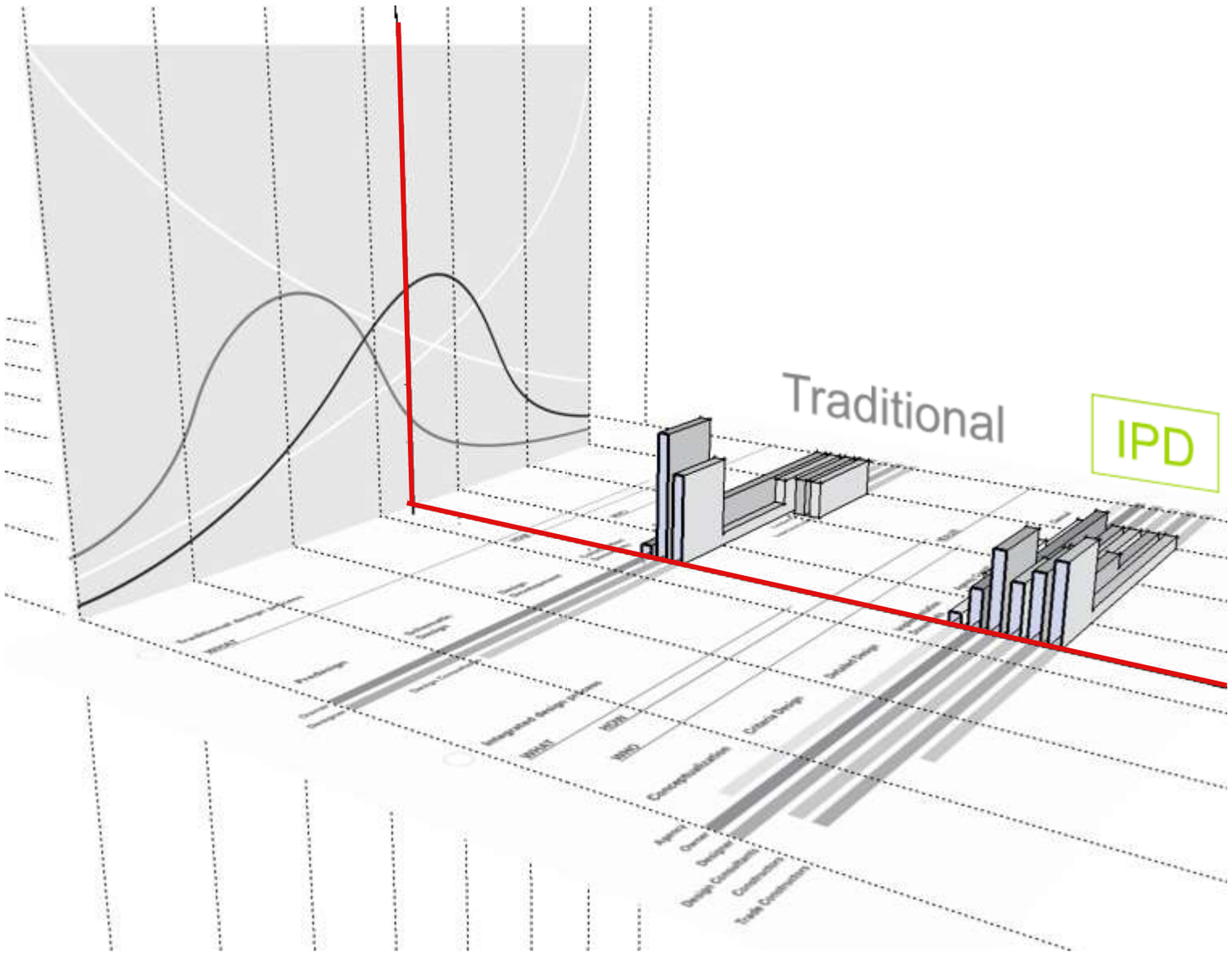
Level of Detail (LOD) 500 – Full Virtual Construction

Complex junctions resolved



Implementation Documents



During the Implementation Documents phase emphasis shifts to **HOW** the systems and structure will be created…

Outcomes

Finalize:

- Construction Means, Methods & Schedule
- Cost
- Specifications

Visualize project for the bank, other bidders

Complete ‘shop drawings’

Start prefabricating some systems

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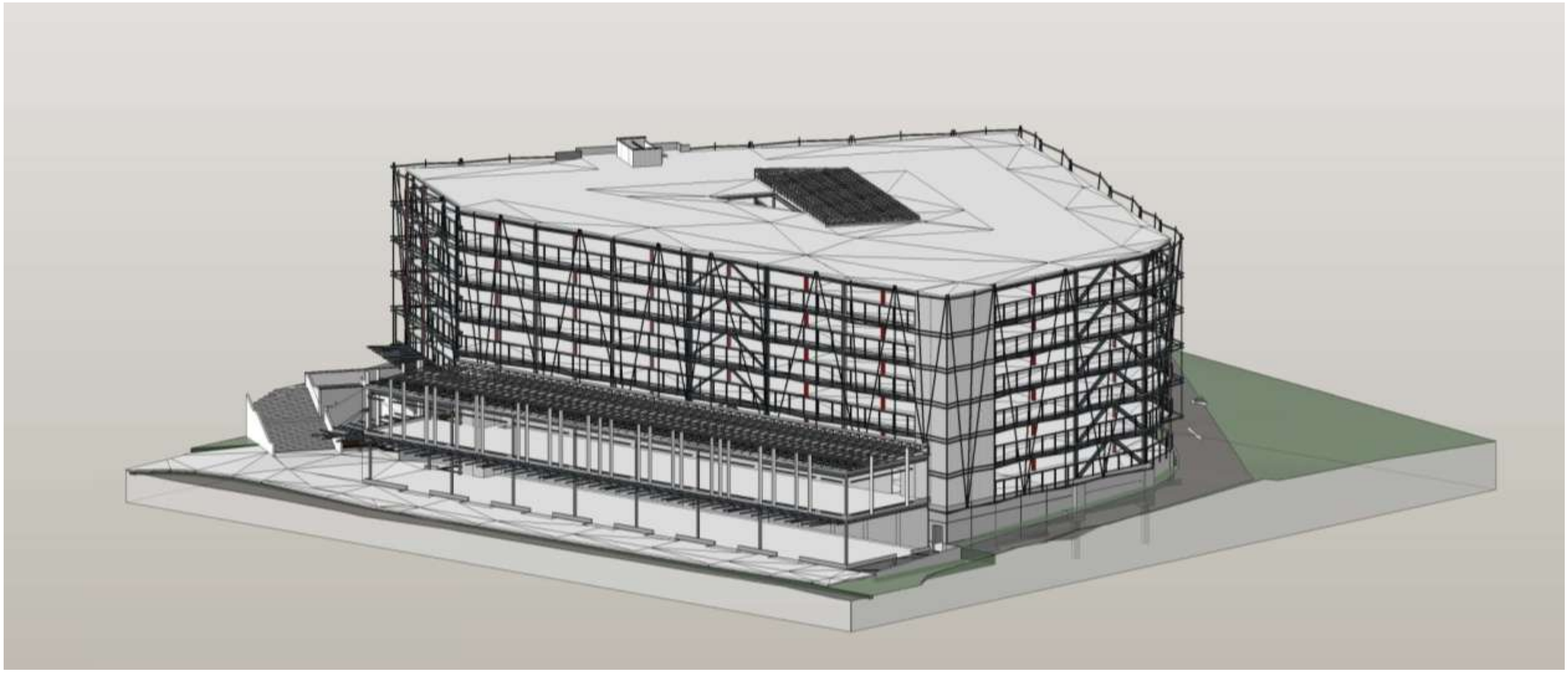
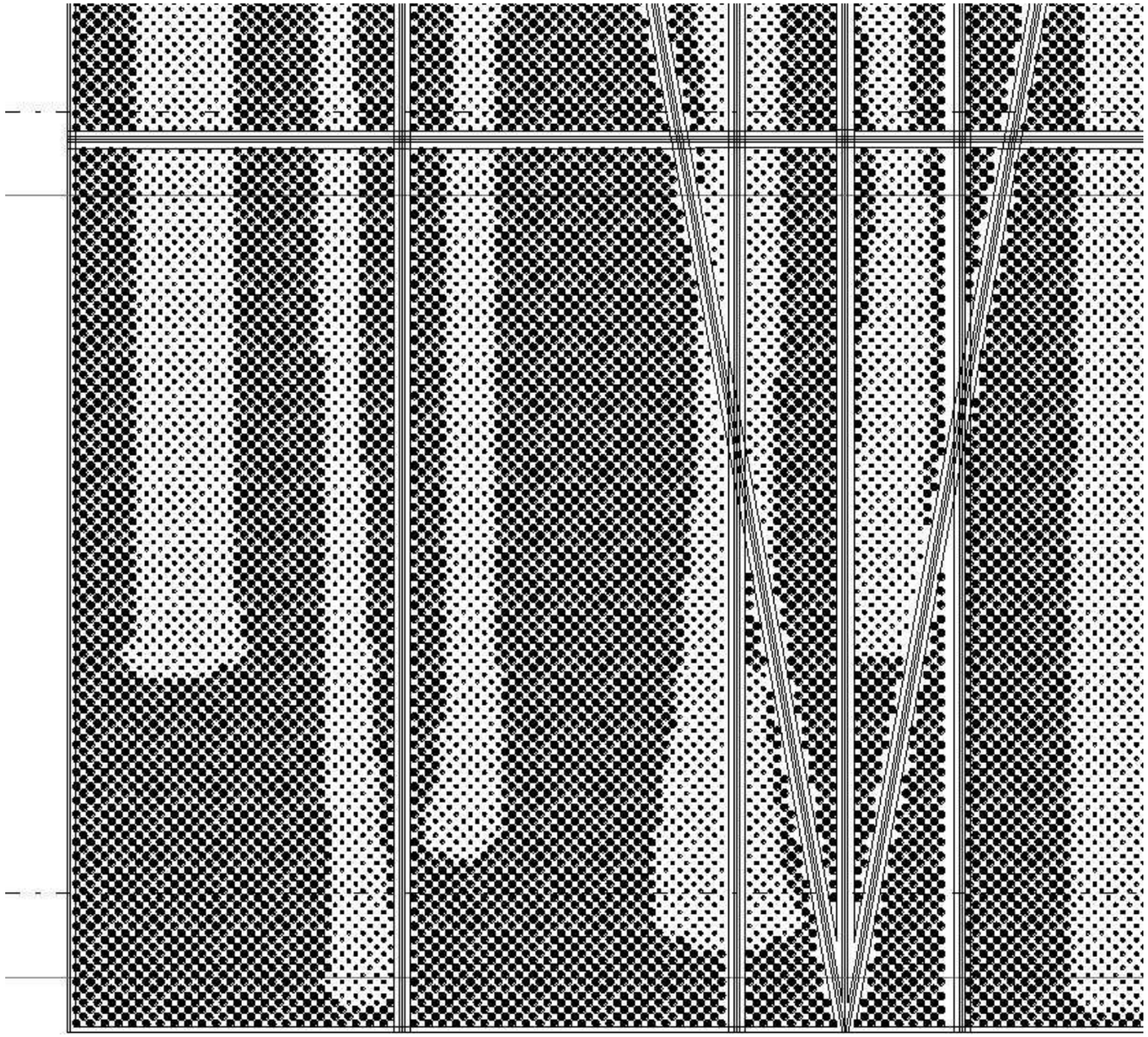
Implementation Documents

Auckland Hospital Car Park – Model data to D&H Steel



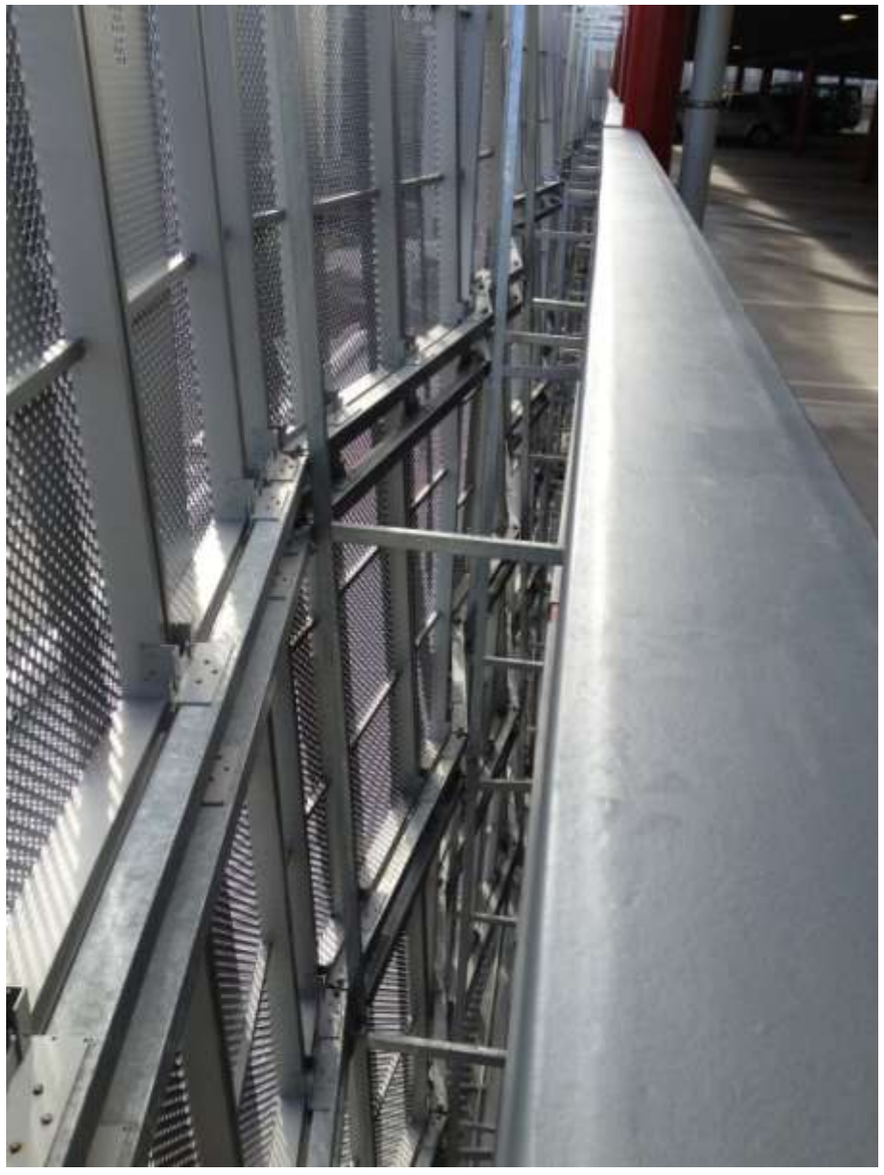
Implementation Documents

Auckland Hospital Car Park – Data to China for CNC manufacture of panels



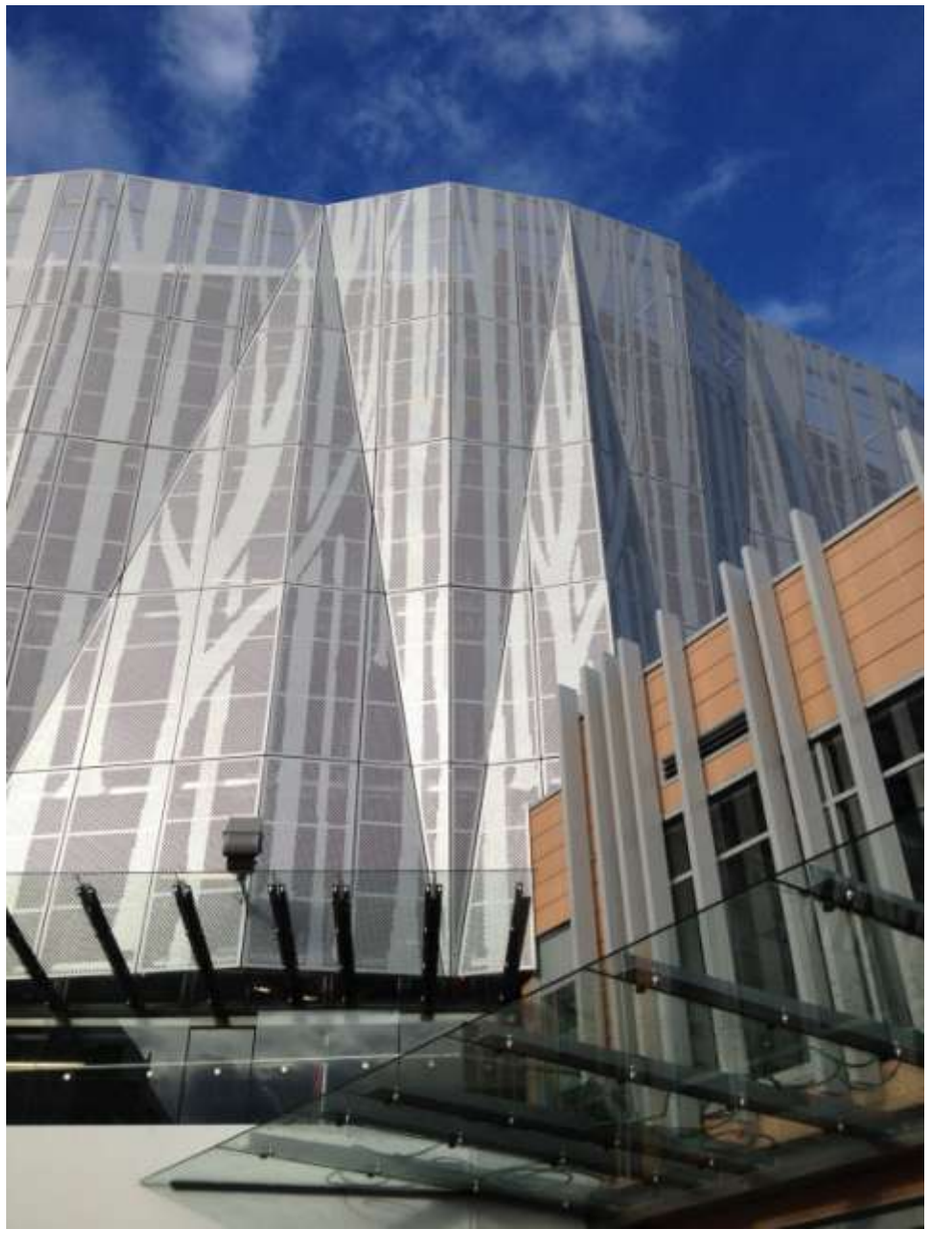
Implementation Documents

Auckland Hospital Car Park – Offsite manufacture: no on-site measure!

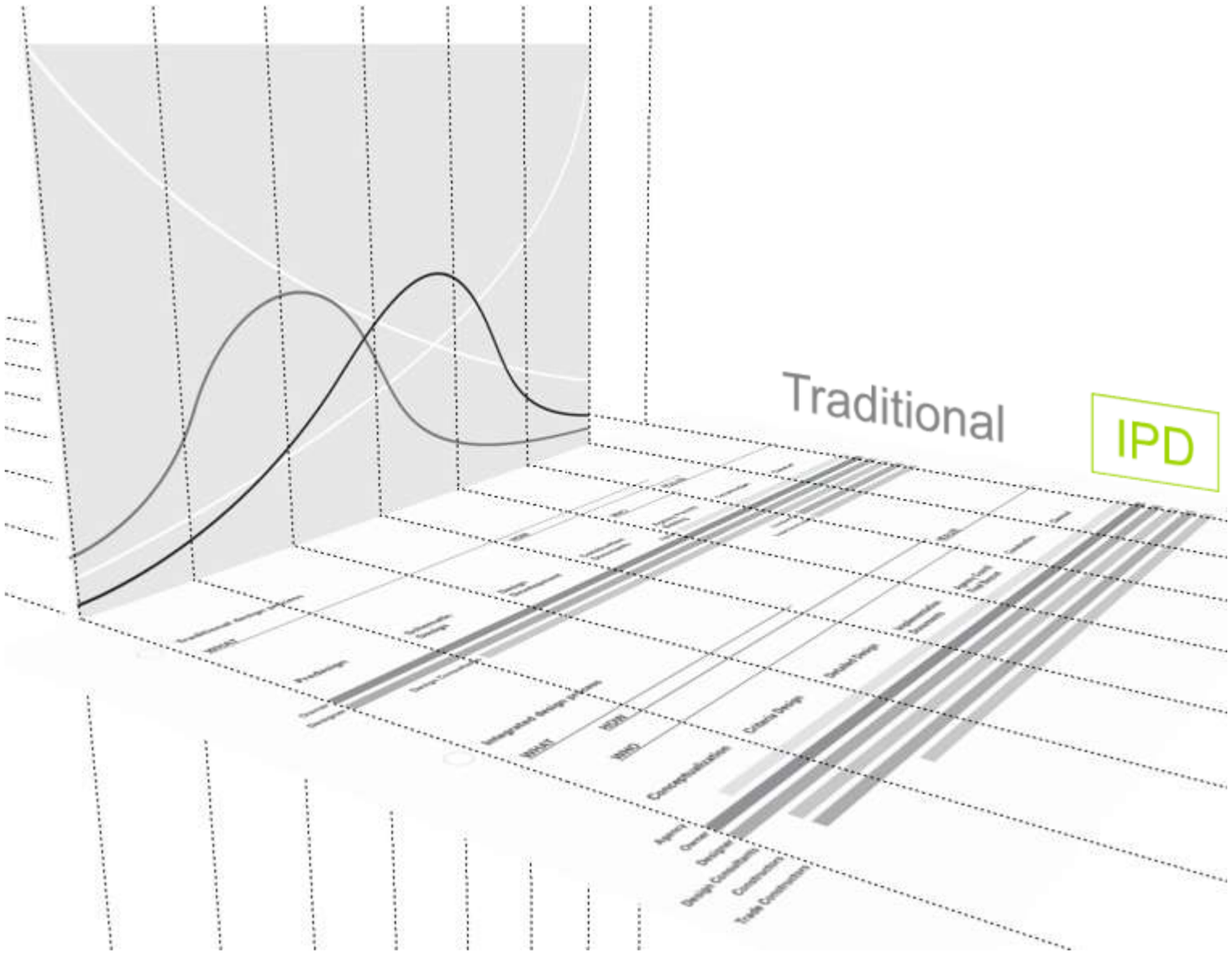


Implementation Documents

Auckland Hospital Car Park



Territorial Authority Review



Early involvement and validation by agencies shortens the permitting process…

Outcomes

Obtain all necessary permits and approvals

- Electronic (on-line) lodgement of data streamlines process
- T.A. interrogates BIM model for design

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Procurement

The Procurement phase is much shorter since most work is already contracted for…

Outcomes

Put in place commitments for all work, materials and equipment needed to complete the project

- Off-site manufacture underway
- Greater % of IPD project is constructed off-site = improvement in quality
- Integrated supply chain

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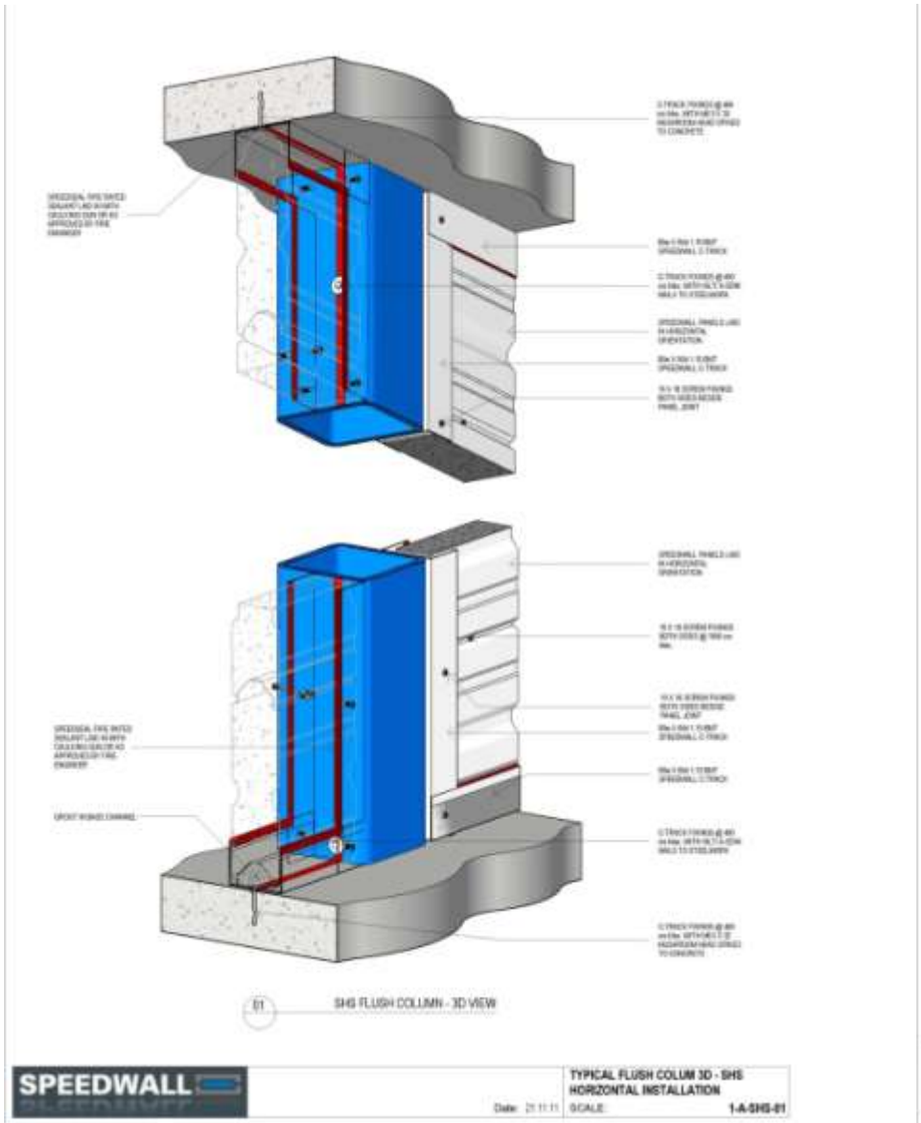
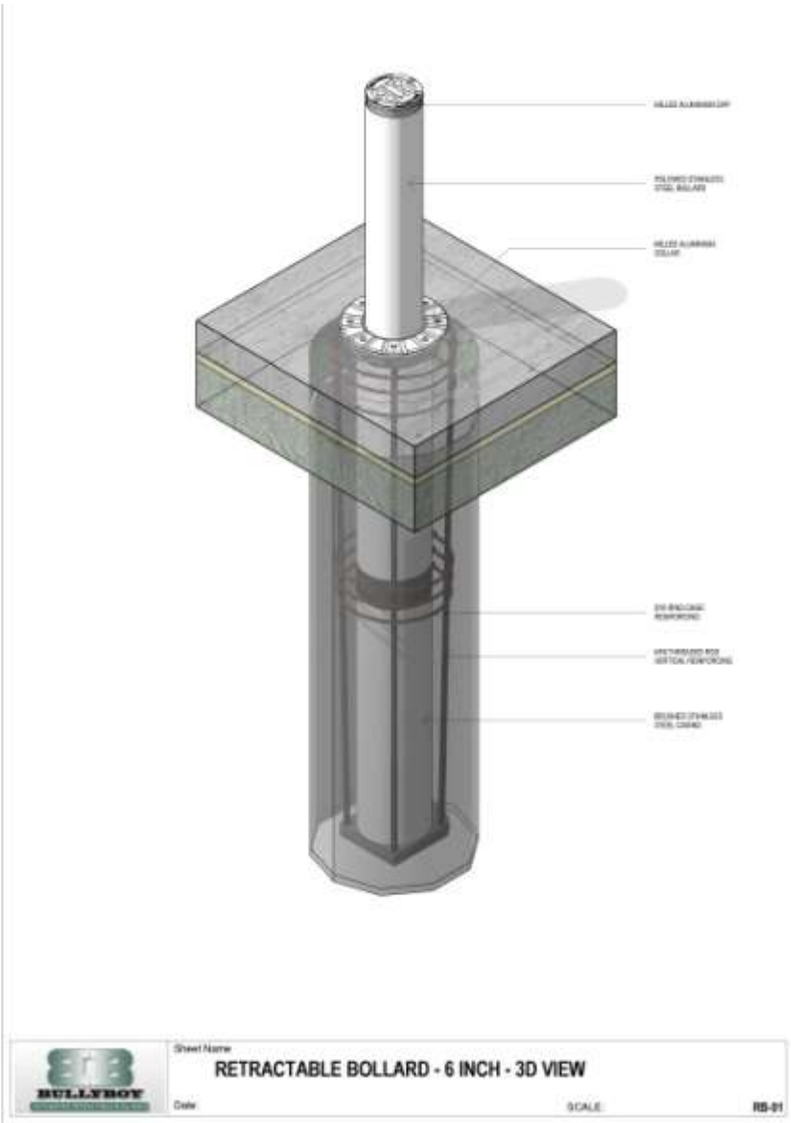
Procurement

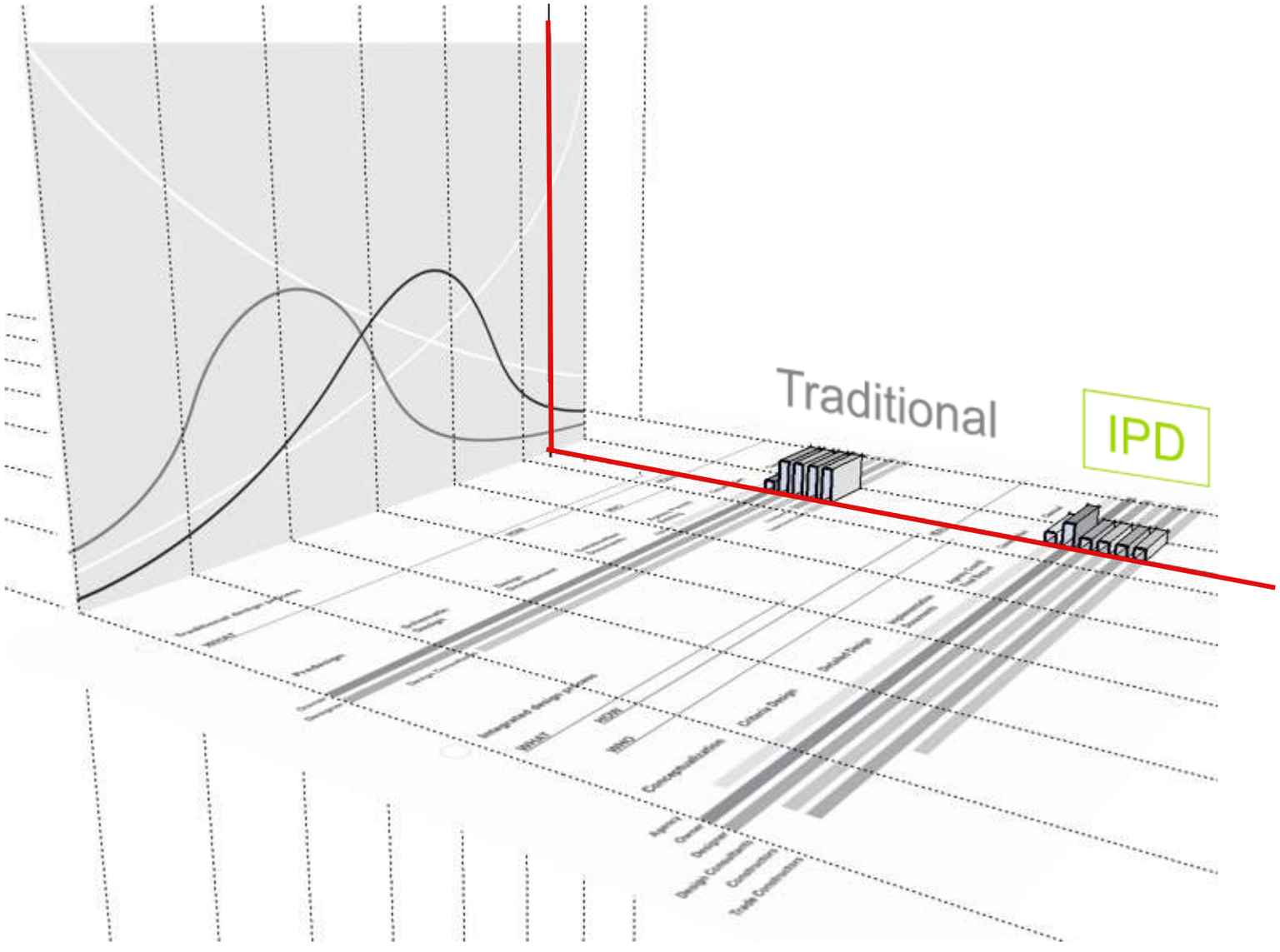
IGNITE’s current work with the supply chain





Build national library - Masterspec

Construction



The benefits of the integrated process are realised in Construction. This phase is about quality control and cost monitoring.

Outcomes

Complete the project

- Minimal RFIs from major trades
- Less contract admin effort required
- Lean Planning
- BIM model used for location-based management

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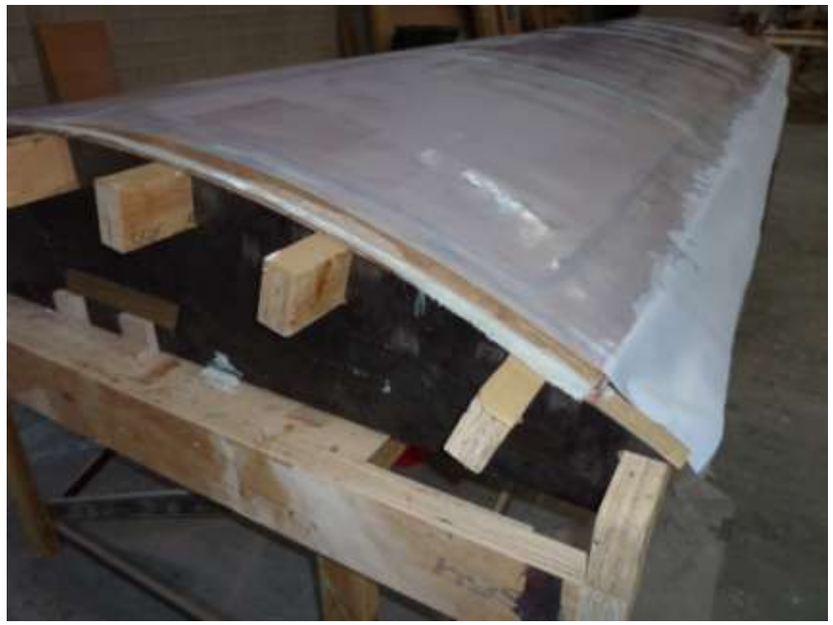
Off-site CNC



Construction

Kitset of parts

Construction

Highest quality

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Location-based Site Management / Flow-line Scheduling

Seppänen et al: The Combination of Last Planner System and Location-Based Management System

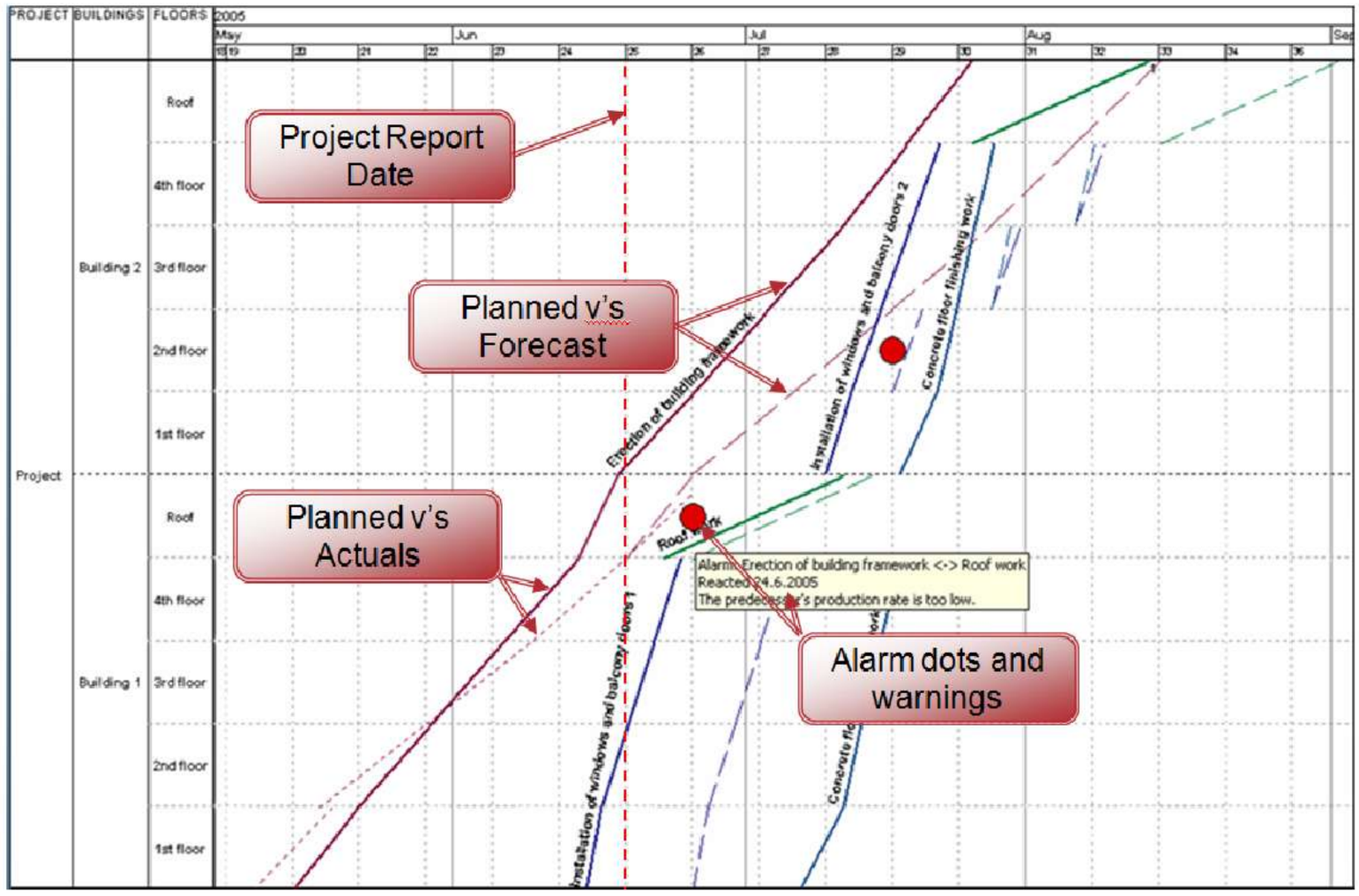


Figure 1: A flowline figure with the plan (solid line), actual (dotted line), forecast (dashed line), and alarms (red dots) shown

Location-based Site Management / Flow-line Scheduling

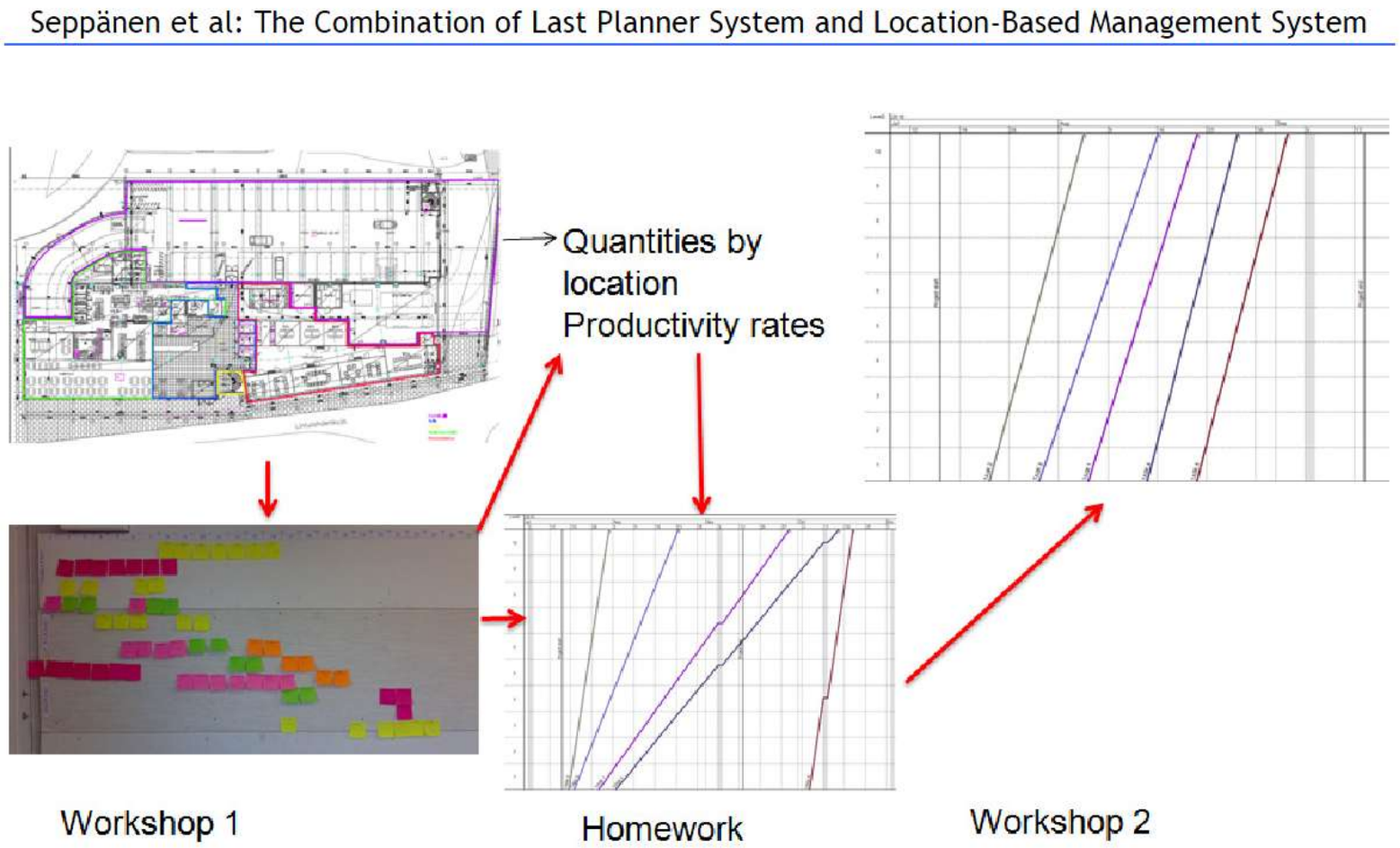
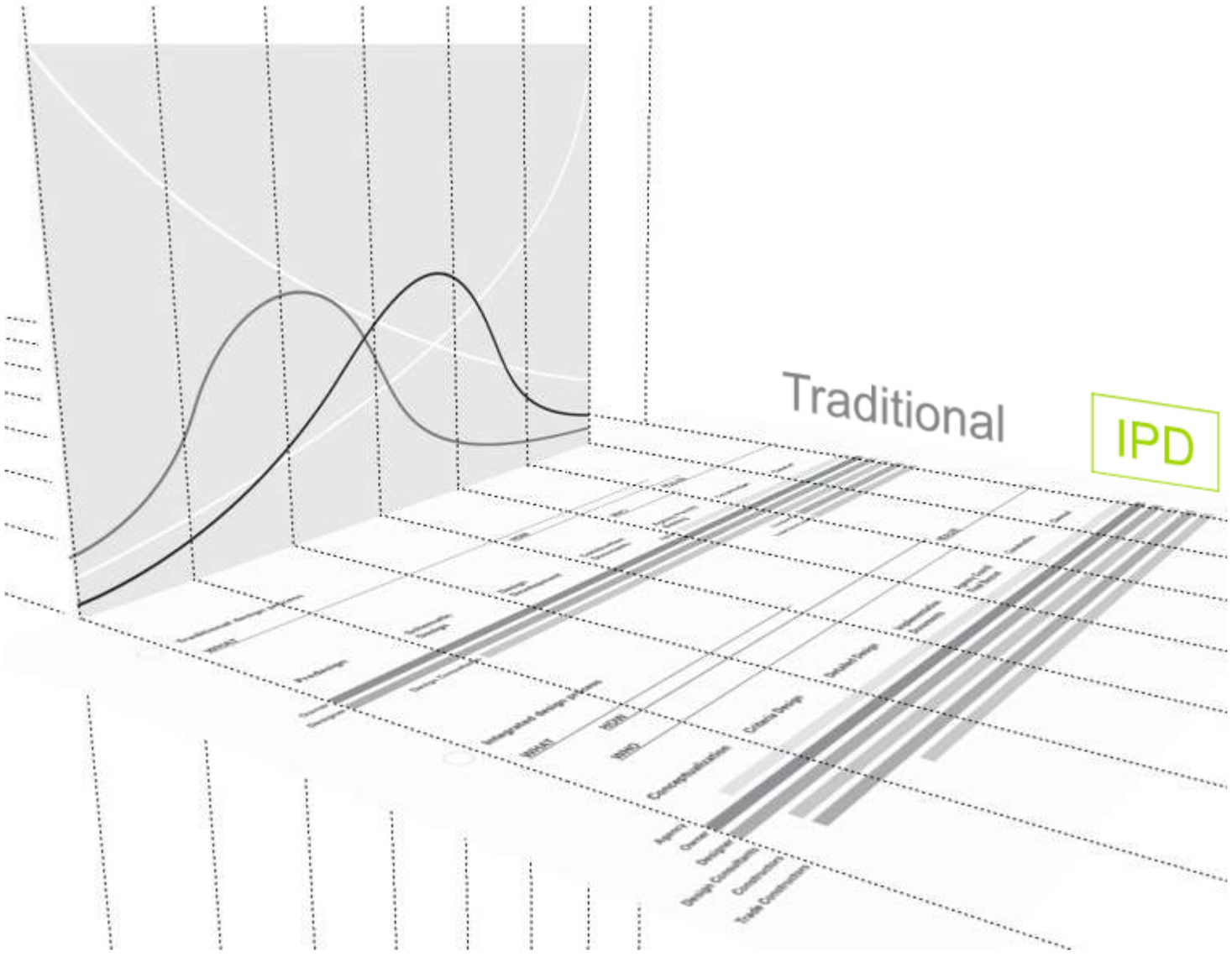


Figure 2: Proposed phase scheduling process. Workshop 1 is a pull scheduling session where Location Breakdown Structure of the phase is defined, and tasks and logic are captured using the familiar Last Planner sticky note method. The second workshop starts with an unaligned schedule with one crew working in each task. Aligning the production rates is done collaboratively in workshop 2. The end result is an aligned schedule capturing production rate commitments of all participants.

Closeout



An intelligent 3D model is delivered to the owner...

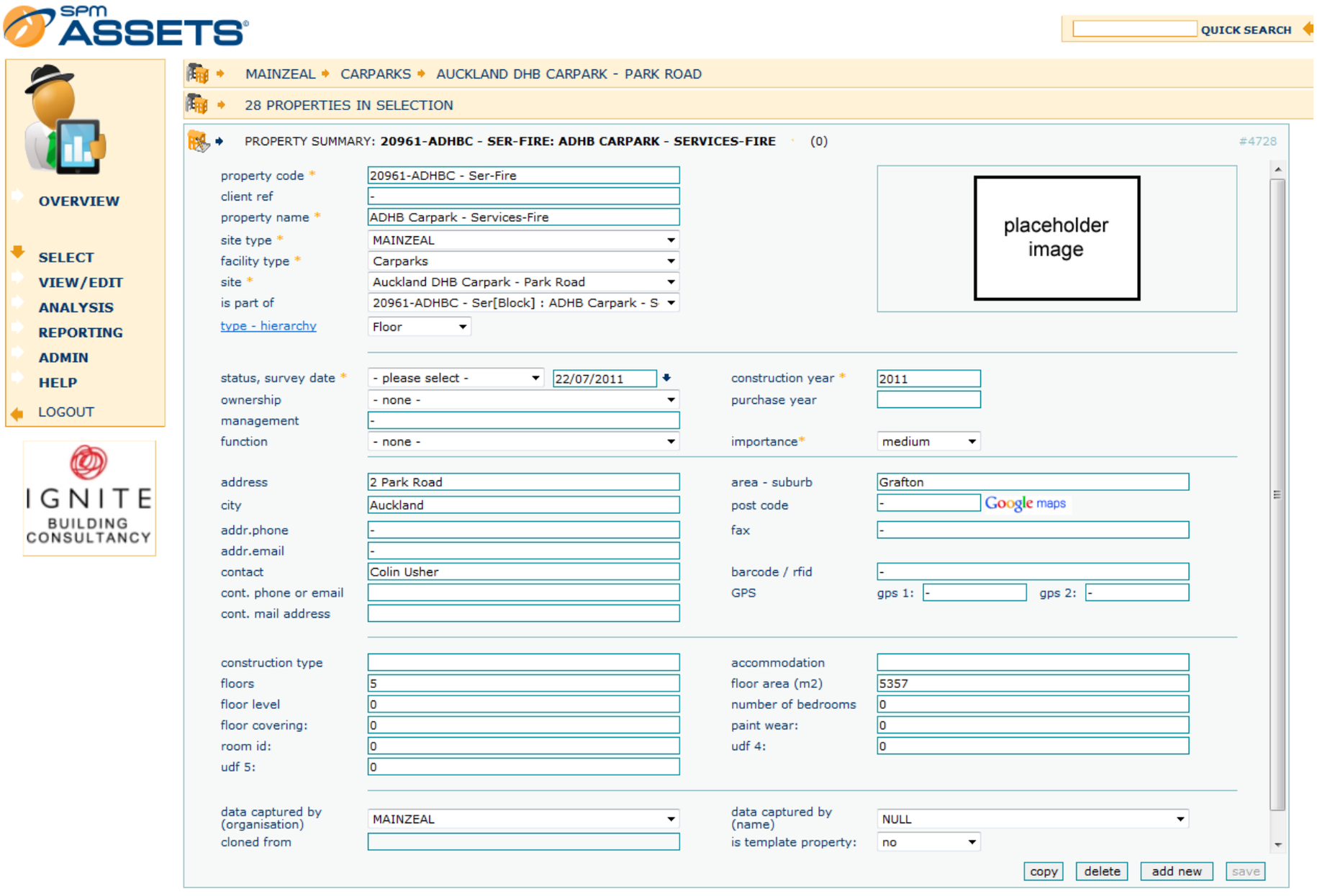
Outcomes

Deliver a complete ‘as-built’ model to the owner

- Life-cycle costs embedded in model
- Asset management plan linked to as-built model

Closeout

Files linked to Revit Model via SQL Database



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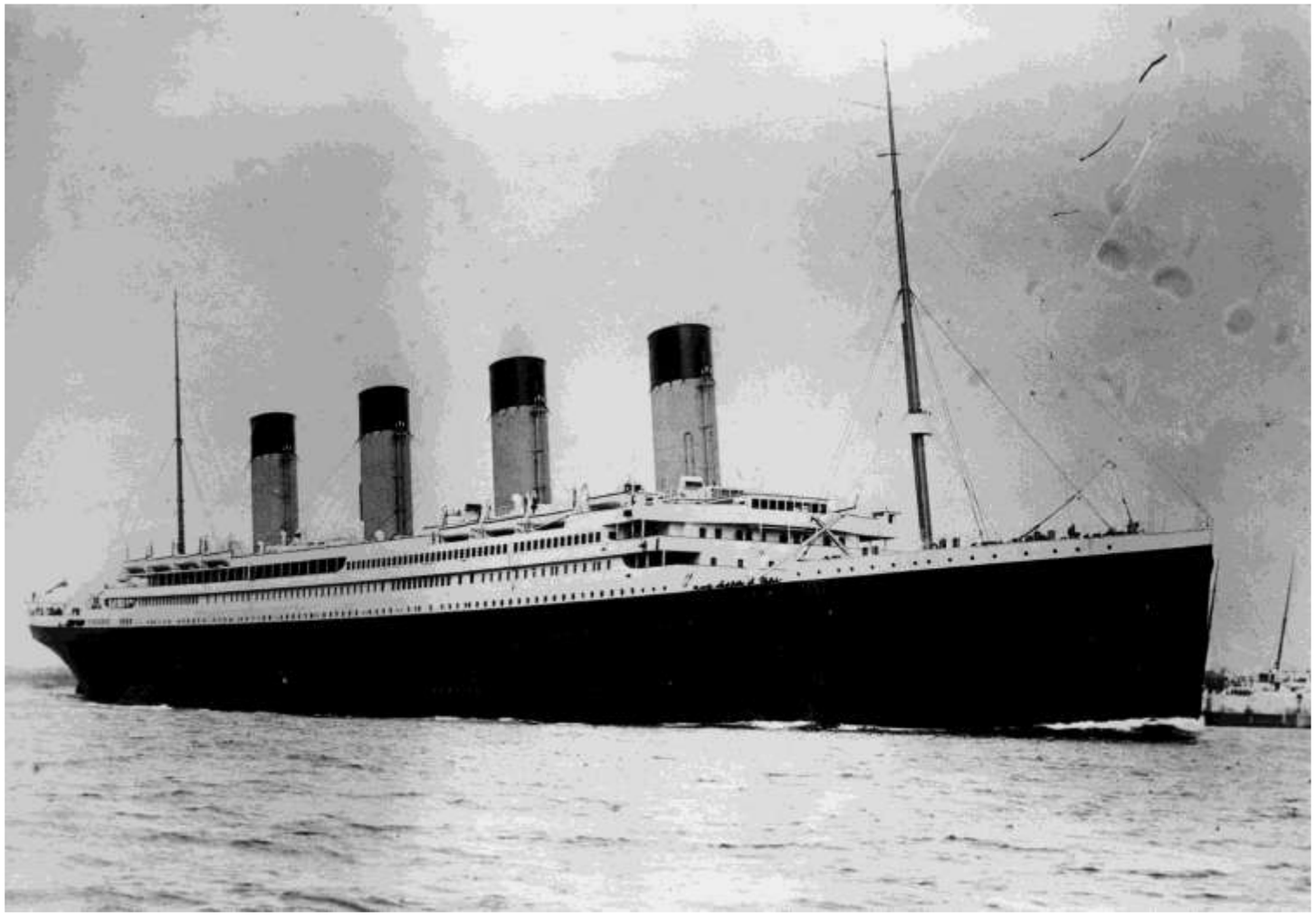
Change Management

‘Like turning the Titanic…’



What is IGNITE doing re. change management?

- Canvassing the industry
- Building relationships with:
  - Contractors
  - Suppliers
  - Other consultants
- Building a world-class in-house BIM team
- Committing to becoming a leader in this field
- Committing to R&D

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Change Management

Challenges to IPD Implementation

1. Fear of change – contractors – Design / Build
2. Weak culture of collaboration
3. Finding like-minded partners
4. Lack of defined liability – AIA Contract, Project Insurance
5. Costs (re. technology)
6. Steep learning curve (and long)
7. Lack of interoperability – single platform vs. Industry Foundation Class (IFC) protocol
8. Ensuring adequate compensation

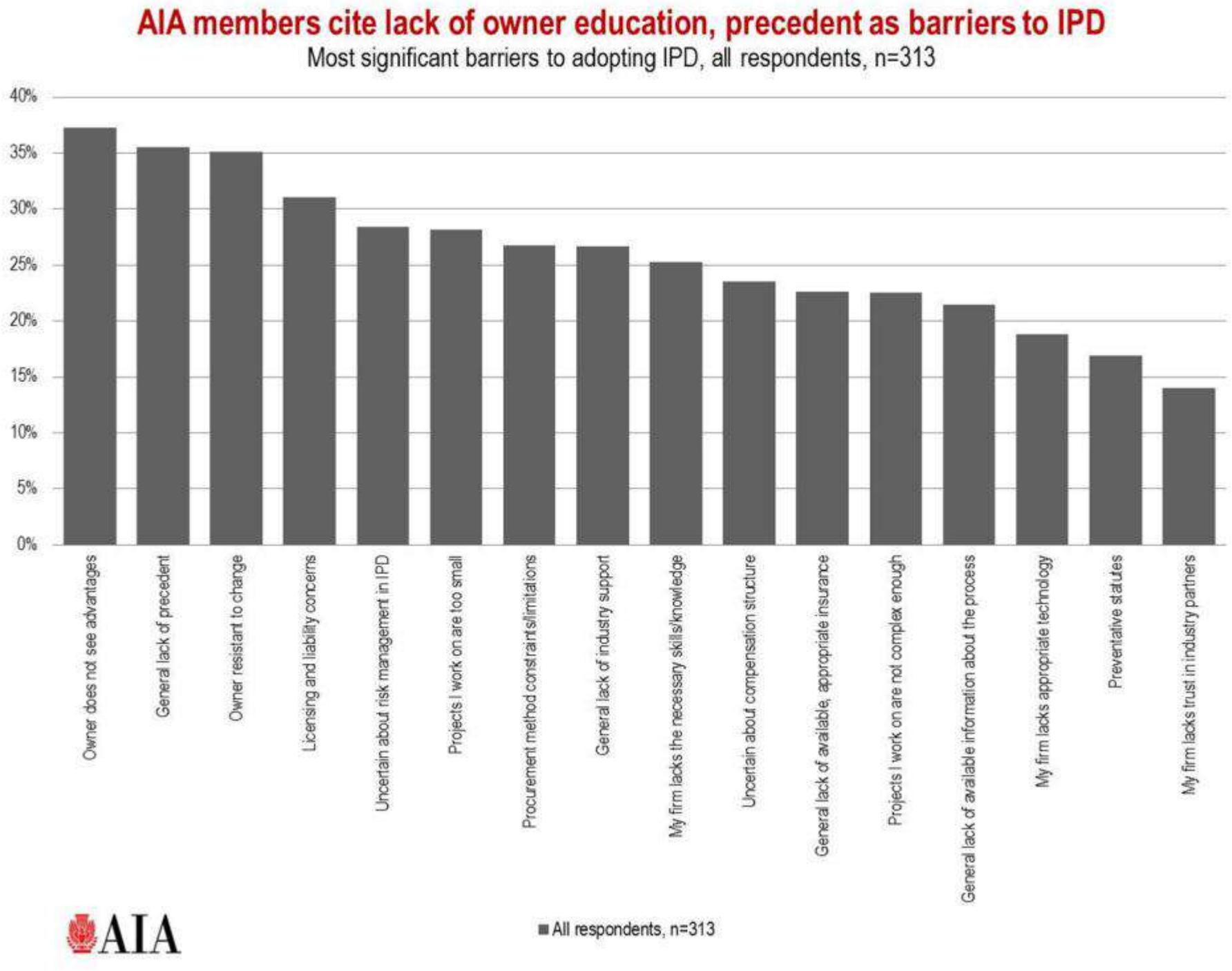
Change Management

Nature of IPD Contracts

IPD is more a relational process than an arms-length transaction.

- Create a compensation structure that encourages overall project success
- Structure participant relationships (tri-party, multi-party or single-purpose entity)
- Waivers of liability
- Project management structure which encourages participation in decision-making and conflict resolution from day one
- Use standard form agreements for IPD projects
- Implement project-specific insurances

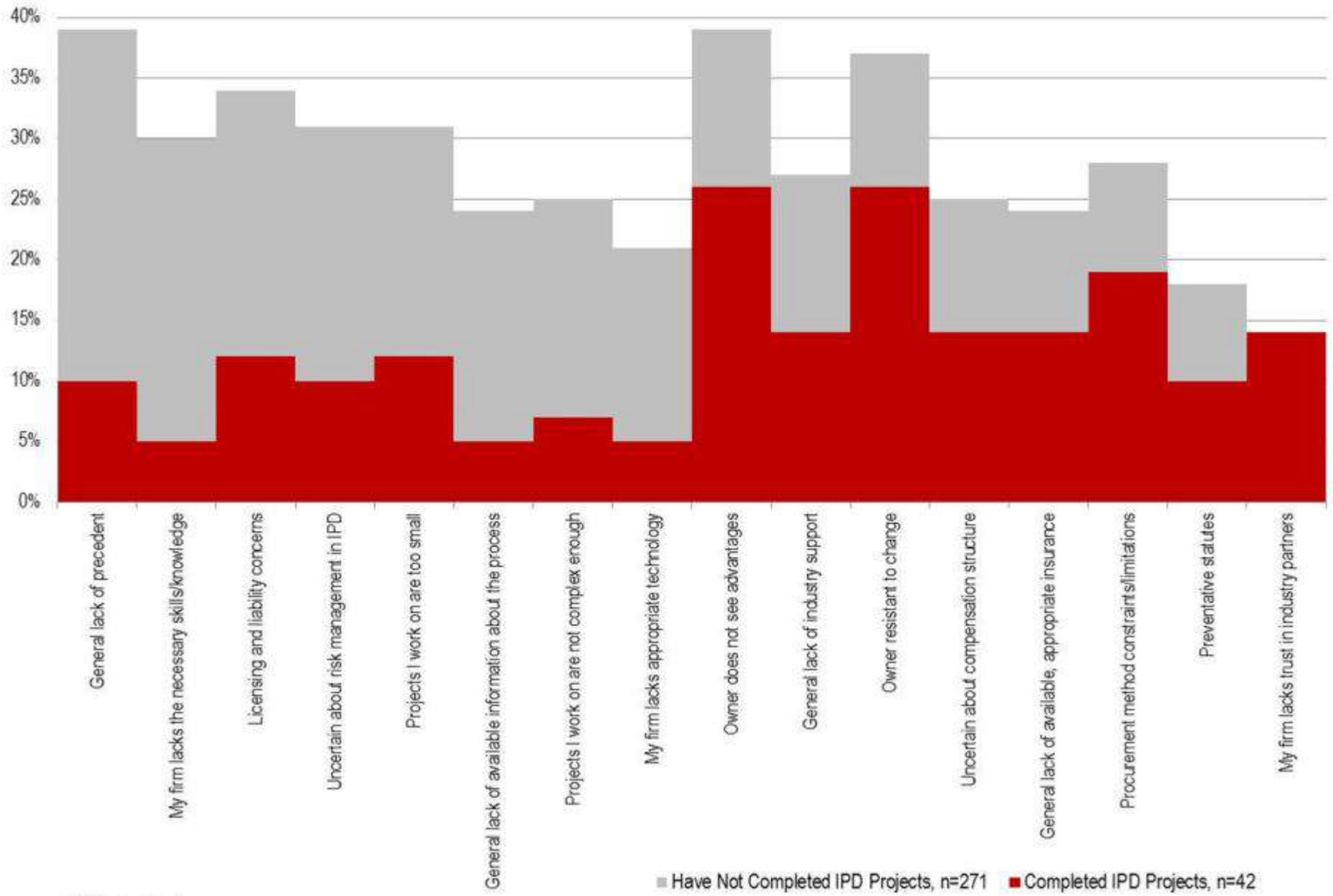
Change Management



Change Management

Owner-related barriers persist even with experience

Most significant barriers to adopting IPD by experience



AIA

NOTE: "Completed IPD Project," n=42 (*note small sample base), refers to respondents reporting one or more project underway and/or completed within the last two years using a contractual IPD Model

Change is Now

Envision a new world, where…

- Facilities managers, end users, contractors and suppliers are all involved at the start of the design process
- Processes are outcome-driven and decisions are not made solely on a first cost basis
- All communications throughout the process are clear, concise, open transparent and trusting
- Designers fully understand the ramifications of their decisions at the time their decisions are made
- Risk and reward are value-based and appropriately balanced among all team members over the life of the project
- The industry delivers a higher quality and sustainable built environment…

This is the world of Integrated Project Delivery.