DESIGN COORDINATION

30 October 2019

Introduction

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

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Construction Workshop

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THE BUILDING INTELLIGENCE GROUP®

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Agenda

1. Background
2. Key Issues
3. Impact
4. The Clients Experience
5. The BIM part of the Solution
6. Problems and Solutions
7. Conclusion
8. Questions

1. Background

WE'VE BEEN AROUND LONGER AND HAVE PEOPLE IN MORE PLACES THAN ANYONE ELSE.

OUR ICONIC PROJECTS HAVE HELPED SHAPE URBAN LANDSCAPES FOR OVER 30 YEARS.

80+ people

30 years delivering project success

9 locations

100% NZ owned by people who work in the business

$400 million worth of projects under construction for 2019

156k m² of fitout completed in 2018

OUR LOCATIONS

- AUCKLAND
- TAURANGA
- HAWKE'S BAY
- WELLINGTON
- NELSON
- CHRISTCHURCH
- QUEENSTOWN
- DUNEDIN
- INVERCARGILL

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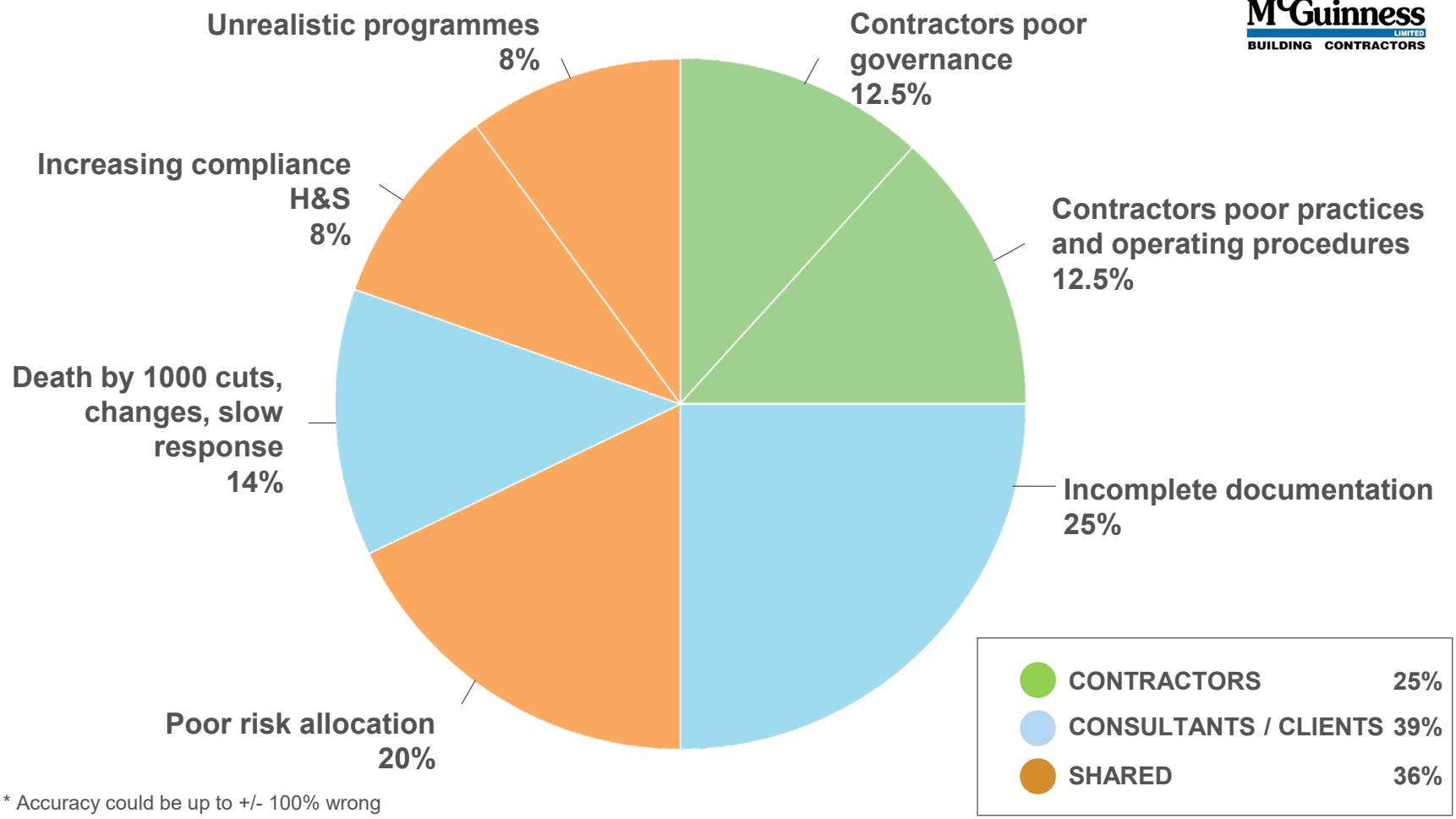
1. Background

- Design coordination is seen as a key challenge for the industry
- Poor design coordination results in
  - high contract administration effort (= low productivity / profitability)
  - abortive costs (variations) and
  - EOTs (time + cost)
- This presentation seeks to outline the problem and some solutions

1. Background – A Contractors View

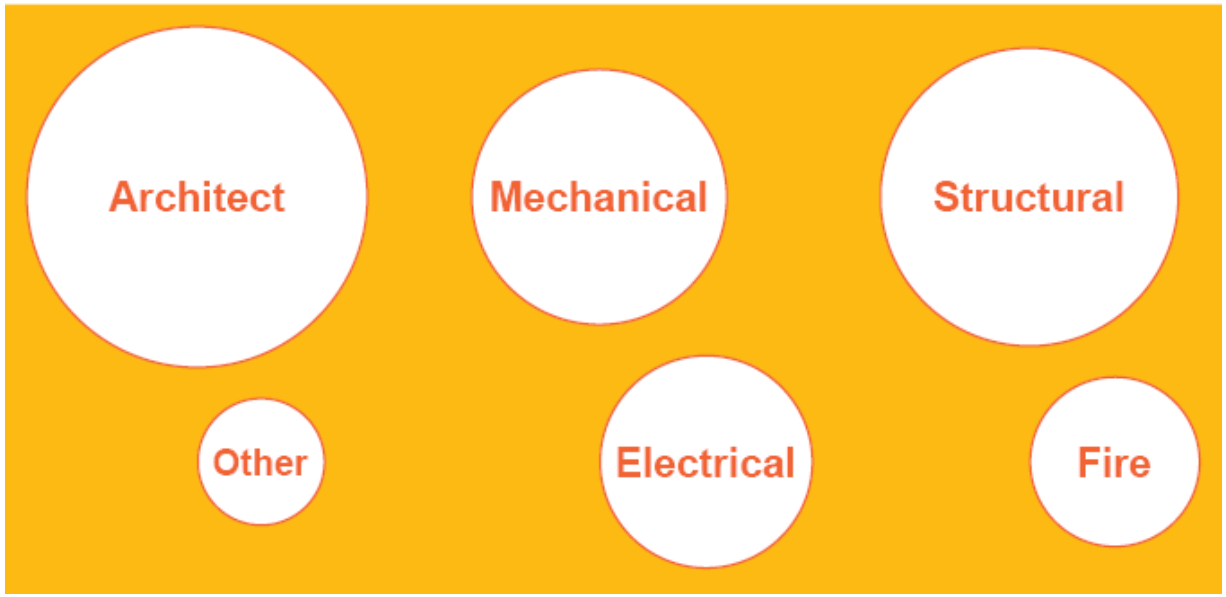
THE PROBLEM SLIDE



* Accuracy could be up to +/- 100% wrong

2. Key issues – Scope gaps

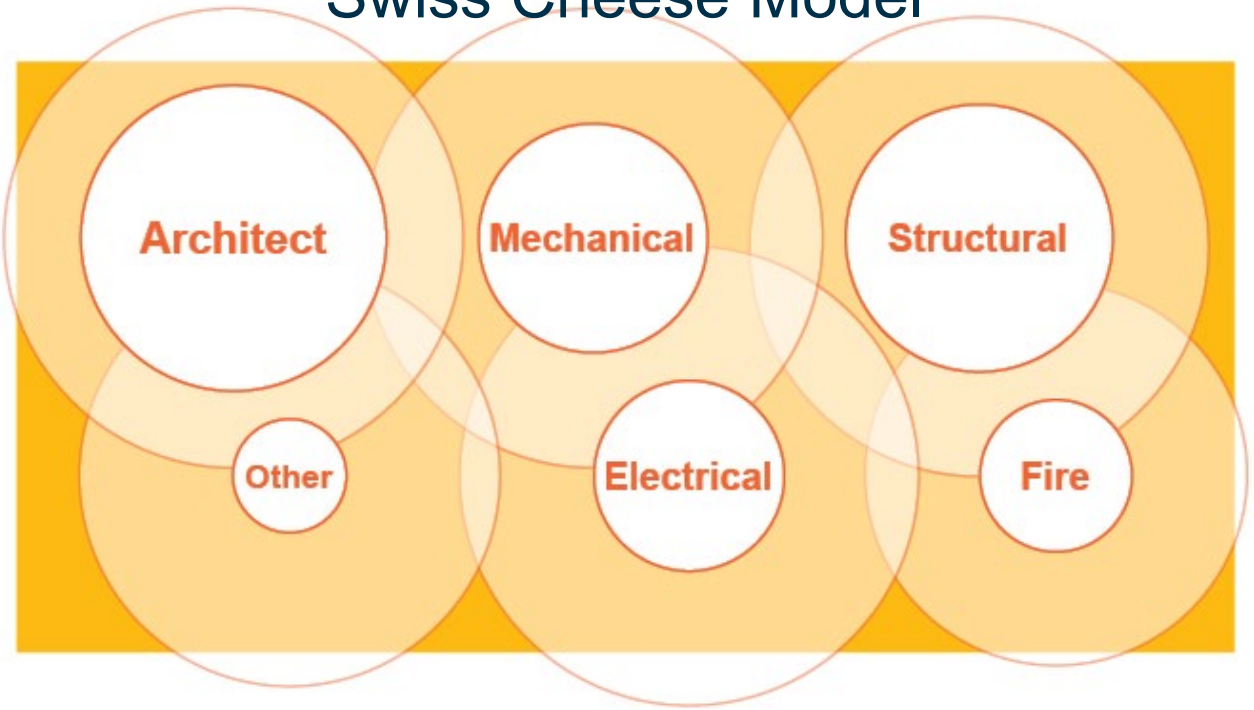
Swiss Cheese Model



- D&B Elements excluded
- Poor scoping / briefing of consultants
- Poor interface between disciplines, functions and elements

2. Key issues – Scope gaps

Swiss Cheese Model



- Ideally consultant scopes interface seamlessly to allow good collaboration, coordination and consultation

2. Key issues – Deferred activity

Discipline	Design Phase				
	Concept	Preliminary	Developed	Detailed	Shop drawings (Construction)
Architectural	Concept	Preliminary	Developed	Detailed	Shop drawings
Structural	Concept	Preliminary	Developed	Detailed	Shop drawings
Facade		Concept	Preliminary	Developed	Detailed + Shop drawings
Sprinklers				Concept + Preliminary	Developed + Detailed + Shop drawings
Non-structural seismic					Concept + Shop drawings

D&B elements are designed out of sync with the main design

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Sprinklers				Concept + Preliminary	Developed + Detailed + Shop drawings
Non-structural seismic					Concept + Shop drawings

Consultant effort (particularly the architectural discipline) has a severe peak at detailed design

2. Key issues – Deferred activity

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Sprinklers				Concept + Preliminary	Developed + Detailed + Shop drawings
Non-structural seismic					Concept + Shop drawings

This peak gets “lopped” to level resource demand

2. Key issues – Typical omissions

▪ Non-structural seismic	▪ Downpipes
▪ Deflection heads	▪ Condensate drains
▪ Setout / Dimensions	▪ External levels
▪ Acoustic ratings	▪ Slab set downs
▪ Passive fire design	▪ Plant deck accessways
▪ Fire ratings	▪ Fall Restraint
▪ Landscaping electrical	▪ Non-structural slabs/screeds
▪ DPM	▪ Landscaping / civils
▪ Access hatches	▪ Door hardware
▪ Accessibility requirements	▪ Seismic Joints
▪ Buildability	▪ BMS

2. Key issues – Typical issues

- Internal elevations not provided
- Reflected ceiling plans not provided
- Items documented in relevant discipline (floor drains in P&D)
- Warrantees / guarantees not clear
- Completion documentation requirements
- “Design intent”
- Specs not cross checked with drawings
- Loose references to NZS standards
- “Fit for purpose” “Design by others”
- Reluctance to share Revit model with others
- Subconsultant scopes not clear
- Disciplines not coordinated

3. Impact

	Project 1	Project 2	Project 3	Project 4
Construction Contract Value	$11,071,639	$13,672,108	$21,411,370	$5,012,670
Avg. RFI's/CI's per month	28/38 per month	24/47 per month	62/12 per month	7/7 per month
Variations due to poor design	$379,157	$647,190	$740,262	$0
% of total variations	33%	52%	38%	$0
Poor design/ documentation cost	$553,586	$647,190 + PM fees	$844,966	$0
% of Construction Value	5%	4.73%	3.95%	0%

4. Design Coordination

Client's View – Ministry of Education

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

Ministry of Education

The Government's lead advisor on the New Zealand education system, including:

- helping schools function by providing **property**, transport and information technology services[1]

Education Infrastructure Service (EIS) is responsible for the management of the state school property portfolio.

- Around 2,100 schools
- Replacement value of $28.7 billion
- annual capital spend of $906 million in 2018/19

Capital Works provides a project stakeholder and strategic lead on the significant and complex capital projects across three regions:

- Northern (Auckland and Northland)
- Central (Wellington to Hamilton)
- Southern (South Island)
- Approx. 60% annual EIS spend is via CW ~$550m spend in 2018/19 = ~$2.2m working day

Quality and Stakeholder Expectations

- Maximise user benefit through **quality** solutions that are *best for project* and stakeholders
- Inadequate design coordination results in make do solutions on site rather than considered specific design solutions.
- Results in a solution that does not fit with end-user requirements

Programme and Completion Deadlines

- Ministry projects often driven by school term dates and fixed completion dates.
- Design coordination issues realised on site often lead to programme delays, delayed completion and user occupation.
- Delayed or partial user occupation can significantly detract from project benefit realisation

Value for Money and Cost Certainty

- Tax payer $ and value for money key driver in Ministry project delivery.
- Rectification of design coordination issues post-design phase results additional and unforeseen cost through consultant fees and construction contract variations.
- Multi-level internal approval process compounds programme implications and incurs significant internal cost and time.
- Lack of cost certainty during construction drives reduced internal confidence.

Stakeholder Management

- Ministry of Education is responsible for leading on school stakeholder management and developing and delivering against project brief.
- Inadequate design coordination leads to mis-alignment of stakeholder's/end-user's expectations against the agreed brief.
- Solutions?
  - Clarity of scope and accountability of design management
  - BIM - technology and specialist software

5. The BIM Part Of The Solution

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Introduction - Who are We?

- Professional BIM Managers and Design Coordinators
- Design, Construction, and Property Focused
- Key Markets – Vertical Infrastructure, Portfolio Property Development
- Selected Clients – MOE, University of Canterbury, Westfield, Metlifecare
- Our focus is to reduce risk, create efficiencies, and increase quality for the design, construction, and management of property assets.

Let’s Keep this Simple

Some basic questions for today:

- Why?
- How?
- When?
- Who?

Why do BIM during Design Coordination?

2 Short Answers:

Leverage Opportunities

Risk Mitigation

How – Our Process During Design Phase

- Procure design team to realistic, achievable, and definable BIM and design deliverables.
- Set up design and project team on common data environment and infrastructure that enables, enhances and streamlines the design phase processes (design, cost, risk, programme).
- Monitor, manage, and report on BIM, design documentation, and design coordination objectives. Assess success at each design issue.
- Assist the design and project team in completing the design documentation and design coordination process

How – BAU Opportunities Created Through Having BIM

- As built documentation takes on a whole new meaning
- Communication about newly constructed assets is improved
- Data about assets becomes visible at the macro level
- Portfolio wide data interrogation becomes reality
- The dataset exists for the entirety of the asset from construction to decommissioning or sale

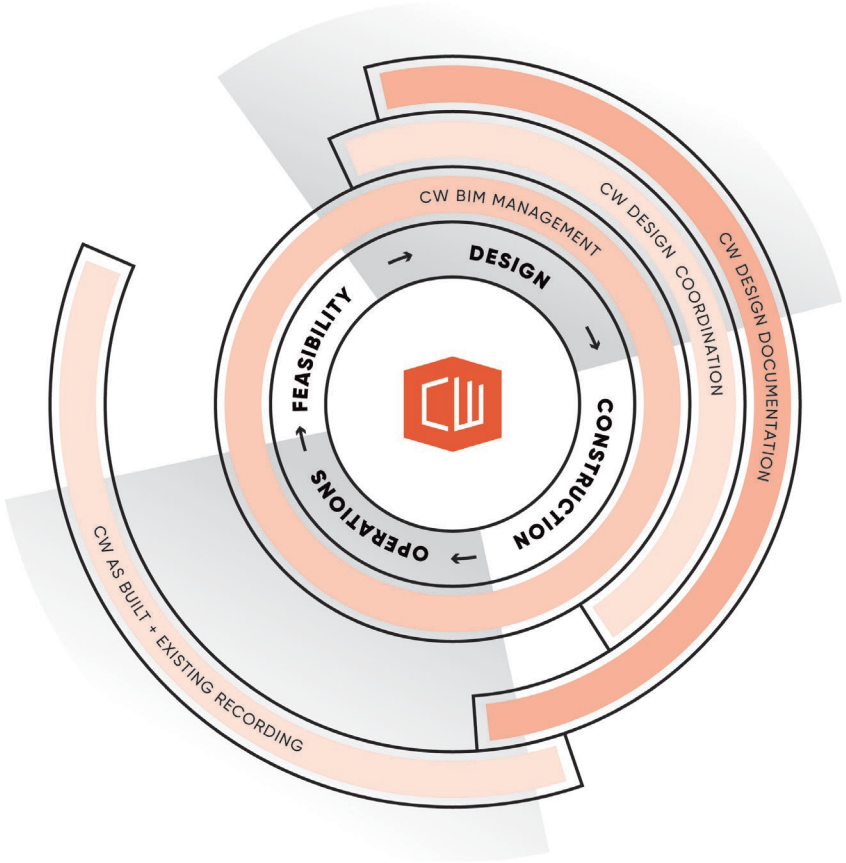
Who?

- Project Team
- Designers and Engineers
- Stakeholders

When are we involved in the process?

- Procurement
- Concept Design
- Preliminary Design
- Developed Design
- Detailed Design

When are we involved in the process?



6. Problems & Solutions

PROBLEM	POSSIBLE SOLUTIONS
Not enough time allowed for design / coordination activity	• Allow time for coordination in programme • Utilise “last planner” principles to obtain consultant and client buy-in to achievable and clear programmes • Strong discipline around design model “freeze points” • Run all disciplines concurrently (i.e. not staggered) or have a plan to manage staggered design • PM to clearly articulate consequences of Client changes
Clear roles and responsibilities	• Clarity around who owns design coordination (lead designer) vs design management (project manager) • Lead consultant needs to be empowered to coordinate • Robust scoping / briefing – RFP or PEP • Utilise CIC Guidelines (2004 vs 2016) • Recognise design coordination / leadership is a skillset • Recognise and “plug” typical scope gaps (see separate slide)
Design fees crunched in competitive situations	• Demonstrate / Understand the value – cost benefit of good coordination can be quantified • Compete on core design services and negotiate specialist services

6. Problems & Solutions

PROBLEM	POSSIBLE SOLUTIONS
BIM use not optimised	• Robust model sharing protocols • Robust BIM briefs – less aspiration and more deliverables. Option to have performance based brief with return brief confirming details. • Industry upskill (designers, PMs, Clients, contractors) • Maintain strong communication across design team • Clear BEP signed-up by all • Clients requirements understood • Whole team works in 3D • Phased LOD requirements • Strong communication across team • Independent / dedicated BIM Manager (not conflicted)

D&B elements not coordinated with design documentation	• Either
	  ○ Fully design D&B elements OR
	  ○ Partially design D&B elements to allow sufficient space and interface for later coordination (time allocated for later coordination)
	• Central coordination owned by Client

6. Problems & Solutions

PROBLEM	POSSIBLE SOLUTIONS
Good Design Coordination not defined by industry	• Provide definition in documentation; *"Good Coordination = From information provided the solution should be obvious"* • Remember – it's a prototype - there needs to be tolerance
Contractors surprised by design effort expected of them (and hence lack capability)	• Identify clearly elements requiring Construction Design in tender documentation • Clearly define shop drawing process including roles and responsibilities in tender documentation

7. Conclusion

1. **Good design takes planning**
    a. Strong client brief
    b. Clear decision making processes
2. **Investing in good design makes good sense**
    a. Make time for good design
    b. Invest in skills/experience/peer review
3. **Clarity of roles and responsibilities**
    a. Robust consultant scoping
    b. Clear contractor design responsibilities
    c. Lead consultant empowered to coordinate
4. **Robust team communication**
    a. Consequences of change clear
    b. Tease-out team requirements
5. **Leverage BIM**
    a. Clear BEP signed-up by all
    b. All-in
    c. Robust model sharing protocols