



Safe Design of Buildings at Universities

Never Stand Still

Malcolm Gallagher

Objectives

- Explain the basic safe design approach
- Show the results of a survey conducted of the Go8
- Look at what we have been doing at UNSW
- Give an insight in to how to start implementing a similar program

Safe Design

Must involve:

- Decision makers and stakeholders
- Consider the purpose and life cycle of the building.



Why bother?

2004 - ASCC (SWA) study

- 37% of 210 workplace fatalities design related
- 30% of injuries design related

Commission of the European communities (CEC)

- 35% of fatal accidents in construction can be attributed to design decisions

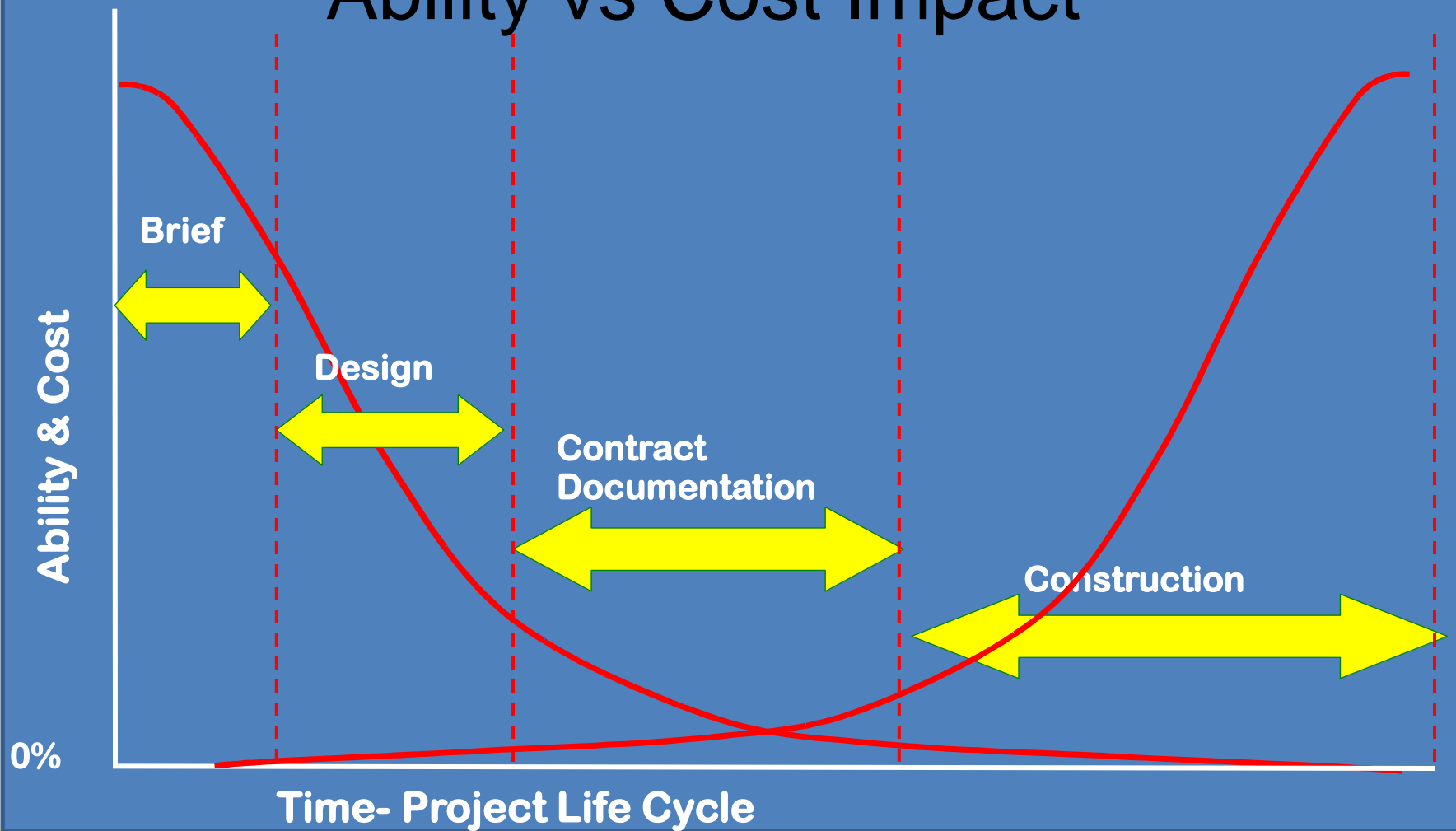
Cost over lifetime

STAGE	Establish project environment	Establish project team + strategy	Project business plan	Design	Construct	Operate	Use
COST RATIO	0.0001	0.001	0.01	0.1	1.0	10	100

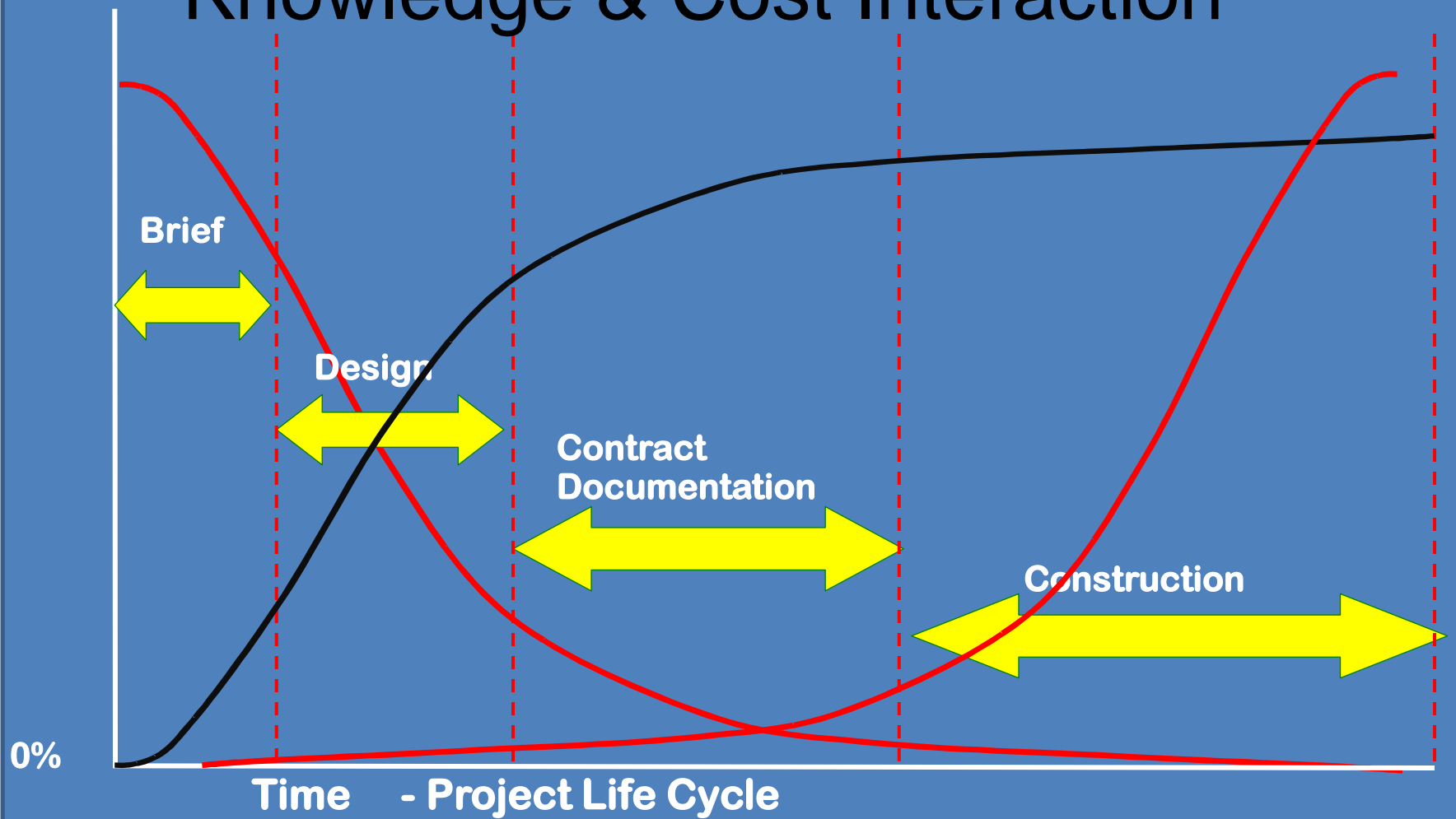
UNSW Energy Technology Building

Establish project environment	Establish project team + strategy	Project business plan	Design	Construct	Operate	Use
\$12,000	\$120,000	\$1.2M	\$12M	\$120M	\$1.2B	\$12B

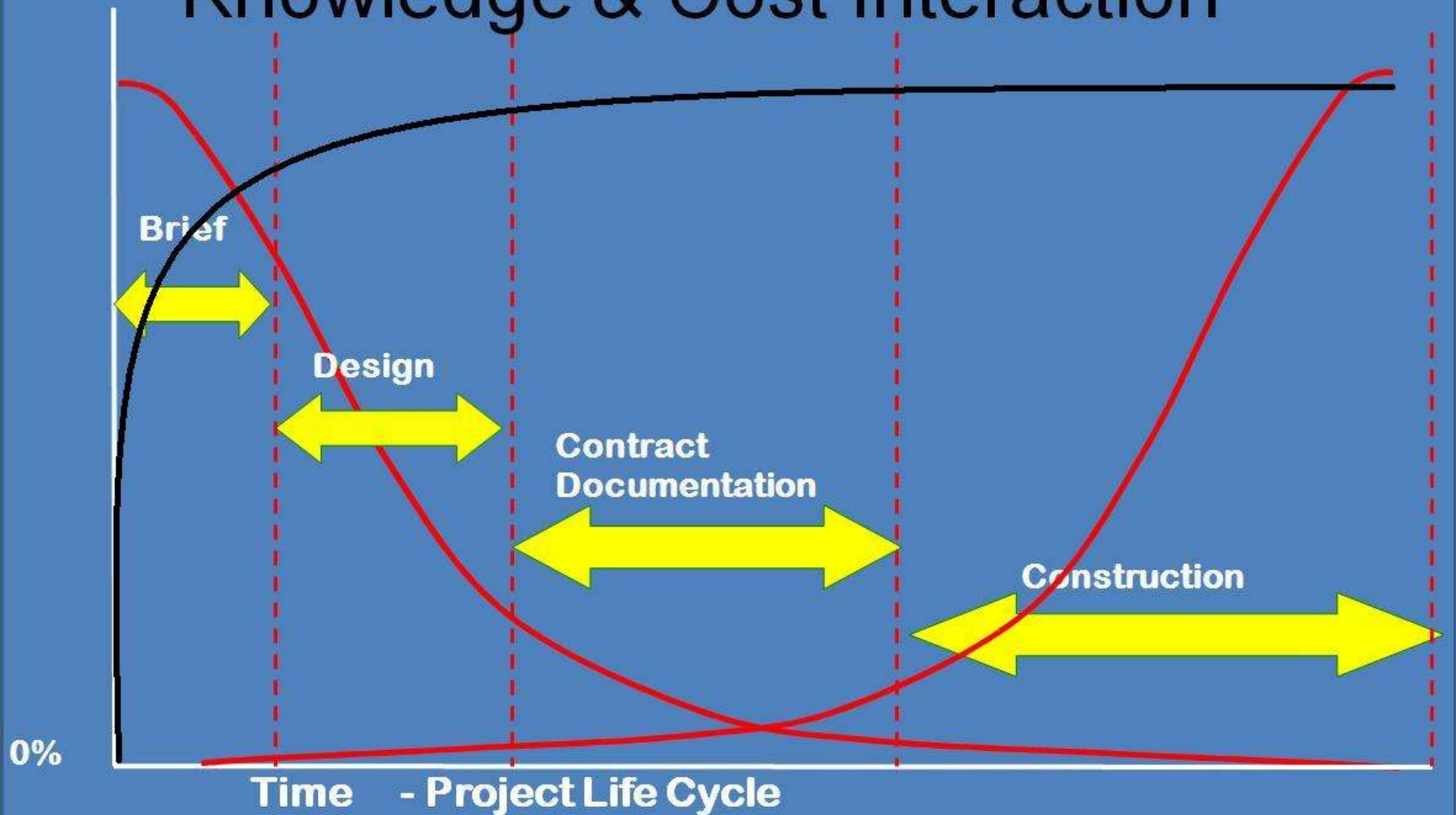
Ability vs Cost Impact



Knowledge & Cost Interaction



Knowledge & Cost Interaction



Survey of Go8 Universities

A survey was conducted of Go8 universities to identify:

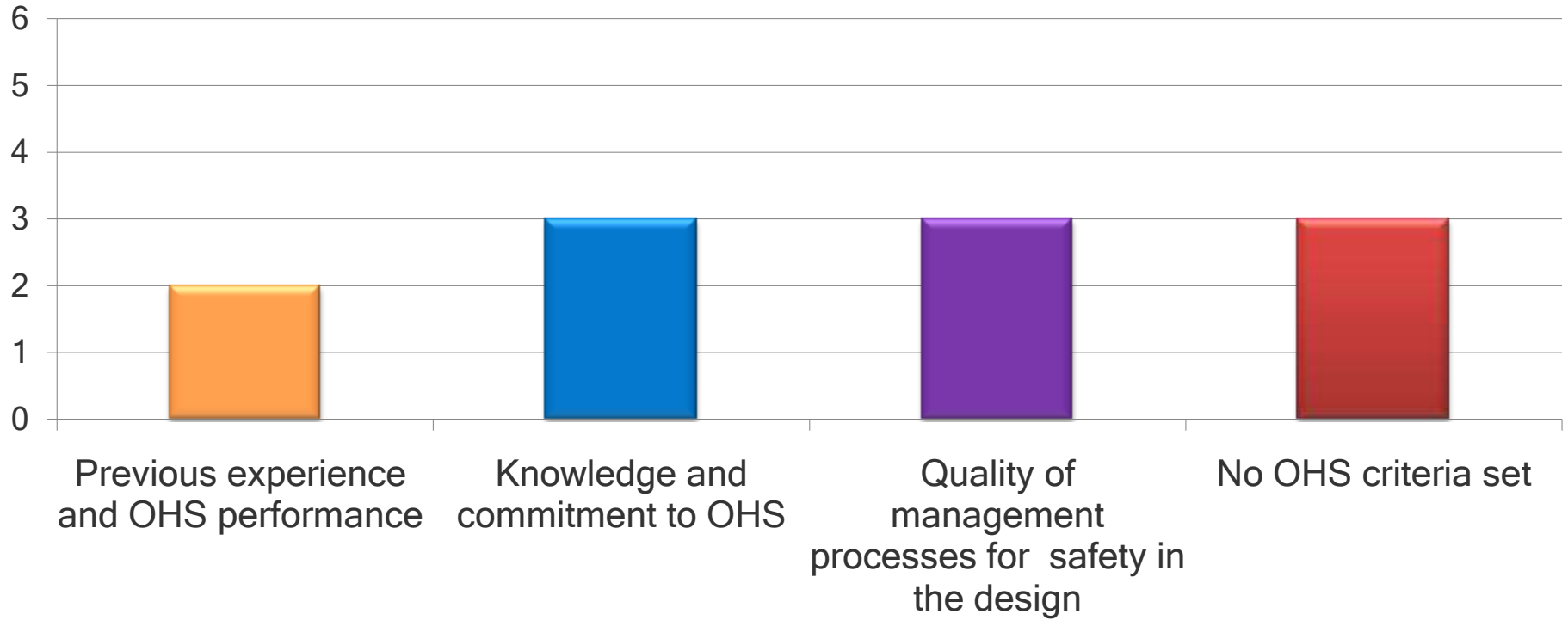
- Procedure related to safety in design
- Elements they were using
- Implementation of those elements
- Safety in design review processes

6 of the 7 Universities responded

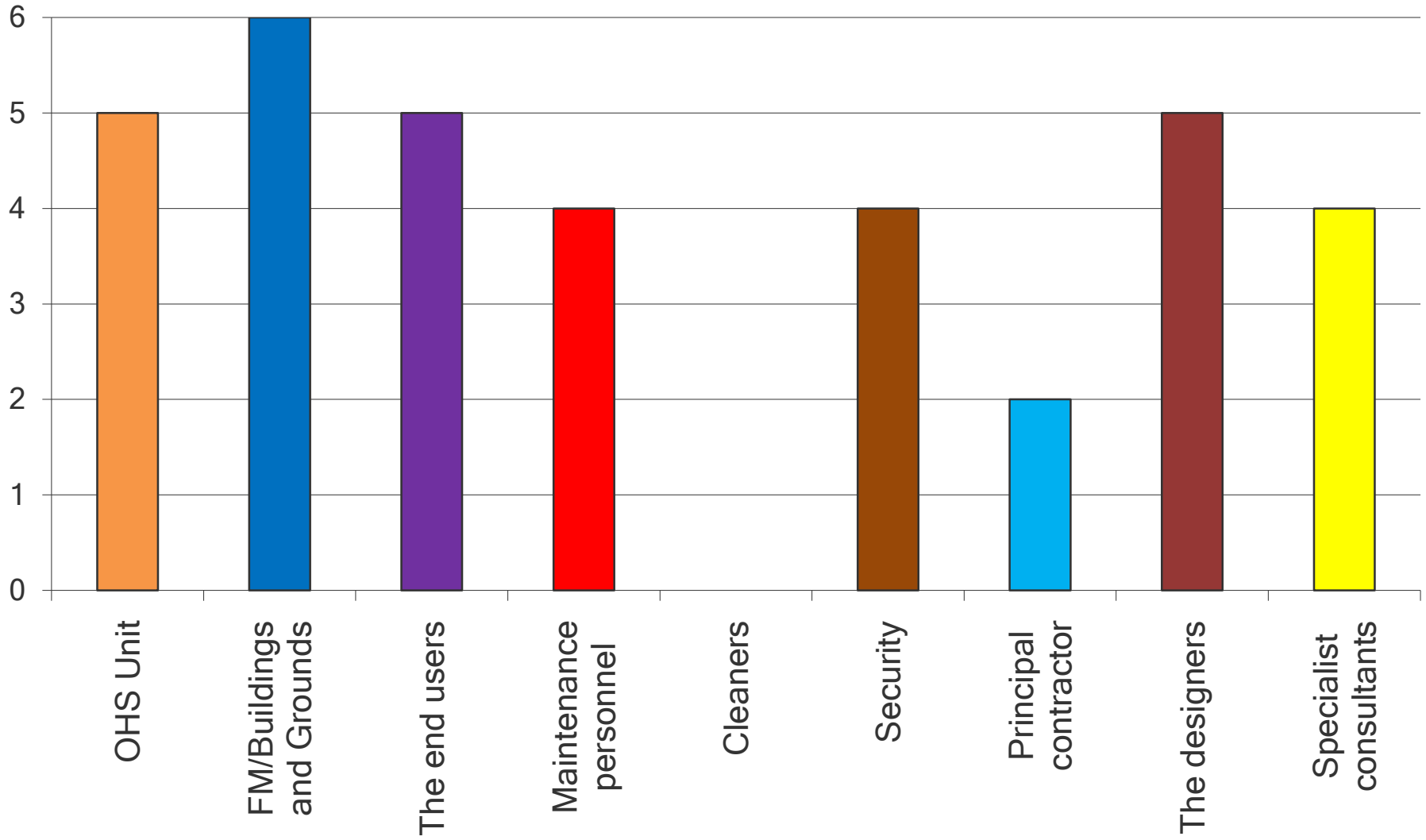
Survey results

- Hazard identification, risk assessment and control
- Documented procedures
- Timing of safety in design reviews
- “Sign off” of designs
- OHS representatives
- Preferred contractor list for designers
- Designers providing a risk assessment with their designs
- Design workshop review tools

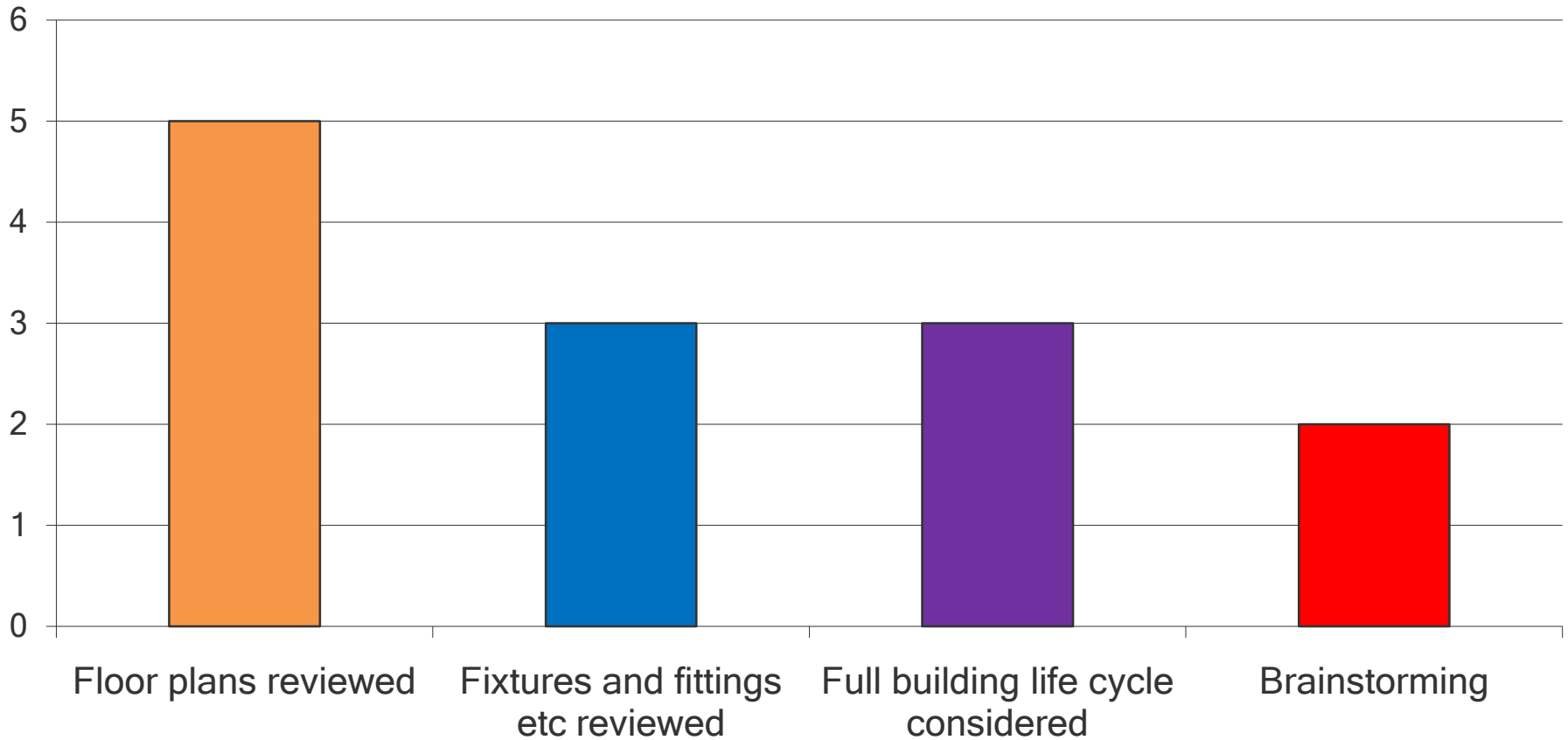
Procurement requirement of designers



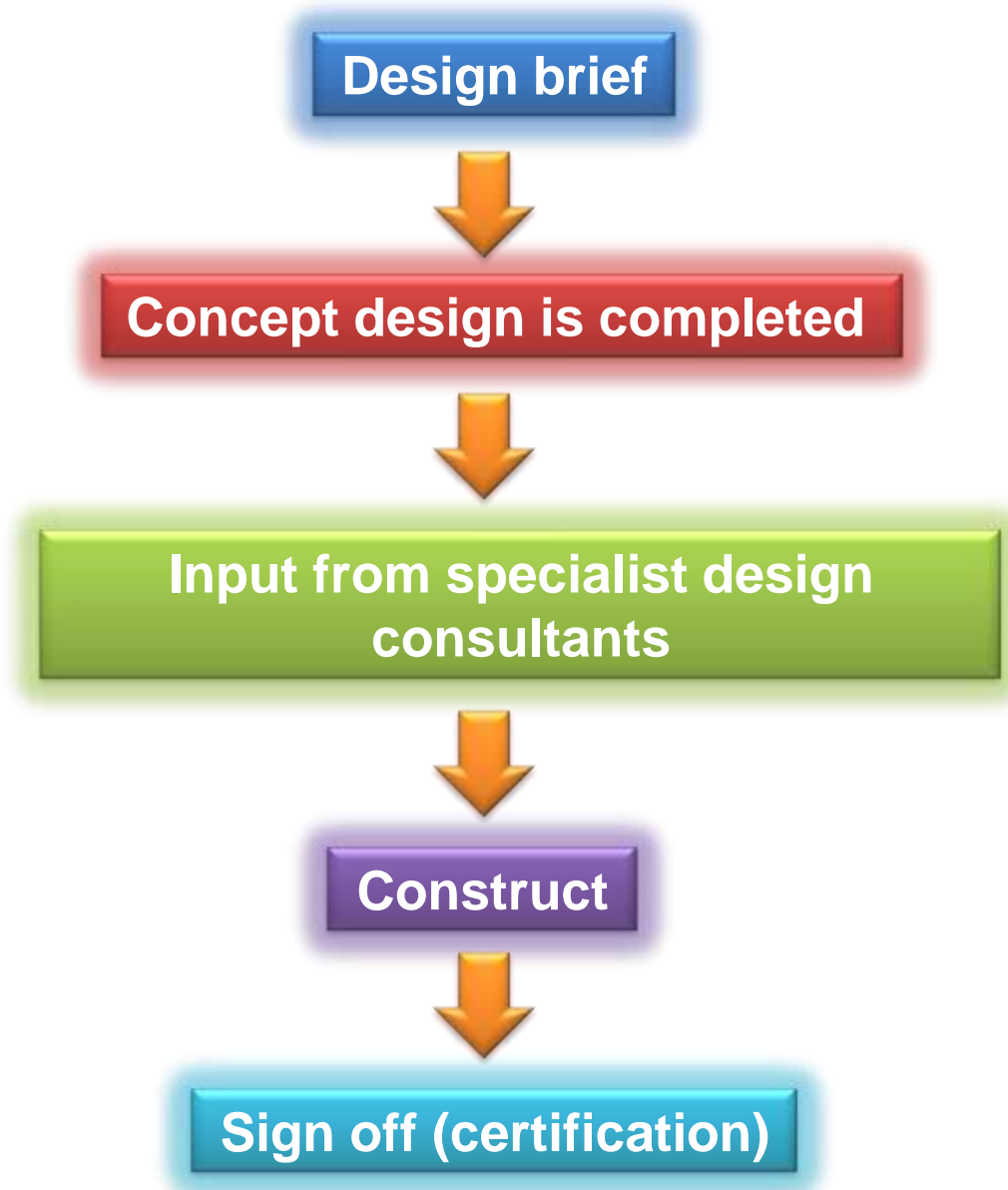
Which of the following groups are involved in the design review process?



How are the design review workshops structured?



The usual approach

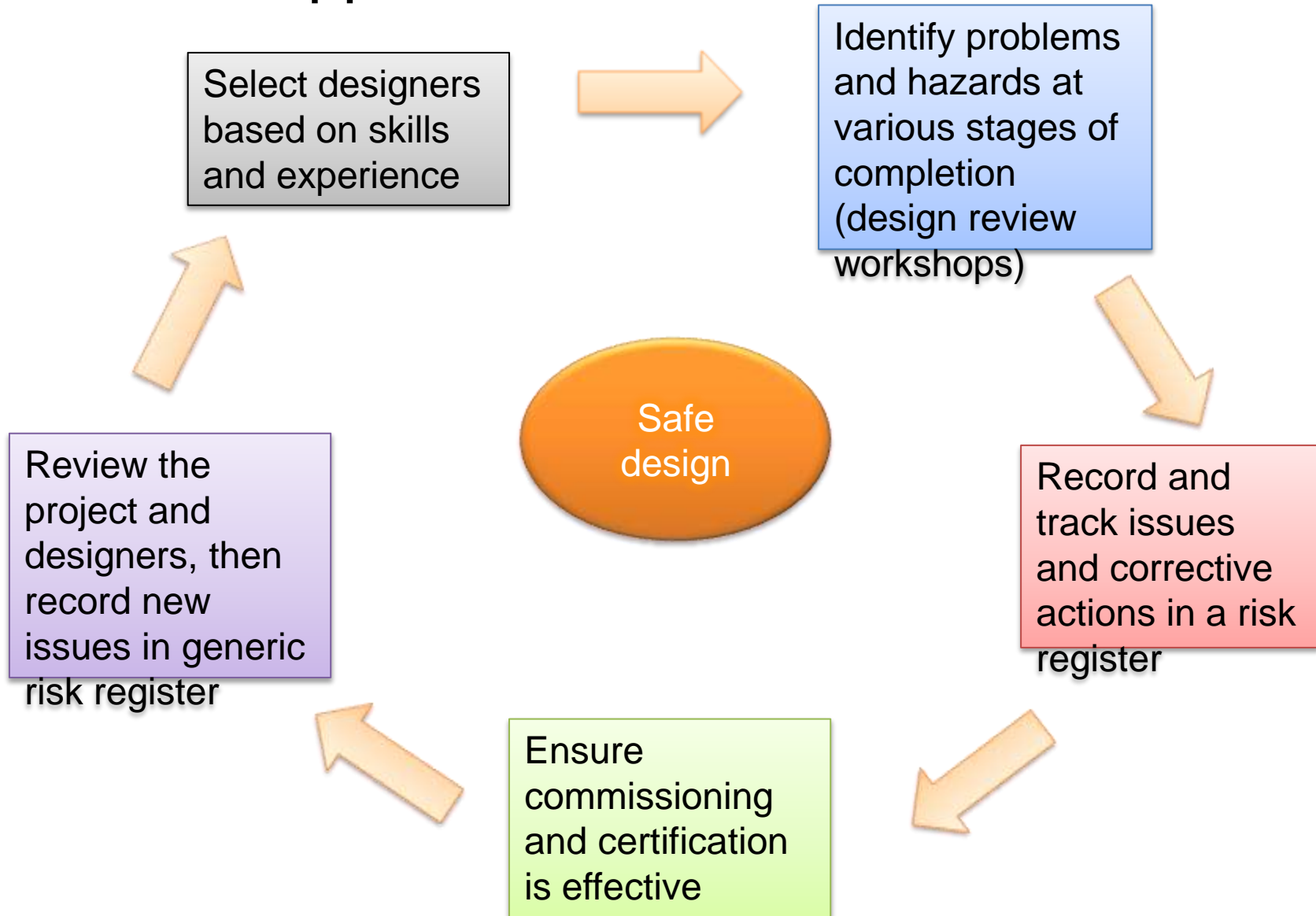


What are the problems with this approach?

- Consultants need to be experienced and be appropriately qualified
- Lack of coordinated approach
- Silo style mentality
- Over reliance on BCA and standards



A better approach



Selecting design consultants

- Create or use a preferred contractor list
- Assess their competency and track record
- Examine and inspect other facilities they have designed
- Get them involved in design reviews
- Ensure they provide a risk assessment for all their designs

Design review workshop tools

- Construction Hazard Assessment Implication Review (CHAIR)
- Hazard and Operability Study (HAZOP)
- Fault Tree Analysis (FTA)
- Event Tree Analysis (ETA)



CHAIR
SAFETY IN DESIGN TOOL



Design review workshops

- Need to structure the workshop team carefully
- The basics of any good meeting
- Develop a short training package - mostly learned on the job
- Try to focus on what's unique and different about project
- The hierarchy of controls needs to be understood
- Confronting for design consultants
- Beware of “Group think” -
 - There are no silly questions
 - Make sure everyone feels empowered to ask questions

Design review workshops - follow up

- List any required actions that may be required as part of future design phases
- Ensure all relevant information is captured and recorded
- Communicate the findings of the review to all relevant parties
- Any review report developed should include:
 - Review methodology used
 - Details regarding any significant risks identified during the review
- Appropriate people follow-up actions generated from review

Risk register

- Serves a purpose right through the project
- Client > Designer > Builder > End user
- A record of risk management process used
- Consider collating this information into a design hazard checklist or generic risk register that can be used to start projects

DESIGN TRACKING REGISTER

No	Category	Description	BLL Comments	Consultant/ Client Comments	Responsibility
1	PCW	Rena tools do not need process cooling water to run through them after hours.	Advised by Roth and Rau- meeting 24/06/10	Process cooling water will run through pipes after hours as part of base design. Confirmed acceptable by Roth and Rau	MWG
2	Electrical	Roth and Rau to confirm cable sizes to tools acceptable.	Refer to electrical single line diagram and floor plan		R&R/ BLL
3	Architectural	Vision panels to be included in double doors to development lab	WB architects to document	Correspondence 2873	WB
4	Fume Cupboard	Fume cupboard in development lab requires local scrubber to the back. Check grouped connection of exhaust to main acid scrubber acceptable. Check AS2243.	check G11 design- similar combined exhaust. (precedence)	Separate flue to be installed with dedicated fan for fume cupboard. Detailed design to be co-ordinated.	MWG/ BLL
5	Nitrogen	By pass loop to be incorporated on Nitrogen supply to dev lab for future installation of meter without interruption of service.	Requested by UNSW meeting with BLL/ AMA- 24/06/10	Will update drawing to reflect this requirement and update RFQ	MWG
6	Facade	Both and Rau to confirm equipment size can fit through northern	BLL to send e-mail to P&P	Verbal confirmation received	BLL

UNSW Fare



- 7 retail outlets, with seating for around 150 people
- One of the main food hubs on campus

The cost

- Slips, trips and falls cost UNSW \$115'000 in workers compensation expenses (not including on costs) in 2010
- Cost \$100'000 to lay tiles in 1993
- We paid \$25'000 to coat tiles with a friction increasing substance which needs to be redone every 2-3 years + friction tested every 12 months \$1'000
- Replacement cost of tiles \$150'000 - \$180'000
- Estimated cost to (staged) shut down for a month \$250'000 - \$400'000
- Total cost or replacement = \$400'000 - \$680'000

Design Workshop



The cost

- Original install (including air conditioning and ventilation unrelated to the dust extraction) -\$223'180
- Modifications made in an attempt to improve dust extraction - \$65'940
- 2 years later...
- Complete replacement of dust extraction - \$175'000



Energy Technology Building



The process

- Design was developed to 95% concept design
- Design consultants were selected by UNSW then handed to builder to complete as a D&C project
- CHAIR reviews at early detail design
- HAZOP reviews at 80% detail design
- Risk register regularly updated and used to track approval, progress and completion

The UNSW safe design journey

- Started with a scattered approach
- Moving towards a comprehensive system
- Training and information sharing for project managers next on the list

How to sell Safety In Design

- Most large builders are using SID (mainly for risks in the constructability of the design)
- Engage maintenance and cleaning units with benefits of lower costs and ease of maintenance etc
- Get project managers on board - sell the cost benefits

Conclusion

- If you are already doing a few of the elements it doesn't take too much effort to get a full system in place
- Critical to get design right as the flow on effects are very hard to change
- Cost of getting it wrong
- Really makes a difference once the building is finished...
A very effective way to properly use the hierarchy of controls

Questions

???