



**Workshop on Planning & Design for Safety in  
Project Life Cycle for Public Housing Developments**

**Benchmarking Good Practice**  
**Safety in Planning and Design in Developed Countries**

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**31 March 2010**



# Presentation Outline

1. Global Trend in Safe Design
2. Common Features of Principles in Safe Design Planning



# Benchmarking Countries

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- EU
- UK
- Australia
- USA
- Singapore





# **Why safe design is important?**

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UK study reveals that 60% of injuries and fatalities on construction sites were traceable back to design decisions and lack of planning

*Source: Churcher & Alwani-Starr. 1996*





# Why safe design is important?

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Australian research reveals:

- ❖ 37% of the workplace fatalities related to design issues
- ❖ 14% of the fatalities suggestive that design issues were involved
- ❖ 30% of the serious non-fatal injuries contributed by design
- ❖ Design related issues prominent in machinery & fixed plant group, mobile plant & transport group
- ❖ 50% of the incidents in agriculture, trade and mining probably contributed by design issues
- ❖ Inferior designs contributes to work-related injuries in Australia



# US research

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- 22% of 226 injuries that occurred from 2000-2002 in Oregon, WA, and CA<sup>1</sup>
- 42% of 224 fatalities in US between 1990-2003<sup>1</sup>

<sup>1</sup> Behm, M., "Linking Construction Fatalities to the Design for Constr. Safety Concept" (2005)





# US statistics

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- The 2009 Workplace Safety Cost Index amounted to US\$52 billion dollars (Liberty Mutual).
- The associated indirect costs equal 2-10 times.
- Construction injury equal to 6-8% of the gross construction cost (University of Tennessee study).





# July 2007 Workshop

## Prevention Through Design (PtD)

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- PtD or safety through design is defined as the integration of hazard analysis and risk assessment methods early in the design and engineering stages and taking the actions necessary so that risks of injury or damage are prevented.
- It addresses S&H needs by eliminating hazards and minimizing risks throughout the life cycle of work premises, tools, equipment, machinery, substances, and work processes including their construction, manufacture, use, maintenance, and ultimate disposal or re-use.
- The National Institute for Occupational Safety and Health (NIOSH) currently leads a nationwide initiative called Prevention through Design (PtD).





# Singapore

## The Nicoll Highway incident

### Committee of Injury (COI)

to address safety and health issues through the life-cycle of a building including the design stage, construction and even maintenance of the building.



Table of Summary of Safe Design in Various Developed Countries and Hong Kong

<b>Country City</b>	<b>EU</b>	<b>UK (CDM)</b>	<b>Australia (Safe Design)</b>	<b>USA (Prevention through Design-PtD)</b>	<b>Singapore (Safe Design)</b>	<b>Hong Kong (CDM &amp; Safe Design)</b>
Rationale	Council Directive 92/57/EEC 24 June 1992 on the implementation of minimum safety and health requirements at temporary or mobile construction sites	Follow EU Directive	-National OHS Strategy 2002-12  -Model Work Health and Safety Bill 2010	Workshop on Prevention Through Design & Survey	OSH Review & enquiry of tragedy Nicoll Highway	Coping with global development and continuous improvement





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Specific Legislation	-EC Directive 92/57/EEC  -National Execution Deadline is 31/12/1993  -27 member states have their regulations 31/12/1993- 1/1/2007	CDM 1994 & 2007	All member states except New South Wales	No specific	No specific	No specific



<b>Country City</b>	<b>EU</b>	<b>UK (CDM)</b>	<b>Australia (Safe Design)</b>	<b>USA (Prevention through Design-PtD)</b>	<b>Singapore (Safe Design)</b>	<b>Hong Kong (CDM &amp; Safe Design)</b>
Safe Design Principle	1. Prevent or reduce occupational risks at all stages of work  2. General principle of prevention at 89/391/EEC	Risk management approach	-Risk management approach  -5 Safe Design Principles in Australia	Risk management approach	Risk management approach  -Modify UK CDM	-Risk management approach  -Modify UK CDM and taking reference to overseas best practice (existing)

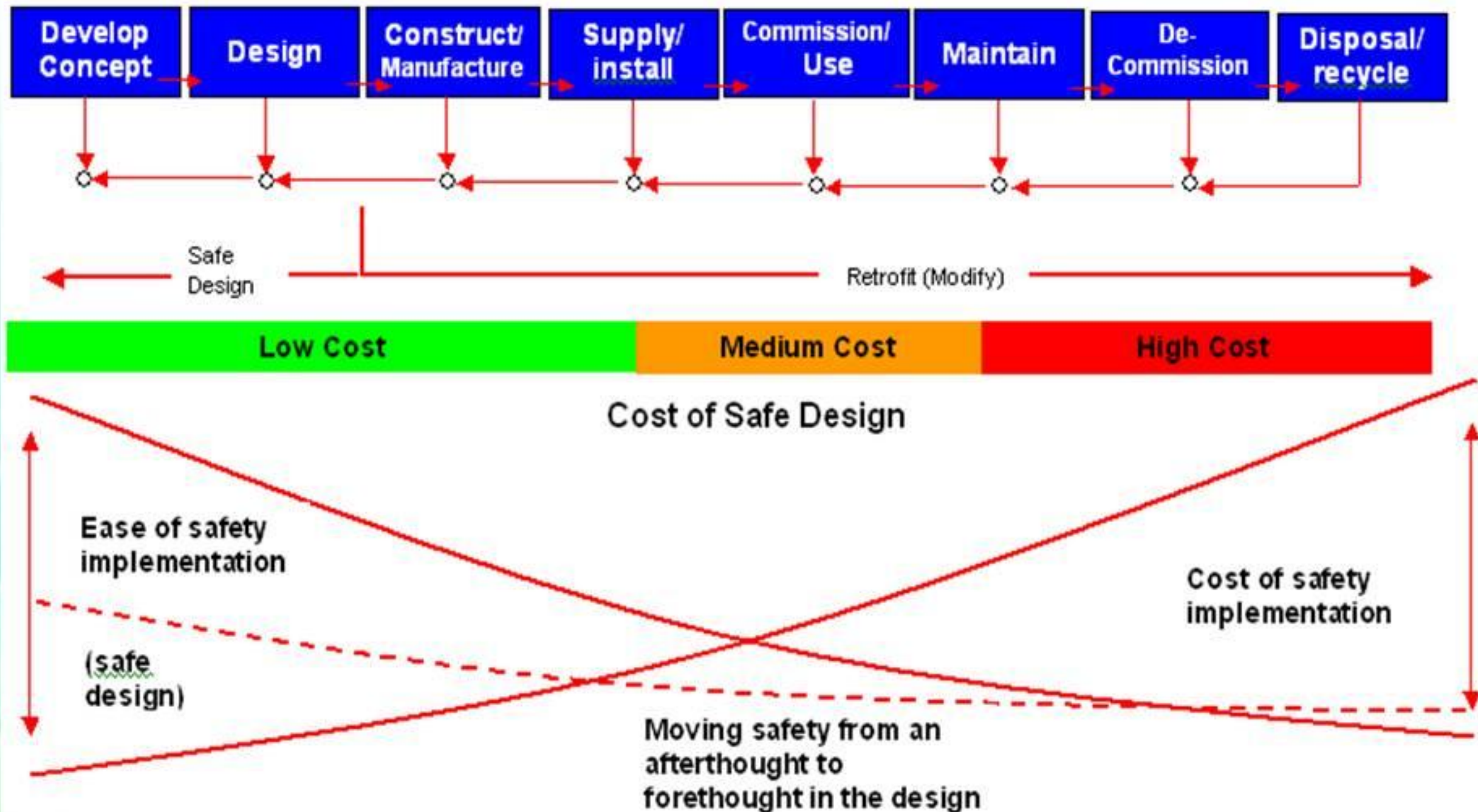




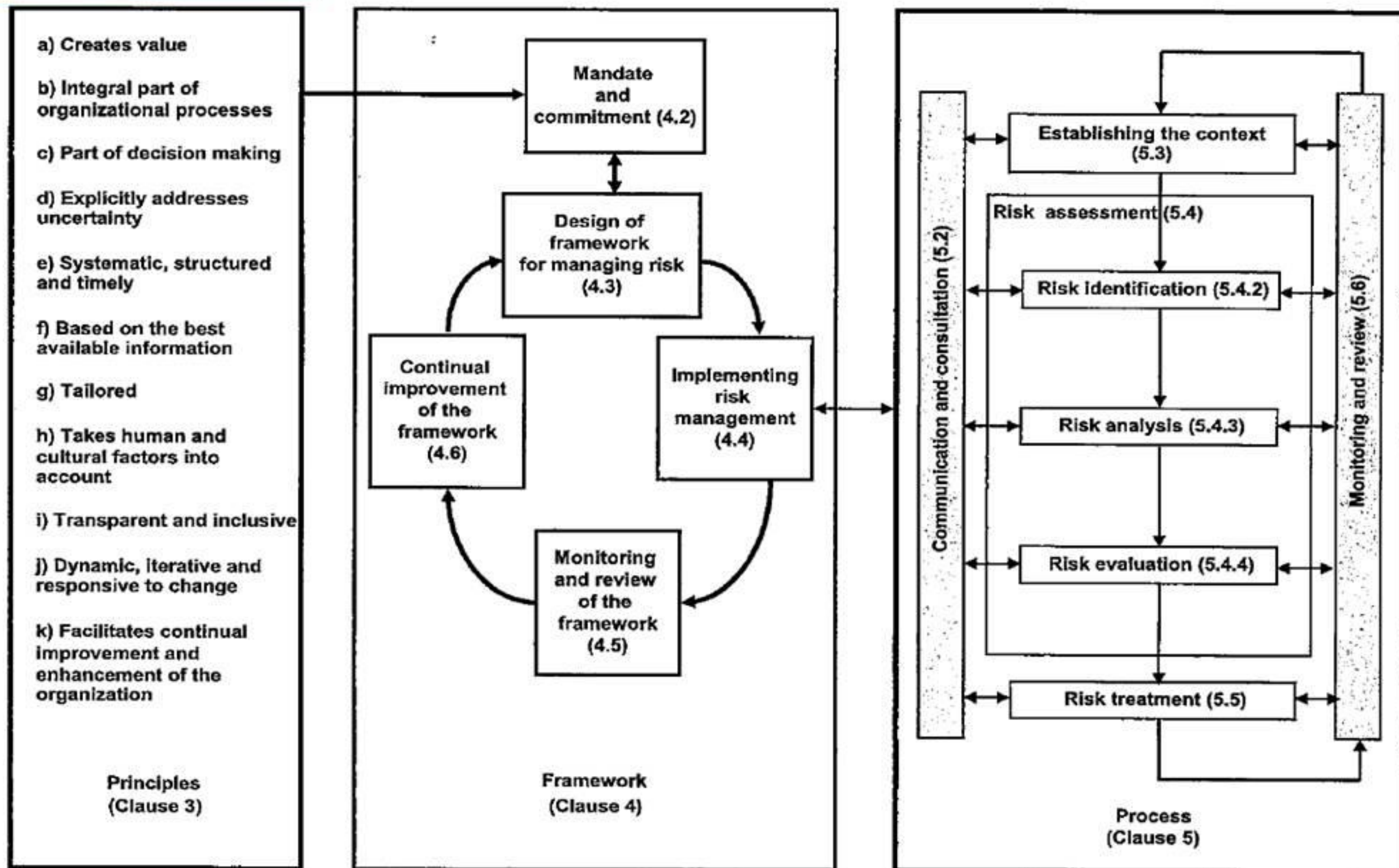
Country City	EU	UK (CDM)	Australia (Safe Design)	USA (Prevention through Design-PtD)	Singapore (Safe Design)	Hong Kong (CDM & Safe Design)
Approach adopted	Depends on development of member states e.g. Ireland The Safety, Health & Welfare at Work (Construction) Regulations 2006 Include a general clause first, then detailed provisions on design requirements in updated regulations.	<ol style="list-style-type: none"> <li>1. promotion</li> <li>2. encouragement</li> <li>3. professional collaboration</li> <li>4. training</li> <li>5. publish CoP &amp; guidelines</li> <li>6. enforcement</li> </ol>	<ol style="list-style-type: none"> <li>1. promotion</li> <li>2. encouragement</li> <li>3. professional collaboration</li> <li>4. training</li> <li>5. publish CoP &amp; guidelines</li> <li>6. develop risk assessment tool "CHAIR"</li> </ol>	<ol style="list-style-type: none"> <li>1. promotion</li> <li>2. encouragement</li> <li>3. professional collaboration</li> <li>4. training</li> <li>5. NIOSH leads a nationwide initiative on PtD</li> <li>6. industry developed tool for safe design reference</li> </ol>	<ol style="list-style-type: none"> <li>1. promotion</li> <li>2. encouragement</li> <li>3. professional collaboration</li> <li>4. training</li> <li>5. publish Guidelines</li> <li>6. consultancy service for government projects offered by MOM</li> </ol>	<ol style="list-style-type: none"> <li>1. promotion</li> <li>2. encouragement</li> <li>3. training</li> <li>4. publish Guidelines &amp; Worked Examples</li> <li>5. pilot projects and contract provision in selected government projects</li> <li>6. internal guidelines in HA</li> </ol>



# Benefits of getting it right the first time







1. ISO 31000 – Risk Management – Principles and Guidelines, 15-11-2009 Edition

2. IEC/FDIS 31010:2009(E) – Risk Management – Risk Assessment

3. BS18004:2008 – Guide to Achieving Effective Occupational Health and Safety Performance



# Safe Design Lifecycle







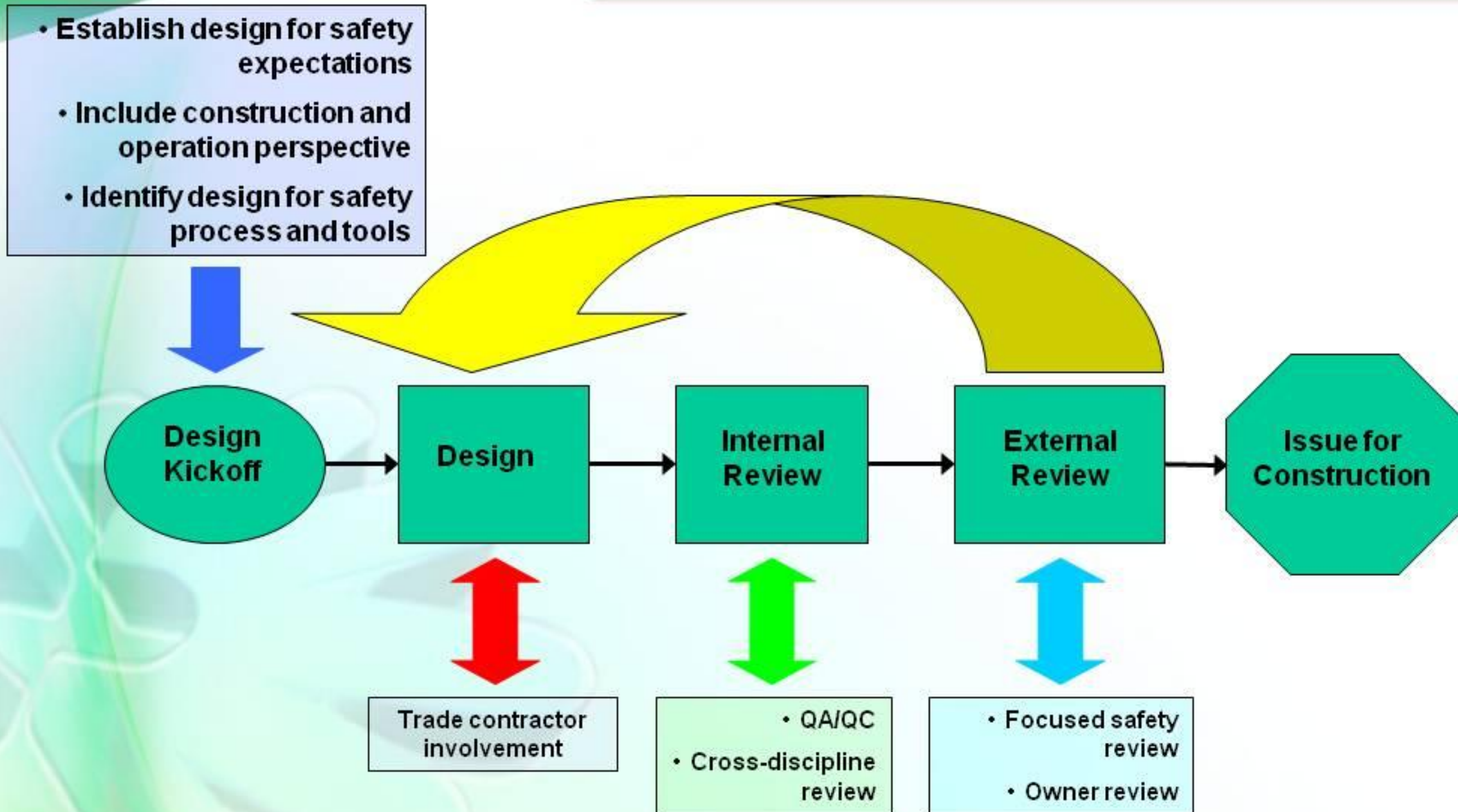
# Prevention Through Design

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## Holistic approach

- Inception
- Design
- Construction
- Operation
- Maintenance
- Demolition/Disposal

# Resources and Processes



(Source: Hecker et al., 2005)





# UK CDM Regulations 2007 (1994)

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The Construction (Design & Management) Regulation 2007 places legal duties virtually on everyone involved in construction work.

- ❖ Clients
- ❖ CDM coordinators
- ❖ Designers
- ❖ Principal Contractors
- ❖ Contractors
- ❖ Workers



# Objectives of CDM Regulations

1. Protect OSH of people in construction , and others who may be affected by their activities;
2. Require a *systematic management* approach from concept to completion: hazards must be identified and eliminated where possible and the remaining risks reduced and controlled;
3. Reduce risks by “*safe design*” during construction and thought out the life cycle of the structure.





# Design Review Process (DRP)

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is done through the GUIDE Process with principle:

1. review in a Group (Safety & Health Review Committee SRC)
2. Understand the full design concepts
3. Identify the risks
4. Design around the risks identified to eliminate/mitigate
5. Enter all information to Safety and Health Risk Register (RR)-vital design change affecting safety & health or residual risk to be mitigated



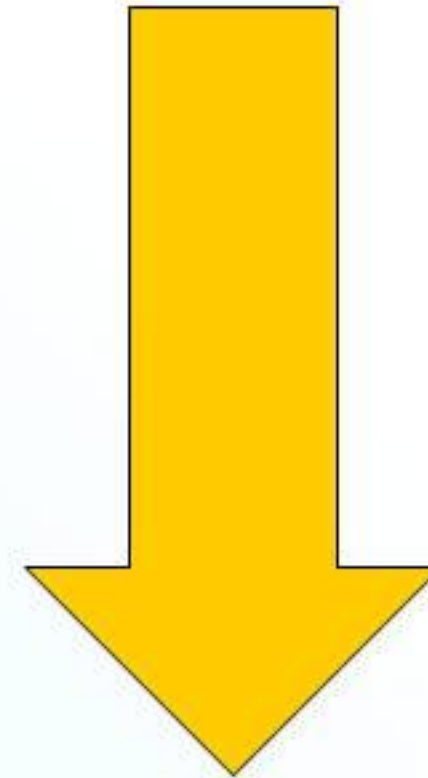
# Design

- Reduction of OSH Risks

- **Avoid**

- **Reduce**

- **Control**







# Designer

1. Must eliminate hazards and reduce risks from the start of the design process;
2. Designs should be safe to build; safe to use; safe to clean and maintain; safe to demolish;
3. Should inform others of significant or unusual risks which remain;
4. Amount of effort put in to risk reduction should be proportionate to the risk.



# Continuous Documentation

- **The (health and safety) risk register**
  - A ‘live’ document
  - Managed by the planning supervisor
  - Populated by all project team members
  - Regularly re-visited
  - On the agenda at ‘all’ meetings
  - Monitored to demonstrate progress
  - Used as a reminder of outstanding actions
  - A measure of performance





# Discrete Documents

- Pre-construction Health and Safety Plan (including Risk Register)
- Construction Health and Safety Plan
- Health and Safety File



# Designers

- **Professional qualification**
- **Knowledge of construction**
- **Awareness of relevant legislation**
- **Health and safety design methods**
- **Skills and training of employees**
- **The time allowed**
- **The technical facilities**
- **Method of communicating issues**
- **Dealing with remaining risks**
- **Advice of the Planning Supervisor**





# **Safe design process effectiveness**

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## Problems:

- ❖ Lack of experience – leader and participants
- ❖ Inappropriate team selection – mix and level
- ❖ Lack of support by senior management - attendance
- ❖ Incorrect or out of date information
- ❖ “Human error” factor -



## Some Observed Weakness of Designers (UK & Australia)

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### Australia (Victoria)

- Only half design companies do collect basis information from client or research.
- Many designers are using a first principles approach rather than risk management eg minimising potential for falls for aged care.
- Principal designers are tending not to let other designers have a view of the operational and OHS issues of the final workplace.
- Designers may have a narrow view of OHS- often excludes people on people issues (occupational violence, manual handling)





## Some Observed Weakness of Designers (UK & Australia)

### UK (HSE)

1. many designers were unaware of their duties under the CDM Regs.
2. Not thinking about safety aspects when it came to maintenance, repairing and cleaning.
3. Not realizing problems they were causing for contractors, trying to manage the risks as a result.



# UK Challenge

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- To change attitudes
- To change behaviours
- Achieve sensible risk management
- Continued lack of awareness by dutyholders, particularly SME's
- Confusion between civil contracts and CDM 2007
- 'Paper chasing' - right information to right people, right time
- Clients and Designers can do more





# Barriers in US

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1. Potential solutions to these barriers involve long-term education and institutional changes.
2. Designers' fear of undeserved liability for worker safety.
3. Increase both direct and overhead costs for designers. Educate owners that total project costs and total project life cycle costs will decrease.
4. Few design professionals possess sufficient expertise in construction safety.













Designer: safe design for marvelous building

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# Appropriate adoption of competence in design, and Partnership in the right approach







Thank You!