



香港房屋委員會
Hong Kong Housing Authority

Designing for Safety *Building Secure and Sustainable Communities*

16 Oct 2025

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Bringing ideas to life



CONSTRUCTION
INDUSTRY COUNCIL
建造業議會



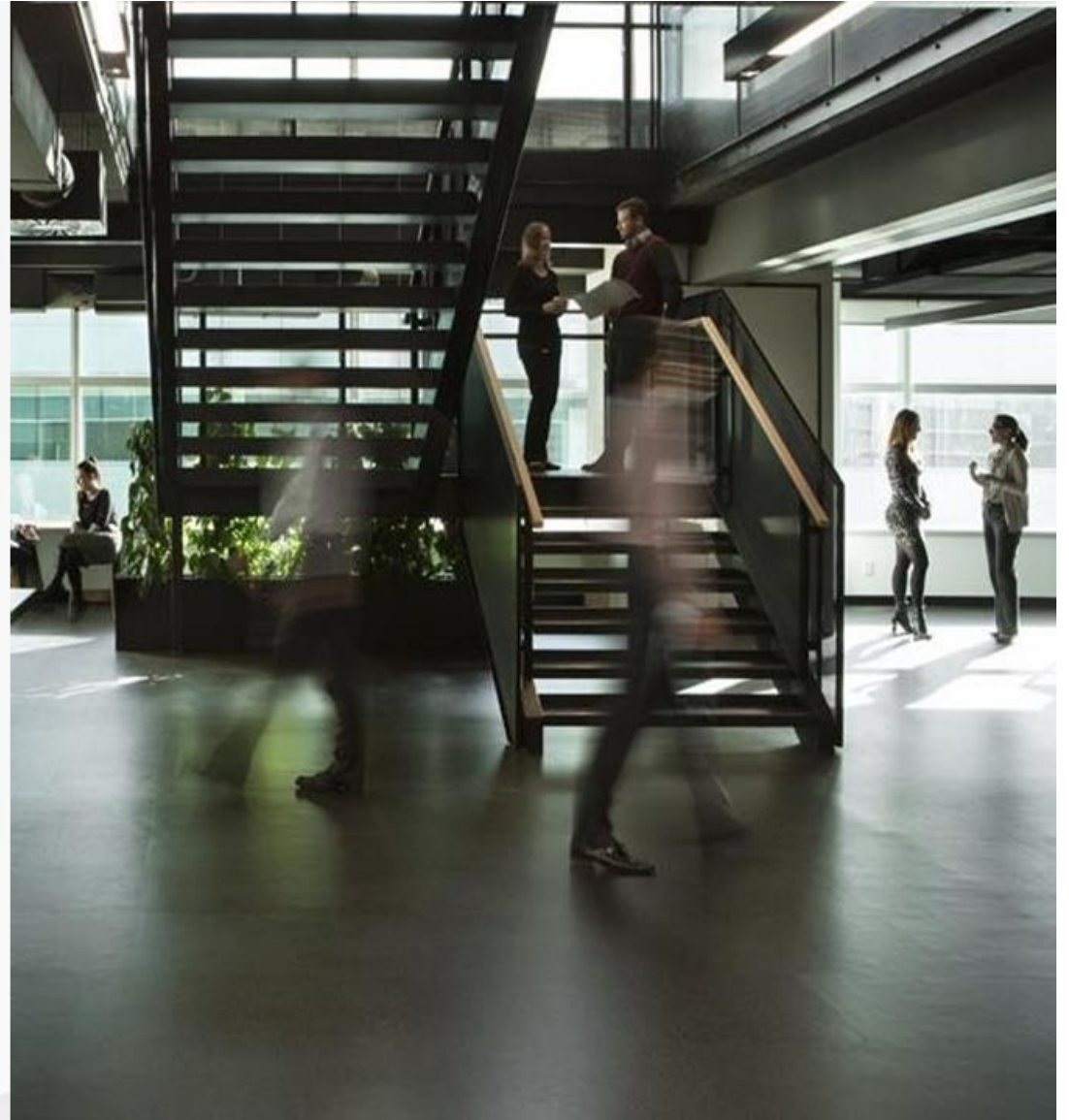
Agenda for Today

- Objective

- Overview of DfS Management System

- Introduce DfS Risk Control Framework

- How to implement DfS
 - Roles & Responsibilities
 - Templates & Tools



Why Safety Matters

- Construction is recognised as one of the **most hazardous industries globally**.
- In addition to the **human cost**, such accidents contribute to **project delays, financial losses**, and damage to organisational **reputation**.
- Prioritising safety extends beyond mere compliance; it embodies a culture of safety that begins with strong leadership.

Construction Sector Accidents and Fatalities								
No. of Reportable Accidents in Construction Sector					No of Fatal Injuries			
Year	2021	2022	2023	2024	2021	2022	2023	2024
Hong Kong	3109	3046	3097	3097	23	17	20	14
Singapore	139	171	167	166	13	14	18	20



Why Design for Safety

Below is an example of integrating DfS in a live substation: maintaining safe access routes at the 275 kV cable flat.

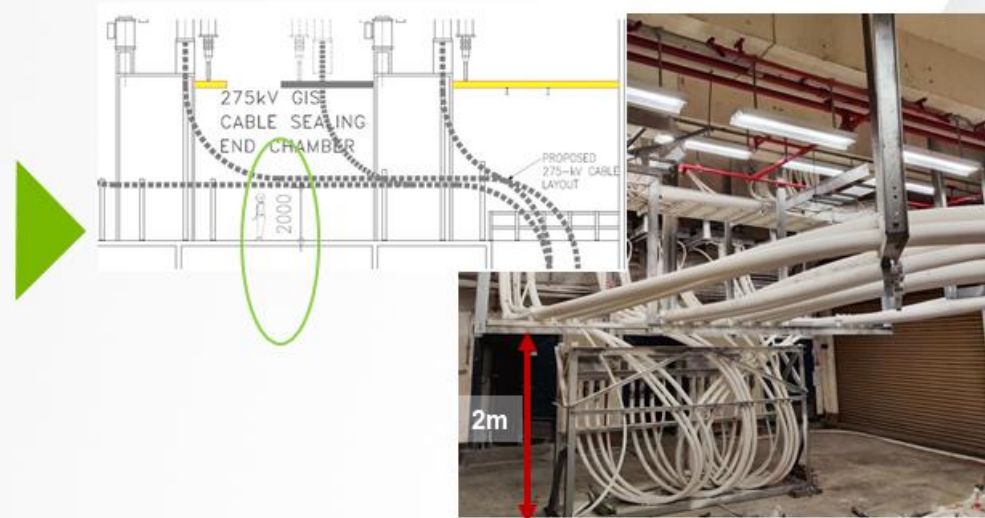
Before



Current Control Measure

- Installation of metallic platforms over transmission cables to maintain access routes
- **Risk: Cannot maintain a flat and clear access routes at ground level**

After



Safety Improvements

- Improved cable installation above ground at about **2 m** for new-built
- Striking a balance between limited height of floor and maintenance requirements
- Maintaining a more safe and clear access routes at ground level
- Providing more space for future cable diversion, maintenance and enhancement

Objectives



Build understanding: Increase awareness of DfS principles and the DfS Management System across project stakeholders.



Enable application: Equip teams to implement DfS using standard templates, checklists, and workflows for consistent delivery from brief through O&M.



Strengthen safety culture: Embed the risk-control hierarchy and proactive hazard identification to reduce incidents, rework, and delay.

Overview of DfS Management System

Overview of the DFS Management System

Background & Introduction

Hong Kong's Journey to Safer Design Practice

- DfS (Design for Safety) in Hong Kong is modeled after the UK's Safety in Design and CDM framework.
- First introduced in 2006, DfS was integrated throughout local construction projects by 2016.
- In 2020, the CIC Task Force established a roadmap to develop a comprehensive DfS Management System.



What is 'Design for Safety'?

Design for Safety **involves identifying and mitigating potential hazards early** in the design process and throughout the project lifecycle.

Key Duty Holders



Client



Designer



Contractor



Maintenance Supervisor



Functional Roles (client rep, architect, AP, PM)

DfS Core Guiding Principles



Communication & Coordination

- Regular Monitoring and Sharing of Key H&S Files
- Regular Review Meetings
- Set up Feedback Mechanism
- Establish Centralised Knowledge Hub to Share Information



Ownership & Leadership

- Integrate H&S into Key Business Decisions
- Ensure Appointment and Resources Competency through Regular Audits and KPI Tracking Mechanism



Risk Prevention & Management

- Reduce Risk at Source
- Early Contractor Involvement
- Manage Key Information in the H&S Files
- Apply Digital Tools to Enhance Risk Identification



Evaluation & Training

- Assess H&S Knowledge, Skills and Experience
- Accredited Training Course with CPD Provided
- Track Lesson Learnt and Assess Key Risks and Design Changes

Stages & Phases

Project set up

Pre-tender

Tender

Construction

Handover

Operation & Maintenance

Introduce DfS Risk Control Framework

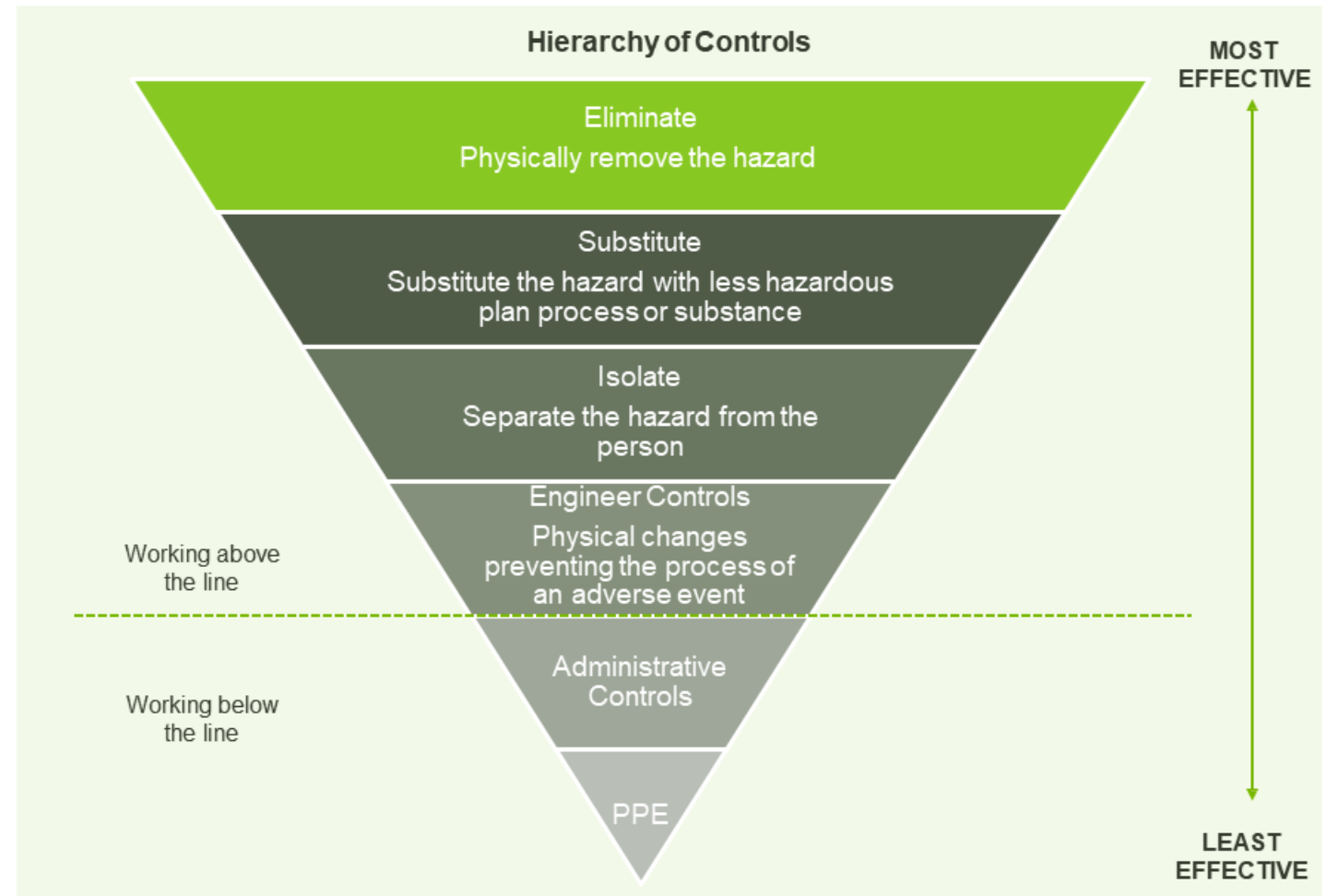
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How to Identify, Assess, and Control Risks Using the Reasonably Practicable Approach (1/2)

We can produce a safe design through:

- Consultation, engagement and drawing on experiences
- Analysis of asset interfaces to identify hazards
- Eliminate hazard or minimise risks
- Use of Hierarchy of Control
- Life of the asset



How to Identify, Assess, and Control Risks Using the Reasonably Practicable Approach (2/2)

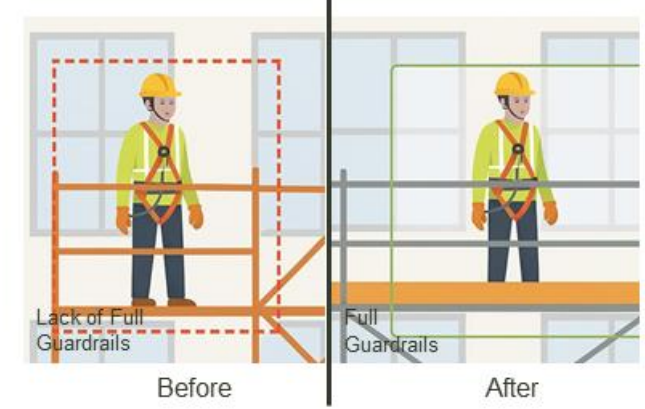
Eliminate



Substitute



Isolate



Engineer Controls



Administrative Controls



PPE



How to Implement DfS

- Roles & Responsibilities
- Detailed Implementation Plan
- Templates & Tools

Roles & Responsibilities

Roles & Responsibilities

Effective DfS implementation relies on clear roles and responsibilities. We have outlined the expectations for the **Client, Designer, and Constructor** throughout the project lifecycle to help with smooth integration of DfS.

1 For Client (1/3)

The Client is responsible for ensuring the successful implementation of DfS by **providing management support, appointing and empowering key roles, promoting a strong safety culture, coordinating risk management, and overseeing all phases** from project setup through to completion.

Duty Holders	Stage	Responsibilities
	All Stages	Promote Safety Culture
		Ensure a "safety first" mentality is embedded across all project phases.
		Apply H&S incentives or benchmarks to duty holders.
		Address cost concerns that could hinder health and safety.
		Risk Management
		Coordinate sharing of identified risks to eliminate or mitigate them throughout the project.
		Require all duty holders to remove or minimize significant risks at their source.
		Management Arrangements
		Ensure management arrangements are established, maintained, and actioned throughout the project lifecycle.
		Allocate sufficient time and resources for the project's success.
		Lessons Learned
		Set and review lessons learned with the Designer, Contractor, and Maintenance Supervisor throughout the project lifecycle.

Roles & Responsibilities

1 For Client (2/3)

The Client is responsible for ensuring the successful implementation of DfS by **providing management support, appointing and empowering key roles, promoting a strong safety culture, coordinating risk management, and overseeing all phases** from project setup through to completion.

Client	Project Set Up Phase	Establish Information
		Provide relevant information to the project team for proper planning and execution.
		Embed DfS principals and practices in the contract documents
		Role Assignments
		Appoint and empower the Designer.
		- A Designer to undertake the project and ensure other roles are competent by accessing qualifications, experience, and professional membership status
	Design Phase	- A Designer to comply with their duties in terms of DfS
		Group duty holder leads into a project review team
		KPI Setting
		Set and review KPIs, both Lead & Lagging Indicators, for the Designer and other involved parties.
		Safety Consultation
		Be advised by the Designer on safety and health aspects, including design finalisation and material selection.
		Risk Reduction in Design
		Work with the Designer to reduce significant risks during the design process.
		Pre-Construction Plan
		Provide Pre-Construction Information before work commences.
		KPI Review
		Review performance against KPIs during the construction phase.
		Welfare Facilities

Roles & Responsibilities

1 For Client (3/3)

The Client is responsible for ensuring the successful implementation of DfS by **providing management support, appointing and empowering key roles, promoting a strong safety culture, coordinating risk management, and overseeing all phases** from project setup through to completion.

		Welfare Facilities
		Ensure that sufficient welfare facilities are provided by the Main Contractor and checked at the start and maintained throughout the project.
		Construction Phase Plan
		Ensure the Contractor's Construction Phase Plan has adequate arrangements to manage identified risks.
		Ensure construction can be carried out safely without health risks to anyone involved.
		Rehearsals and Risk Identification
		Promote rehearsals to identify and eliminate or reduce significant risks.
		Completion and Handover
		Check completion and handover arrangements before project completion.
		KPI Review
		Review performance against KPIs during the construction phase.
	Construction Phase	

Roles & Responsibilities

Effective DfS implementation relies on clear roles and responsibilities. We have outlined the expectations for the **Client**, **Designer** (Functional role to coordinate DfS), and **Constructor** throughout the project lifecycle to help with smooth integration of DfS.

2 For Designer (Functional role to coordinate DfS) (1/3)

- The coordination role of the Designer, **appointed by the client**, is essential for **leading and integrating DfS** throughout the project. This role can be filled by a **Client Representative, Architect, Authorized Person, or Project Manager**.
- If the designer lacks DfS capabilities and there are no in-house health and safety resources available, the Client can appoint a coordinator or team to handle the role.
- The functional role ensures that DfS principles are integrated throughout the project. This role involves **coordinating with stakeholders, leading DfS meetings, maintaining documentation, and using digital tools** to identify and reduce risks.

Duty Holders	Stage	Responsibilities
	All Stages	Coordination with Design Team
		Check, monitor, and coordinate to ensure that designers are fulfilling their duties.
		Review lessons learnt with the Design Team
		Documentation & Information Sharing
		Ensure that all relevant information on significant risks and their mitigation is provided to the Client.
		Demonstrate that information has been shared effectively and is accessible (such as using a Common Data Environment) to all relevant parties.
		Use standardised templates and auditable procedures to maintain uniform documentation.
	Project Set Up Phase	Establish DfS Processes
		Set up regular DfS review meetings.
		Maintain the DfS Register and Pre-Construction Information (PCI).
		Establish key relevant information and processes for the project.

Roles & Responsibilities

2 For Designer (Functional role to coordinate DfS) (2/3)

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- If the designer lacks DfS capabilities and there are no in-house health and safety resources available, the Client can appoint a coordinator or team to handle the role.
- The functional role ensures that DfS principles are integrated throughout the project. This role involves **coordinating with stakeholders, leading DfS meetings, maintaining documentation, and using digital tools** to identify and reduce risks.

Designer	Design Phase	Planning & Monitoring
		Plan, manage, and monitor the design work, ensuring Health & Safety considerations are integrated.
		Oversee and coordinate with designers to identify modern building techniques and mitigate significant risks.
		Information Flow & Coordination
		Assist the Client in gathering pre-construction information.
		Provide pre-construction information to the Designer (lead/coordinating role) and Contractors, including the Main Contractor.
		Risk Identification & Mitigation
		Identify and analyse risks at the source and ensure all duty holders work to remove or minimise these risks.
		Provide all relevant information on each foreseeable significant risk* identified and its mitigation to the Client
		Lead the use of digital tools (like BIM) to visualise and reduce risks.

Roles & Responsibilities

2 For Designer (Functional role to coordinate DfS) (3/3)

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- The functional role ensures that DfS principles are integrated throughout the project. This role involves **coordinating with stakeholders, leading DfS meetings, maintaining documentation, and using digital tools** to identify and reduce risks.

	Construction Phase	Coordination with Contractors
		Coordinate with the Main Contractor to ensure that the design is aligned with safety and construction requirements.
		Liaise with the Main Contractor to ensure design coordination throughout the construction phase.
		Provide construction information and updates to the Main Contractor, including any design changes or potential issues.
	Post Construction Phase	Future Improvement
		Gather and incorporate feedback from users to improve future designs, through methods such as:
		Post-occupancy evaluations
		Defect reports
		Accident investigation reports
		User difficulties

Roles & Responsibilities

Effective DfS implementation relies on clear roles and responsibilities. We have outlined the expectations for the **Client**, **Designer** (Functional roles to coordinate DfS), and **Constructor** throughout the project lifecycle to help with smooth integration of DfS.

3 For Contractor (Functional role to coordinate DfS) (1/2)

- The coordination role of the Contractor, **appointed by the client**, is essential for **leading and integrating DfS** throughout the project. This role can be filled by a Main Contractor when the project engage more than one contractor.
- Client can also appoint a coordinator or team with functional role of DfS if there is lack of DfS capability of Main Contractor
- The functional role and responsibilities of a Main Contractor involves ensuring **collaboration and communication among all stakeholders throughout the construction phase**, managing health and safety risks, and maintaining compliance with safety protocols

Duty Holders	Stage	Responsibilities
Contractor	All Stages	Informing Duty Holders on H&S Risks
		Continuously communicate identified health and safety (H&S) risks and control measures to relevant duty holders throughout the project lifecycle.
		Cooperating and Coordinating Work
		Collaborate with other contractors and project stakeholders to ensure coordinated work efforts and safety management across the project.
		Regularly review and revise the CPP as needed to address any changes during construction.
		Review lessons learned, particularly if there are multiple contractors on the project.
	Pre-Construction	Preparing for Construction
		If the contractor is the only one on the project, ensure that the arrangements in the Construction Phase Plan (CPP) are adequate before construction begins.
		Provision of Information
		Ensure that all workers receive appropriate site inductions, including emergency procedures, where not provided by the Main Contractor.
		Risk Assessment Communication
		Provide information to the workforce on risks and required control measures identified through risk assessments.
		Ensure that the Construction Phase Plan (CPP) reflects the complexity of the project, incorporating updates from the Design Risk Register.

Roles & Responsibilities

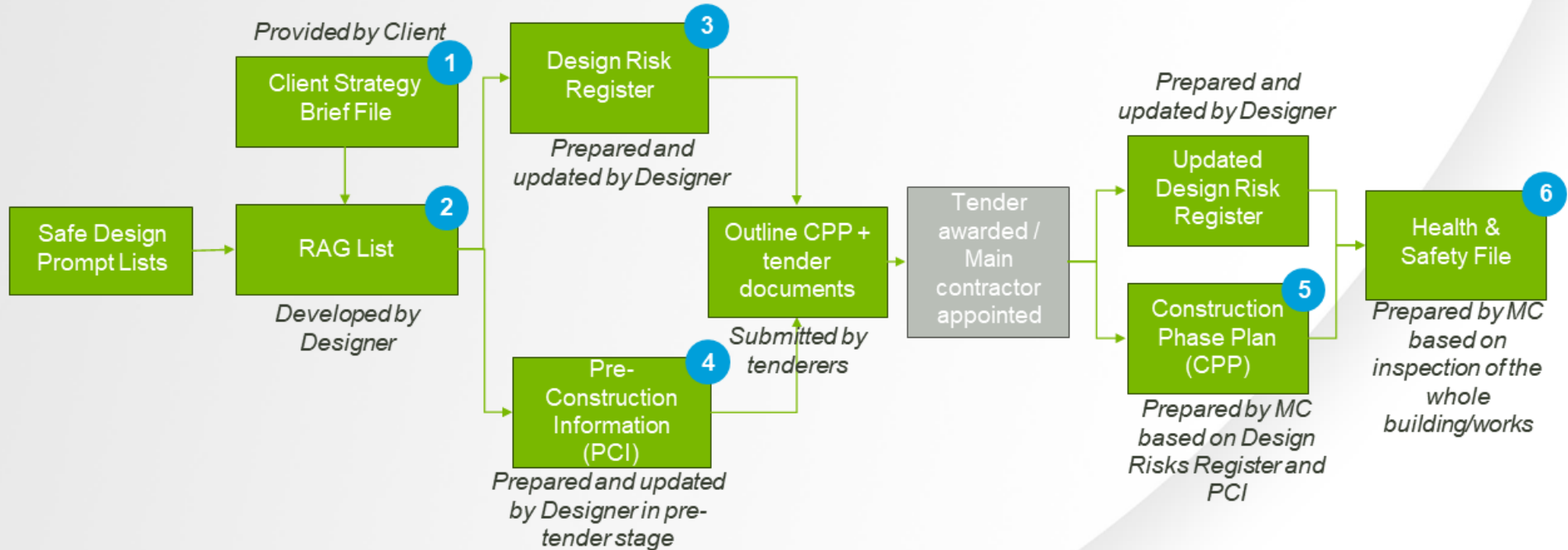
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	Construction	Health and Safety Management
		Plan, manage, and monitor the construction stage to ensure health and safety for all workers.
		Ensure suitable welfare facilities are provided at the start and maintained throughout the works.
		Update and review the Health & Safety (H&S) File regularly throughout construction.
		Take reasonable steps to manage and mitigate H&S risks identified in the Pre-Construction Information (PCI) and during the construction stage.
		Site Management
		Keep full records of all safety and health issues, including accidents and any prosecutions.
		Provide health and safety inductions, information, and training to all workers.
		Monitoring & Coordination
		Check, monitor, and coordinate to ensure that managers, supervisors, and workers are fulfilling their health and safety duties.
		Report DfS issues on time to the design and client team when they find any potential risks.
		Share and provide relevant health and safety information with all stakeholders.

Templates & Tools

Overview of DfS Documents



Client Strategy Brief 1

The Client Strategy Brief document outlines key information for construction projects, detailing essential information to align stakeholders with the client's objectives. It includes **preferred project delivery methods, timelines, resources to be deployed, communication plans, and health and safety goals**. The document is updated as needed to **address changes and maintain safety standards** throughout the project lifecycle.

Client Strategy Brief File Template			
Project Overview			
Project Owner Information			
Name/Organization			
Email Address			
Telephone Number			
Address			
Project Description			
Type of Construction Work			
Brief description of the construction work			
Project site location			
Foreseeable site constraints and limitations? e.g. next to slope, reclaimed			
Health & Safety (H&S) Requirements			
Client H&S Expectations (if above Statutory requirements)			
H&S File – Format & Index			
Procurement Strategy			
Contract Type (e.g., Design-Bid-Build, Design-Build).			
Design for Safety (DfS) Resources			
Is there sufficient time and resources allocated for the implementation of Design for Safety (DfS), and are there any specific rules or requirements in the contract related to this?			
Project Timescale (What are the key stages and how long will they run for?) Please attach the detailed work program or provide a screenshot of it.			
Concept / feasibility			
Scheme Design / Planning			
Detailed Design			
Tender / Selection			
Construction / decommissioning			
Commission / handover			
Time allocation for DfS process			
Strategic Risk((what are the significant or unusual H&S risks?))			
Overall H&S Risks (e.g. challenges from major temporary works, structural			
High-Risk Work Activities (e.g. work at heights, confined space operations, or			
Is there any pre-existing risk register or relevant information & where?			
Duty Holders Involve			
Duty Holder 1			
Name		Role	
Email Address		Telephone Number	
Address			
Duty Holder 2			
Name		Role	
Email Address		Telephone Number	
Address			
Duty Holder 3			
Name		Role	
Email Address		Telephone Number	
Address			
Duty Holder 4			
Name		Role	
Email Address		Telephone Number	
Address			
Duty Holder 5			
Name		Role	
Email Address		Telephone Number	
Address			
Are the roles and responsibilities for the DfS implementation of the duty holders			
Communication Strategy			
DfS Team Meetings (Specify the frequency, duration and location)			
Feedback Mechanism (How feedback will be gathered and how any issues or action items will be tracked and			
Communication Plan (Provide details on additional communication channels or protocols to ensure all team members stay informed)			

Red, Amber, Green (RAG) List for Building Work (1/4) 2

The RAG List is a tool designed to help designers identify and mitigate hazards **during the design stages** of a construction project. The lists will be used across various project phases **by designers and contractors** to continuously update and communicate potential risks, ensuring safety and compliance throughout the project lifecycle.

- Systematically categorised the **principal risk types** associated with the road asset class in various work types
- Highlighted the **key risk areas** of the work types.
- The structured approach enables designers to
 - identify project-specific risks
 - develop a tailored RAG list and design risk register

Asset Class	Work Type	Aspect	Details	Risk Exists? (Y/N)	RAG
	Foundations / Services Trenched / Inground Works	Working / Inspecting in trench	Lack of adequate safety measures in place for protection while working and inspecting in trenches	Yes	Red
		Underpinning of existing structure / infrastructure	Unstable and insecure underpinning of the existing structure/infrastructure	Yes	Amber
		Contaminants in soil	Harmful contaminants present in the soil	Yes	Red
		Groundwater	Polluted groundwater or adverse conditions that could affect safety or health	Yes	Red
	Excavations	Below ground water obstacles	Encountering unexpected utilities or remnants below ground can cause delays and increased costs.	Yes	Amber
		Installation / noise / vibration / dust	Drilling and pile driving generate noise and vibration	Yes	Red
		Effects on Adjacent Structures and Services	Excavations cause subsidence or damage to nearby buildings and disrupt utilities	No	NA
		Stability / Local / General / Rock Fall	Excavations risk endangers workers and passersby	No	NA
		Groundwater / Inflow / Diversion / Disposal	Groundwater inflow leads to additional costs and environmental concerns	Yes	Amber
		Storing / Retention / Fall Protection	Improper storage and retention lead to material falls	Yes	Red
		Loads and Access Adjacent Excavations	Adjacent loads and limited access compromise excavation stability and efficiency	Yes	Amber
		Flat Surface / Sloping Surface / Abrupt Level Changes	Uneven surfaces and level changes increase the risk of slips, trips, and falls.	Yes	Amber
		Effects of Water	Accumulated water causes erosion, weakens structures, and creates hazardous conditions.	Yes	Red
		Liquefaction	Saturated soils causes ground instability and structural damage.	No	NA
	Structural Works (Construction phase)	Access over reinforcement mats / cages – bar spacing	Narrow bar spacing creates trip hazards and limit worker movement	No	NA
		Reinforcement congestion limiting soffit access	Congested reinforcement bars restrict access, complicating installation and potentially causing delays.	Yes	Amber
		Installation of heavy reinforcement cages	Handling and installing heavy reinforcement cages leads to injury.	No	NA
		Exposed ends of reinforcement	Exposed reinforcement ends causes injuries due to improperly managed.	Yes	Red
		Glare and sunburn from metal surfaces (metal deck formwork, roof sheeting)	Reflective metal surfaces cause glare and increase the risk of sunburn for workers.	Yes	Red
		Shop and site applied paints (chemicals, access)	Poor access causes injuries.	No	NA
		Construction staging / phasing / temporary works	Poorly planned construction stages or temporary works lead to safety risks and project delays	Yes	Red
		Plant access	Restricted or unsafe access for plant machinery leads to delays, equipment damage, or accidents involving workers and machinery.		
		Construction staging / phasing / temporary works	Inadequate planning results in conflicts between trades, causing delays, increased costs, and safety hazards.		
		Commissioning / start up	Poorly managed commissioning leads to system failures, accidents, or hazardous conditions during the initial operation phase.		

Red, Amber, Green (RAG) List for Building Work (2/4) 2

Asset Class	Work Type	Aspect	Details	Risk Exists? (Y/N)	RAG
Building	Work at Height	Falling from construction platforms and floors	Falls from heights result in severe injuries or fatalities.		
		Falling objects - item dropped etc	Dropped objects cause serious injuries or fatalities to workers below.		
		Edge protection	Provide adequate edge protection to avoid severe injuries or death.		
		Inadequate back propping	Insufficient back propping results in structural collapse, causing injuries or fatalities.		
		Use of ladders	Operating cranes beyond safe limits result in tipping or collapse, endangering workers and causing significant damage.		
		Use of scaffolds	Poorly erected or maintained scaffolding causes injuries or fatalities.		
		Use of scissor / booms	Misuse or failure of scissor lifts and boom lifts results in falls or crushing injuries		
		Roof access provisions	Unsafe roof access leads to falls, resulting in serious injuries or fatalities		
		Fall arrest provisions	Lack of fall arrest systems increases the risk of severe injury or death in the event of a fall.		
	Heavy Machinery / Plant	Heavy machinery access for excavation / compaction	Limited access results in machinery accidents, equipment damage, and delays.		
		Misuse of equipment	Misuse of heavy machinery results in crushing injuries or fatalities.		
		Craneage / load lifting overhead	Poorly planned or executed crane operations lead to injuries, fatalities, or damage to structures.		
		Excessive lift or reach	Operating cranes beyond safe limits results in tipping or collapse		
		Clash of crane jibs	Collisions between cranes lead to catastrophic equipment failure and severe injuries.		
		Handling of large / bulky items	Improper handling of large items causes strain injuries or accidents, resulting in worker injury or material damage.		
	General Machinery / Plant	Egress and access	Poorly planned access routes lead to accidents, delays, and inefficient operations		
		Manual handling	Excessive manual handling causes musculoskeletal injuries and reduces worker productivity.		
		Adjacent stakeholders	Lack of coordination with nearby stakeholders leads to disruptions, safety hazards, and potential conflicts.		
		Site hygiene / cleanliness	Poor site cleanliness results in slip, trip, and fall hazards.		
	Structural Design Issues (project life)	Handrails and balustrades – types, heights, loading	Inadequate handrails or balustrades lead to falls, resulting in injuries or fatalities.		
		Impact resistance / protection / redundancy	Lack of impact resistance or redundancy leads to structural failure during an impact event, endangering lives and property.		
		Floor design loads / provisions	Underestimating floor loads results in structural failure, causing injuries, fatalities, or significant damage.		
		Access / hanging points	Insufficient access or hanging points hinder maintenance, leading to safety risks or operational inefficiencies.		

Red, Amber, Green (RAG) List for Building Work (3/4) 2

Asset Class	Work Type	Aspect	Details	Risk Exists? (Y/N)	RAG
	Services Design Issues (project life)	Lightning protection	Inadequate lightning protection leads to electrical fires, equipment damage, or injury during a lightning event.		
		Earthing and bonding	Poor earthing and bonding result in electric shock hazards, equipment failure, and increased risk of fire.		
		Depth of services	Incorrect service depths lead to accidental damage during future excavation or maintenance, disrupting operations and increasing costs.		
		Temporary service provisions / future proofing	Failure to consider temporary or future service needs results in costly retrofits, operational disruptions, and safety risks.		
	Maintenance	Cleaning / maintaining facades	Lack of access or space for regular cleaning and inspection leads to material deterioration and safety hazards.		
		Cleaning / maintaining roof and gutters	Blocked access to gutters or insufficient maintenance results in water accumulation, leading to leaks and structural damage.		
		Access to elevated plant (ceilings, soffits, roofs, plant rooms)	Inadequate access to elevated plant areas hinders maintenance activities and pose safety risks.		
		Plant platforms - access, circulation, egress, testing, replacement	Insufficient space or poor design of plant platforms restricts access for maintenance		
		Cleaning / maintaining / replacing services (lighting, fire services, A/C plant etc.)	Inadequate maintenance of critical services like lighting and HVAC causes equipment failure and safety risks.		
		Cleaning / maintaining / replacing steelwork protective coatings	Failure to maintain protective coatings on steelwork leads to corrosion.		
		Hazardous substances / chemicals	Improper handling or storage of hazardous substances leads to serious health risks and environmental hazards		
		Confined / restricted spaces	Inadequate safety measures in confined spaces result in accidents such as asphyxiation or toxic exposure.		
	Operations	Egress and access	Obstructed egress and access routes delay emergency evacuations and hinder daily operations.		
		sight lines	Poor sight lines in critical areas increase the risk of accidents.		
		Clearances	Insufficient clearances cause obstructions and accidents during equipment operation.		
		Fire and smoke management	Inadequate fire and smoke management leads to catastrophic damage and loss of life.		
		Air quality	Poor air quality negatively impacts health and operational efficiency.		
		Water quality	Inadequate water quality management leads to health hazards.		
		Rubbish management	Inefficient rubbish management causes hygiene issues and operational disruptions.		
		Delivery / traffic management	Poor traffic management leads to congestion and accidents.		
		Ambulance access (stretcher/barouche)	Inadequate access for emergency vehicles delays critical response times.		
		Signage	Insufficient or unclear signage leads to confusion and accidents.		

Red, Amber, Green (RAG) List for Building Work (4/4) 2

Asset Class	Work Type	Aspect	Details	Risk Exists? (Y/N)	RAG
	Operations	Ambulance access (stretcher/barouche)	Inadequate access for emergency vehicles delays critical response times.		
		Signage	Insufficient or unclear signage leads to confusion and accidents.		
		Slips and Trips / Slippery. wet or uneven surfaces	Slippery or uneven surfaces result in serious accidents.		
		Slopes and cross falls	Improperly designed slopes cause water accumulation and hazardous conditions.		
		Steps and changes in levels	Poorly designed steps and level changes cause trips and falls.		
		Electrical safety	Inadequate electrical safety results in shocks and fires.		
		Security	Insufficient security measures lead to unauthorized access and vandalism.		
		Vandalism(deliberate and accidental)	Failure to prevent vandalism results in property damage.		
		Pollutants / hazardous materials management and disposal	Improper disposal of pollutants leads to environmental contamination.		
		Lighting	Inadequate lighting reduces safety and productivity.		
		Flooding	Poor drainage leads to flooding, causing damage and disruptions.		
	Demolition(end of project life)	Falling objects in demolition	Uncontrolled falling objects during demolition cause serious injuries.		
		Damage to in ground services	Demolition can damage underground services, leading to service interruptions and hazards.		
		Damage to live services	Accidental damage to live services results in shocks and leaks.		
		Hazardous materials	Improper handling of hazardous materials leads to contamination and health risks.		
		Exposure to asbestos	Inadequate asbestos management exposes workers to severe health risks.		
		Struck by plant	Workers be struck by heavy machinery if safety protocols are not followed.		
		Post tensioning / prestressing	Improper handling during demolition leads to sudden failures and injuries.		
		Design loading	Failure to consider loading during demolition leads to structural collapse.		
		Construction staging / phasing / temporary works	Poor planning creates unsafe conditions and operational delays.		
		Disposal	Improper disposal of demolition waste leads to environmental damage.		
		Adjoining structures / infrastructure	Demolition activities inadvertently damage nearby structures or infrastructure.		

Design Risk Register (1/5)

3

The Design Risk Register is designed to identify and evaluate hazards **during the design and construction phases of a project**. It assesses the severity of potential accidents, mitigates construction hazards, and documents significant risks. It is updated by the design team during the design and tender stage, and by the Main Contractor during the Construction Phase to incorporate any relevant design changes and address emerging hazards.

Design Risk Register Sample														
IDENTIFY SAFE DESIGN RISK							ANALYSE SAFE DESIGN RISK - CURRENT EXPOSURE				IMPLEMENT SAFE DESIGN RISK TREATMENT			
ID	Risk Title	Event / Cause / Consequence	Persons Affected	Applicable Phases	Applicable Disciplines	Inherent Sequence	(Risk Treatment) Current Controls	Residual Sequence	Residual Likelihood	Risk Level	Risk Owner	Re-evaluation	(Risk Treatment) Action Summary	Comments
▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
1	Alignment Constraints	Limited space along Wai Yip Street may restrict optimal alignment, causing accessibility or approval issues	Public	Design	Multi-Discipline	B - Major	Conduct initial site layout review with project team including civil, architectural, and traffic engineers. Assess site constraints; Set up design coordination meetings	C - Moderate	4 - Likely	High	PM - Peter	Intolerable	Arrange joint site visits for all disciplines; Conduct workshops to evaluate alignment options; Document findings and integrate feedback into early design drawings.	24Nov2025 Peter - The risk has been mitigated
2	Unclear Interface with Travellers	Ambiguity on responsibilities or technical requirements for traveller integration leads to interface issues in later stages	Designer Contractor	Design	Multi-Discipline	B - Major	Hold interface coordination meetings with traveller supplier and all design disciplines. Draft and circulate interface responsibility matrix	B - Major	3 - Possible	Critical	M&E Coordinator - Ken	Intolerable	Prepare detailed interface control document with clear responsibilities and technical requirements; Review and update matrix at each design stage.	
3	Climate Resilience Not Addressed	Failure to consider future climate (flooding, heat) leads to maintenance or safety issues	Public	Design	Civil	C - Moderate	Preliminary climate risk assessment; Review historical weather data	C - Moderate	2 - Unlikely	Medium	PM - Peter	Intolerable	Engage expert for climate adaptation review; Integrate higher drainage capacity and shade features into early design..	
4	Insufficient Allowance for Maintenance	Design does not provide for safe/easy maintenance access (e.g., to travellers, lighting)	Maintenance Staff	Design	Structural	C - Moderate	Preliminary maintenance review; Draft O&M requirements	C - Moderate	3 - Possible	High	PM - Peter	Intolerable	Incorporate maintenance access points and working platforms in design; Review design with future maintenance team.	
5														
6														
7														

Design Risk Register (2/5) 3

The Design Risk Register is designed to identify and evaluate hazards **during the design and construction phases of a project**. It assesses the severity of potential accidents, mitigates construction hazards, and documents significant risks. It is updated by the design team during the design and tender stage, and by the Main Contractor during the Construction Phase to incorporate any relevant design changes and address emerging hazards.

IDENTIFY SAFETY RISK						
A	B	C	D	E	F	G
ID	Risk Title	Event / Cause / Consequence	Persons Affected	Applicable Phases	Applicable Disciplines	Inherent Consequence
1	Alignment Constraints	Limited space along Wai Yip Street may restrict optimal alignment, causing accessibility or approval issues	Public	Design	Multi-Discipline	B - Major
2	Unclear Interface with Travellers	Ambiguity on responsibilities or technical requirements for traveller integration leads to interface issues in later stages	Designer Contractor	Design	Multi-Discipline	B - Major
3	Climate Resilience Not Addressed	Failure to consider future climate (flooding, heat) leads to maintenance or safety issues	Public	Design	Civil	C - Moderate
4	Insufficient Allowance for Maintenance	Design does not provide for safe/easy maintenance access (e.g., to travellers, lighting)	Maintenance Staff	Design	Structural	C - Moderate
5						
6						
7						

Item	Column Name	Description
A	ID	A unique identifier for each item
B	Risk Title	This should be a simple descriptor for the purpose of reporting. The shorter the better as long as it achieves the purpose of informing what the item is.
C	Event / Cause / Consequence	This cell contains a combined descriptor for the risk, its causes, and its consequences. If the current consequence differs from the inherent consequence, this should be noted within this cell.
D	Persons Affected	Some safe design assessments require the identifications of persons who may be affected if the risk is realised.
E	Applicable Phases	Some safe design assessments require the identifications of the project phases within which the risk may realised.
F	Applicable Disciplines	Users may wish to identify the engineering disciplines associated with the risk. This enables for example the Electric Lead to quickly filter the register for risks associated with the electrical discipline.
G	Inherent Consequence	The inherent consequence is the maximum reasonably foreseeable consequence were the controls described in the <Current Controls> column not in place and effective.

Design Risk Register (3/5) 3

The Design Risk Register is designed to identify and evaluate hazards **during the design and construction phases of a project**. It assesses the severity of potential accidents, mitigates construction hazards, and documents significant risks. It is updated by the design team during the design and tender stage, and by the Main Contractor during the Construction Phase to incorporate any relevant design changes and address emerging hazards.

Risk Register Sample			
ANALYSE SA	H	I	J
DESIGN RISK - CURRENT	CONSEQUENCE	LIKELIHOOD	RISK LEVEL
(Risk Treatment) Current Controls			
Conduct initial site layout review with project team including civil, architectural, and traffic engineers. Assess site constraints; Set up design coordination meetings	C - Moderate	4 - Likely	High
Hold interface coordination meetings with traveller supplier and all design disciplines. Draft and circulate interface responsibility matrix	B - Major	3 - Possible	Critical
Preliminary climate risk assessment; Review historical weather data	C - Moderate	2 - Unlikely	Medium
Preliminary maintenance review; Draft O&M requirements	C - Moderate	3 - Possible	High

Item	Column Name	Description
H	(Risk Treatment) Current Control Measures	The controls that are important in achieving the current risk level should be listed in this column. Controls should be listed as bullets.
I	Consequence	Per the header this is the maximum reasonably foreseeable consequence given the "Current Controls" identified in that column. The value selected in this column must match the description provided in the <Event/Cause/Consequence> column.
J	Likelihood	Per the header this is the likelihood of realising the maximum reasonably foreseeable consequence given the "Current Controls" identified in that column. It is not the likelihood of the risk event itself.
K	Risk Level	This value is returned as a fnc of the selected likelihood and consequence values using the heat map in the next page

Design Risk Register (4/5)

3

How to Conduct Risk Assessment

		Likelihood Analysis Descriptions		
		Descriptor	Likelihood (i.e. % chance of realisation during applicable period: construction phase, operating cycle or decommissioning)	Industry Incidences (only applicable to common systems/assets)
Category	5 - Almost Certain	The threat is expected to be realised.	90% < Likelihood ≤ 100%	Common incident
	4 - Likely	The threat is likely to be realised.	5% < Likelihood ≤ 90%	Several incidents nationally
	3 - Possible	The threat may be realised.	1% < Likelihood ≤ 5%	One or a few incidents nationally
	2 - Unlikely	The threat is not expected to be realised.	0.1% < Likelihood ≤ 1%	No known national incidents. One or a few incidents in comparable international operating regimes.
	1 - Rare	The threat may be realised in reasonably foreseeable but exceptional circumstances.	0% < Likelihood ≤ 0.1%	No known incidents in comparable international operating regimes.

		Consequence Analysis Descriptions			
		People	Property	Environment	Community
Category	A - Catastrophic	Single or multiple fatality	Virtual complete loss of plant or system	Permanent / irreversible widespread ecological damage not able to be remediated	Outrage by a sizeable community or many communities. Riots.
	B - Major	Disabling injury or illness i.e. amputation and/or permanent loss of bodily function, or any kind of permanent health impact	Extensive damage to plant or system	Extensive ecological damage, lengthy remediation process	Community/NGO legal actions. Pickets, demonstrations.
	C - Moderate	Any Lost Time Incident (LTI), ie. an illness or injury resulting in one or more consecutive days or shifts off work	Significant damage to plant or system	Substantial ecological damage but able to be remediated	Persistent formal community complaints. Formal complaints to politicians or comparable representatives.
	D - Minor	A medical treatment case (MTC) / or restricted work case (RWC)	Damages impact on budget and program	Localised ecological damage, easily remediated	Formal complaints from local Community complaints locally
	E - Incidental	First Aid Case, or an injury or illness not requiring treatment	Minor damage to plant or system	Negligible ecological damage, may not require remediation	No Informal community complaints &/o negative comments / views.

		Risk Level Matrix					
		Likelihood					
		0 - Eliminated	1 - Rare	2 - Unlikely	3 - Possible	4 - Likely	5 - Almost Certain
Consequence	A - Catastrophic	High	Critical	Critical	Critical	Critical	
	B - Major	High	High	Critical	Critical	Critical	
	C - Moderate	Medium	Medium	High	High	Critical	
	D - Minor	Low	Low	Medium	High	High	
	E - Incidental	Low	Low	Low	Medium	Medium	

Design Risk Register (5/5) 3

The Design Risk Register is designed to identify and evaluate hazards **during the design and construction phases of a project**. It assesses the severity of potential accidents, mitigates construction hazards, and documents significant risks. It is updated by the design team during the design and tender stage, and by the Main Contractor during the Construction Phase to incorporate any relevant design changes and address emerging hazards.

IMPLEMENT SAFE DESIGN RISK TREATMENT			
L	M	N	O
Risk Owner	Evaluation	(Risk Treatment) Action Summary	Comments
PM - Peter	Intolerable	Arrange joint site visits for all disciplines; Conduct workshops to evaluate alignment options; Document findings and integrate feedback into early design drawings.	24Nov2025 Peter - The risk has been mitigated
M&E Coordinator - Ken	Intolerable	Prepare detailed interface control document with clear responsibilities and technical requirements; Review and update matrix at each design stage.	
PM - Peter	Intolerable	Engage expert for climate adaptation review; Integrate higher drainage capacity and shade features into early design..	
PM - Peter	Intolerable	Incorporate maintenance access points and working platforms in design; Review design with future maintenance team.	

Item	Column Name	Description
L	Risk Owner	Per the header this is the person who should be responsible for the risk.
M	Evaluation	This column reflects the decision of the authorised person as to whether it is OK to expose harm receptors to the risk &/or whether additional actions are required to modify the risk exposure.
N	(Risk Treatment) Action Summary	This column lists actions required to bring the risk to an acceptable level . It should be empty if the risk has been evaluated as retired (eliminated) or acceptable. If actions are required the list should be preceded by the leader line "The risk will be actioned to an acceptable level by:".
O	Comments	The comments column is used to record the development of the entries.

Pre-Construction Information 4

The Pre-Construction Information (PCI) **centralises essential project details and health and safety considerations**. It serves as an essential component throughout the project lifecycle, from pre-tender to construction stages, guiding the planning, management, and communication of safety-related information among all designers and contractors. The PCI is **initiated by the client** at the project set-up stage, continuously **updated by the design team** during the design stages, **included with tender documents** during the tender stage, and **reviewed and transferred to the Health & Safety file** by the main contractor in the construction stage.

Sample Outline of Pre-Construction Information			
Item	Section	Exist in the document? (Y/N)	Comment / Notes
1. Project Information			
1.1	A description of the Project		
1.2	Key dates		
1.3	Contact details for the project team		
1.4	The extent and location of the existing information		
1.5	Project arrangements:		
1.5.1	- Planning and managing the construction work		
1.5.2	- Communication and liaison		
1.5.3	- Security		
1.5.4	- Site hoarding - preventing unauthorised access		
1.5.5	- Site transport - access routes		
1.5.6	- Permit-to-work systems		
1.5.7	- Fire precautions		
1.5.8	- Emergency procedures		
1.5.9	- Means of escape		
1.5.10	- Authorisation requirements		
1.5.11	- Ground works - excavations confined spaces		
1.5.12	- Smoking and parking restrictions		
2. Safety Hazards			
2.1	Boundaries and access including traffics		
2.2	Restrictions on deliveries, waste collection or storage		
2.3	Adjacent land uses and projects		
2.4	Existing live and redundant services (i.e. overhead HV and underground utility services including gas, drainage, telecommunications, etc.)		
2.5	Ground conditions (i.e. stability, contamination)		
2.6	Existing stability of structures (i.e. permanent and temporary)		
2.7	Issues relating to plant and equipment		
2.8	Health and safety information in earlier design, construction or 'as-built' drawings		

3. Health Hazards	
3.1	Asbestos
3.2	Contaminated land
3.3	Client's activities
3.4	Storage of hazardous materials
3.5	Significant design and construction hazards
3.5.1	- Assumptions and working methods
3.5.2	- Arrangements for co-ordination of ongoing design work
3.5.3	- Significant risks identified during design
3.5.4	- Materials requiring particular precautions
4. Information in Existing Health & Safety File	
4.1	A description of the Health and Safety File and any conditions relating to its content
4.2	Asset or Building Manual

Construction Phase Plan (1/3) 5

The Construction Phase Plan (CPP) is crucial for identifying and mitigating significant health and safety risks throughout the construction project. It is a key document for communicating risk management strategies to all pertinent duty holders during the construction phase. The **initial CPP is developed by the Main Contractor** before construction begins, and both the **Main Contractor and sub-contractors collaboratively update** it with safety details as the project progresses through the construction stage.

Construction Phase Plan		
PLAN		
Project Name		
Client's Information		
Name	Address	
Project Details		
Job Description		
Client-Specific Considerations (if any)		
Project Milestones	Start	
	Finish	
	Others	Progress Review Date:
WORK TOGETHER		
Stakeholder & Roles		
List of Parties on Site	Main Contractor	
	Subcontractors	
	Design Team	
	Client Representative	
	Safety Consultant	
	Other	
Main Contractor Designation	Project Manager	
	Site Supervisor	
	DfS Coordinator	
Communication & Coordination	Regular Meetings (frequency, time, and location)	
	On-Site Notice Board	
	Emergency Communication Method	

Construction Phase Plan (2/3) 5

The Construction Phase Plan (CPP) is crucial for identifying and mitigating significant health and safety risks throughout the construction project. It is a key document for communicating risk management strategies to all pertinent duty holders during the construction phase. The **initial CPP is developed by the Main Contractor** before construction begins, and both the **Main Contractor and sub-contractors collaboratively update** it with safety details as the project progresses through the construction stage.

Health & Safety Management		
Safety Documentation & Inspections	H&S Plan	
	Safety Audits (frequency and responsible party)	
	Daily Inspection (checklist and responsible party)	
Site Rules and Induction	Site Inductions	
	PPE Requirements	
	Site Rules	
Induction Procedures	Site Induction Process (Describe how the induction will be managed.)	
Operational Management		
Traffic Management	Traffic Management Measures (Describe the system for managing vehicle movements on site to ensure safety.)	
Welfare Facilities	On-Site Amenities (Describe the welfare facilities provided on site. E.g. Sanitation, Hydration Points, Locker Rooms and Break Areas)	
Fire Prevention and Emergency Procedures	Emergency Equipment and Procedures (Detail location and maintenance of fire extinguishers, fire watch assignments, evacuation plans, and storage protocols for hazardous materials.)	

Health & Safety File 6

The Health & Safety File is designed to **cover all relevant information about a building's construction, operation, and maintenance to ensure safe future practices**. It aims to enhance the health and safety of maintenance personnel and building users by guiding informed decision-making and effective risk management. The Health & Safety File is updated throughout the project lifecycle: specified by the client pre-tender, compiled by the designer in design stage and collaboration with contractor during construction, and the main contractor delivers the updated file at handover

Sample Outline of Health & Safety File (Asset or Building Manual)		
Section	Description	Details
-	Front Page	Title of the project, the particular element of the project covered by the manual, the relevant manual reference, and the date of issue of the manual.
-	Content Page	A fully detailed index of the Operation and Maintenance Manual. Title/Page number etc.
1	Introduction	Description of the manual content and structure. How to use it and why it is being issued. [could be standardized across all your projects]
2	Project Information	Include detailed information on the project. [can take information from the Owner's Project Requirements (OPR), Basis of Design (BOD), Specifications, Commissioning Plan/Cx Plan]
3	Project Specifications	Include a register of Specifications that were utilized on the project.
3.1	Building Management System (BMS) Specification	Include BMS Systems Specification.
3.2	Extra Low Voltage (ELV) Systems Specification	Include ELV Systems Specification.
3.3	Electrical Systems Specification	Include Electrical Systems Specification.
3.4	Fire Systems Specification	Include Fire Systems Specification.
3.5	Mechanical/ Heating, ventilation, and air conditioning (HVAC) Systems Specification	Include Mechanical/ Heating, ventilation, and air conditioning (HVAC) Systems Specification.
3.6	Plumbing and Drainage Systems Specification	Include Plumbing & Drainage Systems Specification.
4	As-Built Drawings	
4.1	BMS System As-Built Drawings	Include a register of BMS Systems As-Built drawings.
4.1.1	Schematics/Single Line	Include a set of as-built schematics/single line diagrams for the BMS Systems.
4.1.2	Layouts	Include a set of as-built layouts for the BMS Systems.
4.1.3	Controls System As-Built Drawings	Include a register of Control Logics As-Built drawings.
4.2.1	Control Logics	Include a set of as-built Control Logics.
4.3	ELV System As-Built Drawings	Include a register of ELV Systems As-Built drawings.
4.3.1	Schematics/Single Line	Include a set of as-built schematics/single line diagrams for the ELV Systems.
4.3.2	Layouts	Include a set of as-built layouts for the ELV Systems.
4.4	Electrical System As-Built Drawings	Include a register of Electrical Systems As-Built drawings.
4.4.1	Schematics/Single Line	Include a set of as-built schematics/single line diagrams for the Electrical Systems.
4.4.2	Layouts	Include a set of as-built layouts for the Electrical Systems.
4.5	Fire System As-Built Drawings	Include a register of Fire Systems As-Built drawings.
4.5.1	Schematics/Single Line	Include a set of as-built schematics/single line diagrams for the Fire Systems.
4.5.2	Layouts	Include a set of as-built layouts for the Fire Systems.
4.6	Mechanical/HVAC System As-Built Drawings	Include a register of Mechanical/HVAC Systems As-Built drawings.
4.6.1	Schematics/Single Line	Include a set of as-built schematics/single line diagrams for the Mechanical/HVAC Systems.
4.6.2	Layouts	Include a set of as-built layouts for the Mechanical/HVAC Systems.
4.7	Plumbing and Drainage Systems As-Built Drawings	Include a register of Plumbing Systems As-Built drawings.
4.7.1	Schematics/Single Line	Include a set of as-built schematics/single line diagrams for the Plumbing and Drainage Systems.
4.7.2	Layouts	Include a set of as-built layouts for the Plumbing & Drainage Systems.

5.0	Electrical Discrimination Study	Include the approved discrimination study report for the electrical systems.
6.0	BMS Graphic Document	Include the approved BMS Graphic document.
7.0	BMS Access/Messaging As-Built Information	Include the approved information relating to access to the BMS/control systems and programming.
8.0	Summary of Systems Installed	Provide a summary of each system's components, location, and how they are designed to operate. [can take from specifications, drawings, control logics]
9.0	Asset Register	Include a detailed list of equipment for each type of system that has been installed. 1. Equipment ID 2. Type 3. Manufacturer 4. Model 5. Size/Rating 6. Building/Floor/Room [usually taken from the progress trackers that were created through the project]
10.0	System Operation	Expand on the way in which each of the systems operates: 1. Start-Up, interfaces/interlocks 2. Setpoints 3. Running 4. Shut down, interfaces/interlocks 5. Fault finding/problem solving [Use specifications, drawings, control logics, manufacturers data, and information].
11.0	Manufacturers Literature/Information	Include all the manufacturer's information relating to the equipment, ancillaries, and systems. [Use the asset register for reference of what would be needed]
11.1	[Add each type]...	
11.2	[Add each type]...	
11.3	[Add each type]...	
12.0	Health and Safety	
12.1	Safety Procedures	Include all safety processes and procedures related to the operation, access, and maintenance of the equipment and systems. Don't forget a register/index to show what is included. [Use the project health and safety file for examples and reference]
12.2	Control of Chemical/ Substances Hazardous to Health	Include all Chemical/substances hazardous to health data sheets for items related to the maintenance, cleaning, and disposal of chemicals [paint, adhesives, gases, and chemicals]. Don't forget a register/index to show what is included. [Use the project health and safety file for examples and reference]
12.3	Risk Assessments	Include all risk assessments related to the operation, access, and maintenance of the equipment and systems. Don't forget a register/index to show what is included [Use the project health and safety file for examples and reference]
12.4	Arc Flash Study	Include the approved Arc Flash Study for the electrical systems.
13.0	Disposal of Equipment/Products	Provide information on how equipment and products should be disposed of.



Bringing
ideas
to life

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现在放映的是2025年10月16日

香港房屋委员会

「新工程合约工地安全讲座」的片段

台上的讲者是澳昱冠大中华区基础设施咨询总监

掌晶女士

她的讲题是

「建筑设计 - 打造安全与可持续发展的社区」

(00:24)

感谢房委会的邀请

今天很高兴可以和大家分享

建筑设计安全的一些知识

今天的议程主要目的是

向大家介绍建筑设计安全

接着，我会介绍一些风险控制框架

希望大家在日常工作中都能够应用

最后，我也会介绍

建筑设计安全的一些角色与责任

以及这个建筑设计安全系统中的

重点范本和工具

在正式讲解建筑设计安全之前

我也很想先让大家看看这组数字

相信很多人对这些数字都非常熟悉
我们选择了新加坡
作为一个基准对象
我们都看到
无论是意外的数字，或是死亡率
香港和新加坡之间仍然有颇长的一段距离
这样告诉我们
香港城市本身有很多很有特色的地方
包括建筑密集度
以及人口密度都相当高
正因如此，我们更加要关注建筑安全
在日常工作当中
无论是设计、建造
甚至是营运和维修
其实在每一个工序里
安全都绝对是优先的
接着，在介绍一些文字和概念之前
我很想先用一个简单例子
说明什么是建筑设计安全
相信一会儿林凯帆先生应该会有更多例子
不过这里先用一个小小的例子
让大家看看一些前后对比
左边那张相片

是一个大家认识的地方

就是配电房

其实很多电缆桥架

或是一些有很多电缆槽、水喉喉管的房间

都会是这个样子

当大家看到这张相片时

能不能找到安全问题？

虽然这里有一个平台让人可以进出

但其实很容易绊倒

而且东西搬不进去

没有空间能使用手推车

所以一些重物、机械

或者较重的工具都要靠人手搬运

将来在这间房间进行维修的维修人员

在日常工作时，面对很多困难

如果我们在设计这房间的时候

在安装这些电缆或安装其他设备之前

已经想到这个问题

就可以把设计改为右边这种方法

我们把电缆安装在离地约两米的位置

工友就可以使用手推车

很自由地在下面通行

运送物料和工具

维修也会相对容易
整体安全指数也会较高
所以一个很简单的例子
想告诉大家
如果我们在设计时已经想到将来的使用情况
其实就可以设计一个更安全的工作环境
接着回到今天的主题
把建筑设计安全的原则
介绍给大家
希望能融入在大家的日常工作中
可以使用这方法
建筑设计安全是什么时候来到香港的？
其实这套建筑设计安全系统
是来自英国的建筑设计及管理规例框架
它在2006年第一次被引入香港
但差不多到2020年
建造业议会才成立了一个专责小组
去研究这件事

当时也出版了一份参考资料
当时我有协助建造业议会制作这份参考资料
已将这些参考资料
应用在20个先导项目当中
当然，房屋署有参与其中

所以，我们希望能将建筑设计安全的原则和一些资料
在业界作更广泛的应用

其实，建筑设计安全

正如刚才那张图所介绍

就是希望我们在设计阶段

甚至在规划阶段

已经想到将来在建筑上或将来营运和维修时

会遇到的一些危险、困难和阻碍

并尽量在设计上先行处理

以最大程度减少未来可能出现的危险和事故

在建筑设计安全当中

我们有四个关键持份者

在左下方也有列出

包括客户、设计师、承建商和维修主管

因为大家都明白

设计和建筑可能只是涉及数年

但其实大厦的运作

在香港可能长达五十年、六十年

所以，维修主管这个角色

可以在前期阶段对将来的营运和维修

提出很多风险方面的意见

另外，我们为建筑设计安全

创造了一个功能性职位

这个职位可以由客户代表、建筑师、认可人士
或者项目经理担任

这个所谓的功能性职位

其实就是帮助协调整个建筑设计安全的倡议

让不同界别的声音、不同意见、不同经验和分享
可以在不同阶段、不同角度之下得到协调和整合

而建筑设计安全的核心指导原则就在右边列明

这里所写的CORE(核心)

C代表Communication(沟通)和Coordination(协调)

我们希望一些主要的健康与安全档案
关注事项和反馈机制

以及不同团队之间都可以有足够的沟通
因为大家看问题的角度可能会有所不同

所以我们希望有一个良好的反馈机制

让不同声音都可以被听到

O就代表Ownership(拥有权)和Leadership(领导能力)

意思就是把健康与安全

放在我们一个关键商业决策里面

大家都知道

执行项目时，最重要的是什么

很多时候，大家先考虑的是成本

然后是时间，再之后可能是质量

可能与成本和时间比较

大家会有不同的优先次序

所以如果要进行商业决策

在选择材料时

大家会考虑成本和时间

但有没有人考虑安全呢？

应该会比较少

房屋署真的做得非常好

所以，我们很希望将健康与安全

也变成一个关键商业决策

即是说，在考虑时间和金钱之外

都必须同时考虑安全

R就是Risk Prevention(风险预防)和Management(管理)

这一点，我相信大家在自己的项目里面应该都有进行

例如识别风险

再制定一些风险缓解措施

而建筑设计安全

就是希望可以从设计这个源头开始

减少这些风险

E就是Evaluation(评估)和Training(培训)

正如今天这样，我们希望透过更多分享

让大家知道不同的方法

令整个业界可以变得更加安全

至于阶段和步骤

可能和大家想像的不一样

因为我们的建筑设计安全

是覆盖由规划阶段

一直到将来的营运和维修阶段

所以稍后介绍的一些工具和范本

也都会覆盖这些不同环节

接着，我很想介绍一下控制等级

我想林凯帆先生应该对这个很熟悉

大家有没有看过这个倒三角？

相信大家在不同场合都曾经看过

其实，我们可以由最底部开始看

最底部是什么呢？

就是个人防护装备

这个大家一定很熟悉

再上一层就是行政控制

这个字眼大家可能未必常常直接这样说

但其实行政控制包括

工作许可证系统、每日简报、联合安全检查等

大家可能会很好奇

因为我们现在业界做得最多的

就是个人防护装备和行政控制

但在这个控制等级里面

我们反而认为它们是效率最差的

为什么呢？

因为当事情已经在工地才处理

在建筑的角度来说

其实已经是最后一个步骤才去做

很多时候，只是因为再没有其他方法

所以才要依靠工友或依靠工地同事

在现场执行这些措施才能维持安全

因此，我们认为这是效率最差的做法

那什么是最有效呢？

就是上面的四个方法

第一个，就是消除

如果可以直接消除危险

当然是最好

这是最彻底的方法

不过，未必每一个个案都可以做到

如果无法完全消除，我们还可以做什么呢？

就是替代

替代就是用一些风险较低的工序

去取代风险较高的工序

或者用一些风险较低的设计

去取代一些风险较高的设计

这就是替代

第三个就是隔离

这就是把风险从人身上移除

例如做一些围封

或者更简单地说，用机械人去进行工序

不用人去执行，自然就没有风险

第四个就是工程控制

工程控制是指透过一些物理的改变

去防止一些风险的过程

其实在设计阶段

甚至我们现时的安全智慧工地系统

都可以看作是工程控制的一部分

这里我也有一些例子，例如消除的对比

左边可见，有一位工友站在工作平台上

在外墙上安装一些东西

如果我们不需要在外墙上工作

或者外墙根本不需要那么多维修和安装

那是不是就可以消除这个风险呢？

这当然是一个很极端的例子

我们曾经和一些承建商讨论

他们都说如果外墙采用清水混凝土设计

其实已经是最安全的

因为建成之后

不需要再进行工序就可以直接使用

不需要再结砖，也不需要安装玻璃

所以最安全

当然，若考虑美观等因素

未必每个项目都做得好

但这个例子就是想让大家知道

有时不进行额外工序，反而是最安全

第二个例子就是替代

左边是传统棚架

如果我们使用右边的移动式升降工作平台

便会更加安全

另外一个替代的例子

房屋署也做得很好的

就是组装合成建筑法和机电装备合成法

因为它们可以很大程度上

减低工地的工序

把部分工作转移到工场完成

从而减少在工地工作的危险性

另外，在工序上有时也可以考虑不同安排

例如很多时候我们建筑都是由底层一直做到顶部

但有时也可以考虑一些由上而下的方法

将一些原本需要在高空完成的工序

改为在地面处理

这其实已经可以很大程度上减少工地作业的风险

至于隔离，可以包括一些全封闭式护栏

又或者刚才提到的机械人、无人机、机械技术等

这些都属于隔离的一部分

至于工程控制

这里也有一个很简单的例子

左边那个例子中

地面有水，在上面行走就很容易滑倒

其实一个很简单的方法

就是使用一些防滑的表面或物料

这样便可以避免将来出现这些风险

这个解决方案

大家现在看到的是在码头使用

码头很多时候都会使用这种防滑的物料

至于行政控制和个人防护装备

大家都非常熟悉

例如行政控制

包括工作计划、工作许可证系统、禁止进入系统等

而个人防护装备

则包括安全鞋、安全帽、安全装置、安全绳等

这些大家应该都很清楚

我就不再强调了

所以，这个控制等级系统
最重要是帮助大家建立一种思维模式
当我们遇到一些风险
要构思缓解措施的时候
就可以遵循这个等级去思考
看看怎样才是减低风险的最佳方法
接着，我想向大家介绍
我们这个建筑设计安全系统的
角色与职责以及范本与工具
这里我不会详细介绍
因为内容比较长
其实角色与职责
刚才也已经简单介绍过
我们把它分成三个部分：
客户、设计师、承建商
今天现场，我估计比较多的是客户方的同事
对业主方来说
最重要的是建立一个安全文化
以及安全第一的心态和建立风险管理系统
并确保整个项目周期之中
都能够做到安全第一
同时，也应该和不同的持份者去分享一些经验
在项目设置阶段

当然包括一些角色的分配
以及关键绩效指标的设定
在设计阶段
则要授权设计师去做一些更安全的设计
并和设计师保持充分沟通
让他们知道我们的期望

至于建筑阶段
则包括一些福利设施
令工友工作时可以更安心
不需要有太多顾虑
特别是在时间方面
工友就可以做多一些安全相关的事情
令日常工作变得更加安全
另外也有其他方法
例如彩排、风险识别
以及在完成和移交阶段做好一个完整文件的检查
这些主要属于客户的部分
至于设计师
我估计今天现场应该不算多
所以我不会说明太多

不过，设计师在整个安全设计过程中
其实是一个主要的贡献者
因为他们在设计时

除了考虑美观、实用之外
也需要考虑安全的问题
不只是建造时的安全
更要考虑整个设计
究竟怎样才能安全地建造出来
以及从将来住户或维修主管的角度
思考将来的维修通道
特别是天台、冷气房、配电房等位置的
通道和安全问题
这就是设计师的角色与责任

至于承建商在施工阶段
其实就是一个建筑设计安全的主要角色
他们必须有足够的安全措施
而我们也准备了一份文件
文件的名称是施工阶段计划
稍后我也会介绍这份文件
希望帮助承建商建立一个更完整、更安全的管理体系

另外，当然也包括健康与安全管理
设计管理监控和协调
这些就是建筑设计安全一系列的文件
我们设计这些范本和工具
其实是想帮助业主方、设计师和承建商
令他们可以更方便地推行建筑设计安全

一共有六个范本和工具

第一个，就是客户策略简报

这份文件主要是让大家在计划阶段

要包括一些可能发生的风险

其实很多时候大家在计划时

也会有一份文件

载有一些项目的基本资讯

而在这份客户策略简报里

我们特别希望大家写下

这个项目的一些潜在风险

例如，这个项目旁边可能有斜坡

那么在挖掘时便要考虑斜坡安全

又例如，这个项目地势较低

旁边有河流

那就可能要考虑水浸风险

又或者在挖掘时，地下有水管

这些都属于工地限制

也即是潜在风险

所以，我们希望在客户策略简报文件中

先把这些资料记录下来

让之后不论是设计、建设

还是将来的营运维护

也知道这些固有的风险

第二份文件就是红黄绿清单

这是我们特意开发出来的红黄绿清单系统

这其实可以视作为一份检查清单

我们把不同的项目类型

或一个项目在不同阶段

可能会遇到的风险全部整理出来

所以对每一个项目来说

我们都可以对照这份清单

看看这个项目有没有这些风险

如果有的话

我们建议把识别出来的风险写进第三份文件

即设计风险登记册

其实大家对风险登记册应该都很熟悉

画面上就是我的六份文件

至于这个红黄绿清单

我们现在已经针对不同项目类型开发了不同版本

包括基础设施类别

例如高速公路、隧道、道路、桥梁等项目

另外，也有针对建筑物的清单

以及针对维修、保养、改建及加建工程的清单

也就是说，针对不同的建筑类型

我们都设有相应的清单让大家参考

因为很多时候，我们未必能即时想到所有风险

若可以参考这些清单

就可以帮助我们去识别风险

至于设计风险登记册

它的作用就是帮助大家进一步思考缓解措施

一般来说

一份风险登记册通常包括哪些栏目

大家都很熟悉

例如列出风险、再按照严重性发生的频率给予一个评级

然后加入安全的缓解计划

这其实是一个很典型的风险登记册的内容

之所以称为设计风险登记册

是因为我们希望

大家在现有的一些风险缓解基础上再多想一层

看看能否从设计那里直接解决问题

例如，如果涉及高空工作

现在常见的措施可能是安排剪刀式升降台

加强对员工的管理、提供训练、安排专人监督

以及制定更多规则和程序

提供更多的训练和规则给工友去使用剪刀式升降台

但如果我们再进一步思考

从建筑设计安全的角度出发

是不是可以不使用这个剪刀式升降台

而是使用一个更安全的措施呢？

例如，对于高空工作
我们是否可以在设计阶段
预先设置一个永久工作台
将来不论是维修、更换设备、检查冷气
或换灯泡，都可以在那个平台完成
这样就不需要依赖剪刀式升降台
也可以减少由此带来的风险
如果我们在设计阶段可以多想一步
其实就可以解决很多问题

刚才提到的红黄绿清单
我们将它分成工作类型、范畴和细节
让大家可以有详细地参考
若你觉得某项风险是存在的
便可以填上「是」
并在红黄绿清单上标记
以判断其程度

这是一份很长的清单
至于设计风险登记册
刚才也提过
绿色是风险的细节
黑色是我们现行的措施
例如，我们现在可能会用一些工作台
去进行训练、监察和检查

而蓝色那一栏
是我们特别设立出来
希望大家再多想一层的部分
也就是说，从建筑设计安全的角度
怎样可以从根源杜绝这个问题
真正解决这个风险
这就是设计风险登记册
之后，我们还有一份施工前的资讯文件
其实在投标之前
我们会把设计风险登记册、红黄绿清单
和客户策略简报
一并放进这份施工前资讯
这一份清单会说明工地安全状况、客户期望
安全风险和健康风险
我们希望这些文件
可以一同放进投标文件里
让承建商在投标时
已经知道自己会面对哪些风险
从而可以提早准备
当承建商进场后
开始建造楼宇或建设设施时
他们需要跟进的一份主要文件
就是施工阶段计划

施工阶段计划分为几部分

例如共同工作计划

包括一些基本资料

例如有哪些持份者会参与这个项目

谁是总承建商、有没有定期会议

以及紧急应变方案

另外，在健康及安全管理和营运管理方面

我们希望承建商可以整合其安全计划

工地安全教育培训的材料

个人防护装备的要求以及工地规则

在营运方面

也包括物流安排、交通安排、福利设施安排

防火安排以及紧急程序

在组织方面

我们很希望承建商

能够针对一些特定风险制定相应措施

例如，工地通常都一定会有高空工作

很多时候也会有密闭空间

所以，我们希望透过这份文件

指导承建商建立一个更完整的安全管理系统

我们很多时候发现

其实承建商并不是没有做事

他们是有做的

但很多时候，他们未必懂得怎样去组织、整合
或统一这些资料

所以我们希望这份文件可以成为
承建商、业主和设计师之间
一个主要的沟通渠道

令不同参与方都可以达成共识
一起去面对建筑阶段的安全问题

当建筑完成后

我们最终的文件就是健康及安全档案
这份档案

我们同样提供了一份检查清单
这份检查清单是由承建商交给最终业主方的
大家可能都听过这类文件内容
里面包括竣工图
一些楼宇管理系统的设定和规格
甚至一些资产的登记册

很多不同系统的手册
以及一些健康与安全的实践
还有一些设备与产品处置的要求
它本身就是作为一份检查清单
让业主方可以去检查承建商
是否已提供所有文件

而这些文件之所以重要
就是因为对将来的营运和维修非常有帮助
让之后的使用者可以知道前期所有的历史
也知道哪些地方有危险
需要特别留意
因为很多时候
我们在前期已经想到某些风险
例如水浸
可能在设计阶段，未必能完全解决这个问题
在建设阶段，也未必能解决
但如果这些资讯可以移交给营运和维修团队
他们便知道这个工地可能存在水浸的风险
那么在日常营运中
便可以采取一些预防措施
去减少水浸所造成的严重损害
所以，我们非常重视这些资讯
在不同阶段、不同持份者
以及不同责任人之间的分享
我今天的分享就到这里
希望大家可以更了解建筑设计安全
如果大家想知道更多资讯
都可以找房屋署的同事

他们已经备妥了相关资料

多谢大家

谢谢观看

(30:26)