

# Phase 1 Final Report

*Consultancy Services for the Development of Design for Safety Management System and Training Programmes for the Hong Kong Construction Industry for Construction Industry Council*

**November 2022**



# TABLE OF CONTENTS

<b>ABBREVIATIONS &amp; TERMS.....</b>	<b>3</b>
<b>1 INTRODUCTION .....</b>	<b>5</b>
1.1 Background.....	5
1.2 Survey and Stakeholder Engagement Summary.....	7
1.3 What is 'Design for Safety'? .....	10
<b>2 FRAMEWORK OF DESIGN FOR SAFETY.....</b>	<b>13</b>
2.1 Supporting Legislation and Regulatory Requirements.....	13
2.2 CORE Guiding Principles .....	14
2.3 'Safety First' Mentality .....	16
2.3.1 Enhance focus on workplace health .....	16
2.3.2 Promote publication of H&S performance .....	17
2.3.3 Training.....	17
<b>3 ROLES AND RESPONSIBILITIES OF DUTY HOLDERS .....</b>	<b>19</b>
3.1 Overview.....	19
3.1.1 Client .....	19
3.1.2 Designer .....	20
3.1.3 Contractor.....	21
3.1.4 Maintenance Supervisor.....	23
3.1.5 Functional roles to coordinate DfS.....	23
<b>4 APPLICATION ACROSS PROJECT STAGES.....</b>	<b>32</b>
4.1 Pre-tender Stage (Project set up and Pre-tender stage).....	36
4.2 Pre-construction Stage (Tender stage).....	39
4.3 Construction Stage.....	40
4.4 In Use (Handover, Operations and Maintenance stage).....	43
4.5 Review & Feedback .....	44
<b>5 NEXT STEPS .....</b>	<b>47</b>
<b>6 REFERENCE.....</b>	<b>49</b>

## ABBREVIATIONS & TERMS

Abbreviation	Definition
AIR	Asset Information Requirements
BIM	Building Information Modelling
CDE	Common Data Environment
CDM	Construction Design and Management (CDM) Guidance Regulations 2015 and HSE's L153 Guidance – United Kingdom (UK)
CIC	The Hong Kong Construction Industry Council
CPD	Continuing Professional Development
CPP	Construction Phase Plan
DfS	Design for Safety
DfSP	Design for Safety Professional (Singapore)
DfMA	Design for Manufacture and Assembly
EIR	Exchange Information Requirements
EPMS	Electronic Project Management System
HSE	Health and Safety Executive (UK)
H&S	Health & Safety
MiC	Modular Integrated Construction
PASS	Performance Assessment Scoring System
PCI	Pre-Construction Information
PV	Property Vehicle
RAG	Red, Amber & Green Lists
SIA	Singapore Institute of Architects
OIA	Organisational Information Requirements
O&Ms	Operation and Maintenance Manuals



**01**

**INTRODUCTION**

# 1 INTRODUCTION

## 1.1 Background

### Hong Kong's Journey to Safer Design Practices

The current Design for Safety (DfS) practices in Hong Kong are based on the United Kingdom's Safety in Design approach and Construction Design and Management (CDM) model. In 2006, Hong Kong's first CDM model was implemented based on the United Kingdom's CDM 1994 model, while Singapore also implemented a similar model. The Development Bureau (DEVB) has published the Guidance Notes on Design for Safety and Worked Examples in 2016, which brought positive changes for the Hong Kong construction industry by specifying responsibilities on the duty holders and the Safety Design concepts engaged in the different stages of the construction projects.

In 2020, the Hong Kong Construction Industry Council (CIC) Task Force on Design for Safety (Task Force) was formed in May 2020 and a road map on the implementation of Design for Safety in the Hong Kong Construction Industry was agreed. One main element in this roadmap is to develop a Design for Safety Management System and training programmes applicable to various types of construction projects in the Hong Kong Construction Industry. Figure 1 provides a snapshot illustration of DfS-related regulatory development, in the three selected locations.

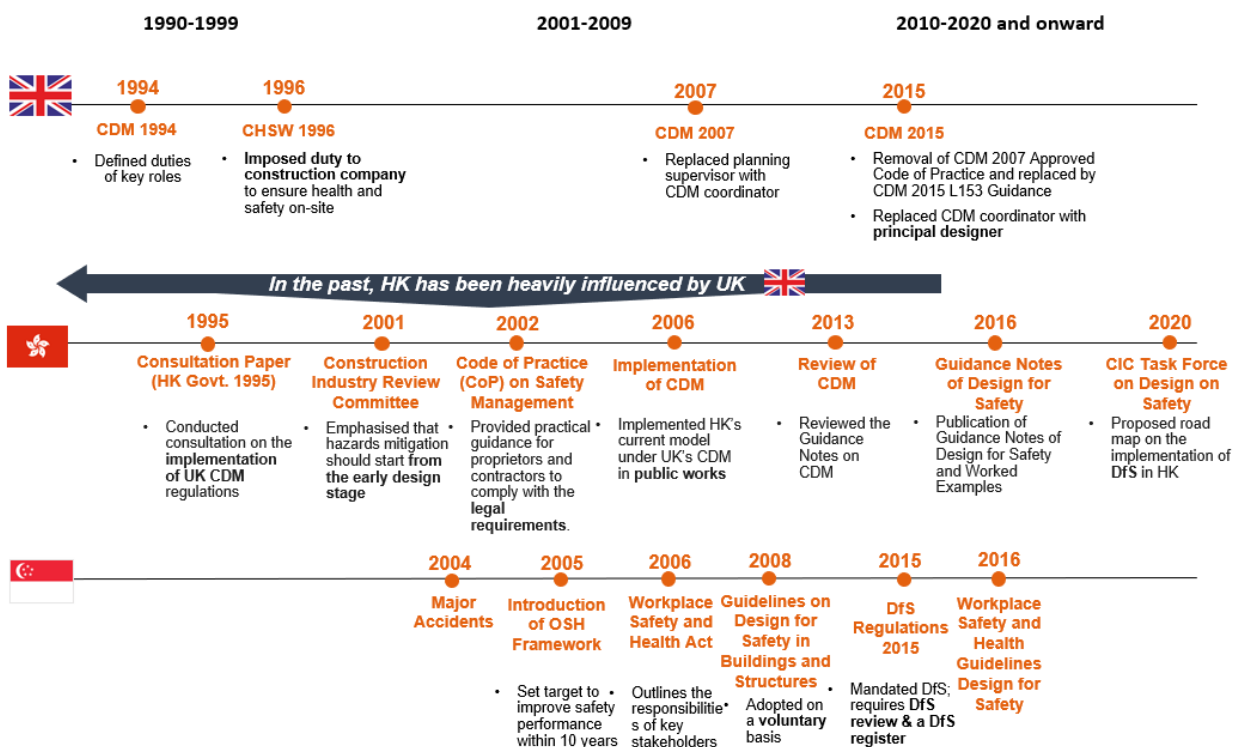


Figure 1 Overview of Regulations across UK, SG, and HK

Note\* UK – 2015 the removal of CDM 2007 Approved Code of Practice and replaced by CDM 2015 L153 Guidance

### Background of the future Design for Safety Management System

The CIC appointed Arcadis Consultancy Hong Kong Limited (Arcadis) in June 2021 to conduct a study to develop a Design for Safety Management System and training programme for the Hong Kong Construction Industry. This Consultancy follows a four-stage methodology: 1) Review &

Collection, 2) Survey and Analysis, 3) Development of Design for Safety Management System, and 4) Training Programme & Material.

In Stage 2, key insights were drawn from local and international practices to supplement the gap analysis conducted in Stage 1, and supplement additional areas of improvement and potential best practices that could be applied into future DfS considerations and guidelines.

Based on analysis of survey findings and global benchmarking, the key reforms (compared to the Guidance Notes of Design for Safety published by Development Bureau in 2016) include:

- Development of four “CORE” guiding principles that aim to cultivate safety best practices to strengthen the safety culture in Hong Kong, and can be applied throughout the Design for Safety Management System and future training
- Improve the clarity on the demarcation of roles and responsibilities of responsible parties across the construction life cycle by applying ‘CORE’ principles
- Enhance focus on safety mentality and promote the integration of Health and Safety (H&S) into key business decisions
- Development of a systematic DfS framework that can be followed by each key duty-holder, and sets out 1) the interactions among duty-holders, and 2) process flow of key files
- Revision of DfS reference materials including, but not limited to:
  - Notification of Construction Project
  - Pre-Construction Information (PCI)
  - Preliminary Hazard and Significant Risks Analysis
  - Design Risk Register
  - Risk Assessment Rating (Risk Rating Matrix)
  - Hazard and Impact Summary
  - Construction Phase Plan (CPP)
  - Health & Safety (H&S) File (Asset or Building Manual)
  - Fire and Emergency File

The review of the Guidance Notes of Design for Safety provides an opportunity to promote the early involvement of duty holders in terms of reducing safety risks and improve the clarity on the demarcation of roles and responsibilities of responsible parties for better safety coordination across the construction life cycle.

This report aims to achieve the following key objectives:

- To develop a Design for Safety Management System applicable to various types of construction projects in the Hong Kong Construction Industry
- To prepare Design for Safety Management System reference material for the CIC

To design and develop a basic Design for Safety training programme for industry stakeholders to facilitate the adoption of Design for Safety in the Hong Kong Construction Industry. The upcoming project milestones are listed in Table 1.

<b>Date</b>	<b>Project milestones</b>
January – April 2022	Conduct Stakeholder Engagement
January – June 2022	Development of final Design for Safety Management System
June 2022	Phase 1 Final report submission with reference materials
June – December 2022	Development of training course and material

Date	Project milestones
December 2022	Phase 2 Draft report submission with training plan
March 2023	Phase 2 Final report submission with training plan
May 2023	Phase 2 Draft report submission with Executive Summary
June 2023	Phase 2 Final report submission with Executive Summary

Table 1 Project Milestones

## 1.2 Survey and Stakeholder Engagement Summary

Prior to this Report, a Survey Report was drafted to outline the findings from the survey of Design for Safety across Hong Kong, United Kingdom and Singapore. This study's recommendation for Design for Safety in Hong Kong will be based on best practices identified for adoption and enhancement in the local construction industry.

Based upon the survey results, the **key issues / gaps in the current Design for Safety (DfS) Management System** include the following:

- Insufficient resources and time
- Lack of clarity in roles and responsibilities
- Lack of priority of management focus
- Lack of procurement specifications
- Subcontractors have difficulty achieving standards
- Lack of guidance between Main Contractors and sub-contractors
- More clarity needed for Maintenance Supervisor
- DfS awareness needs to be enhanced including awareness of temporary works
- More training needed for MiC, DfMA, steelworks
- Intensive training paperwork
- Lack of organizational structure
- Lack of clarity in demarcation of roles & responsibilities
- DfS is not as prioritized as programme / cost in business decisions
- Improve the workflow and time taken in the approval process
- Clients and their initial designers not embracing BIM (digital engineering) and incorporating health & safety for the benefits of the project
- BIM (digital engineering) not utilised early as possible in the design by the initial design team lead by the Client and to continue through the phase with the Designer (lead/coordinating role) and Main Contractor
- Permanent designers not considering or flagging up temporary works solutions with the Designer (lead/coordinating role) and / or Main Contractor

After the Survey was conducted, stakeholder discussion workshops with 65 attendees across 34 organisations were also held to refine and validate this Report.

Based on the key issues identified in the survey, stakeholder engagements, and draft report, the following solutions have been developed below in *Table 2*.

		<b>Key Issues</b>	<b>Proposed Solutions</b>
<b>Findings on the Proposed DfS System</b>	<b>Process flow</b>	<ul style="list-style-type: none"> <li>• DfS should be considered earlier than the pre-tender stage (i.e. Project Set-up stage regarding a client’s strategy brief etc.)</li> <li>• Consider early engagement of construction experts especially for any enabling works</li> <li>• Tender analysis should include DfS factors</li> <li>• Lack of DfS knowledge among the Contractors</li> <li>• Consider a holistic process feedback mechanism</li> </ul> <p><i>*Note</i>  <i>Enabling works can include site preparation, creation of access and haulage routes, site perimeter hoardings/fencing, diversion of live utility services, dismantling or demolition works etc.</i></p>	<ul style="list-style-type: none"> <li>• Propose earlier involvement of construction expert</li> <li>• Promote DfS review meetings</li> <li>• Promote both a “top down” and “bottom up” approach for collaborative working with Clients and other duty holders as a partnership</li> <li>• Add DfS considerations in the Tender analysis</li> </ul>
	<b>CORE Guiding Principles</b>	<ul style="list-style-type: none"> <li>• Shift in “safety-first” mentality for individual workers</li> <li>• Consider reference to the United Kingdom’s “CROSS” system in terms of reporting of fire and structural issues or failures for lessons learnt to prevent reoccurrences.</li> <li>• Application of the technologies needs to be enhanced</li> <li>• Refer to the overseas best practices on training</li> </ul>	<ul style="list-style-type: none"> <li>• Add BIM applications/submissions</li> <li>• Strengthen training of DfS for key duty holders across the holistic project life-cycle and behaviour training on accountability</li> <li>• Consider partnership with professional bodies to provide CPD points in DfS training</li> </ul>



<p><b>Key Roles &amp; Responsibilities</b></p>	<ul style="list-style-type: none"> <li>• Insufficient resources to hire a Designer (lead/coordinating role)</li> <li>• Architect takes the role of Designer (lead/coordinating role) as proposed, but they have insufficient knowledge and experience on DfS.</li> <li>• Potential conflict between innovative design and architectural concept and safety in design</li> <li>• Add clarity on the project nature and project size for the appointment of Main Contractor*</li> <li>• Consider whether the terminology of Asset Building Manager is acceptable in the local context</li> </ul> <p><i>*Note</i>  <i>CDM 15 UK requires more than one Contractor on site during the project lifecycle for the client to appoint a Principal Contractor suggested for the DfS, as the Main Contractor</i></p>	<ul style="list-style-type: none"> <li>• Evaluate the addition of Designer (lead/coordinating role), Main Contractor, coordinator/team with functional role of DfS</li> <li>• Clarify the naming of roles and responsibilities of Asset Building Manager</li> </ul>
<p><b>Reference Materials</b></p>	<ul style="list-style-type: none"> <li>• Lack of the purpose of the notification</li> <li>• Consider the applicable types of the contract</li> </ul>	<ul style="list-style-type: none"> <li>• Assess the purpose and applicability of the Construction Project Notification</li> </ul>

Table 2 Key Workshop Findings with Proposed Solutions

This report will consider the following key recommendations made by stakeholders:

- Additional guidelines to promote DfS in the Pre-Tender Stage (or earlier), including a DfS review meeting, senior management / client support, and earlier contractor engagement
- Tender stage framework to include more DfS factors and outline of significant risks
- A holistic process feedback mechanism and lessons learnt sharing sessions
- An incentive scheme and additional guidelines to promote a shift in “safety-first” mentality
- A knowledge portal / hub and promotion of application of technological solutions including VR and digital twins
- Additional review of the United Kingdom’s “CROSS” system and its application to the Hong Kong industry

- Training system that may include lessons learnt, case studies, partnership with universities / professional institutions, behaviour training on accountability, and reference to international best practices
- Additional review of proposed additional functional roles of Designer (lead/coordinating role), Main Contractor, and H&S Advisor or coordinator or team for DfS
- Streamline of redundant paperwork by referencing Electronic Project Management System (EPMS) system and consideration of integration with existing organisation documentation system.
- Consideration of adding safety reports and different types of applicable contracts into the reference files
- Additional assessment to the addition of the Construction Project Notification

### 1.3 What is ‘Design for Safety’?

#### What is Design for Safety?

Design for Safety (DfS) is the process of identifying potential hazards and reducing Health and Safety (H&S) risks through adequate design as earlier at the conceptual and planning phases and throughout the project lifecycle.

#### Why is Design for Safety important?

The purpose of DfS is to improve the overall management of health, safety and welfare in the construction industry. By proactively applying the principles and guidelines set out in this report, members of the industry can apply best practices to deliver construction projects to prevent incidents (including injuries and illness to workers and members of the public), and to deliver timely and cost-efficient projects. Safe Design is the most effective risk control measure which is achieved by eliminating the hazards at source (Development Bureau, 2016). The strategic roadmap (Figure 2) on Design for Safety in Hong Kong is to ultimately introduce pilot schemes, facilitate use of digital tools, and set up a DfS Knowledge Hub to become a leader in safe design practices.

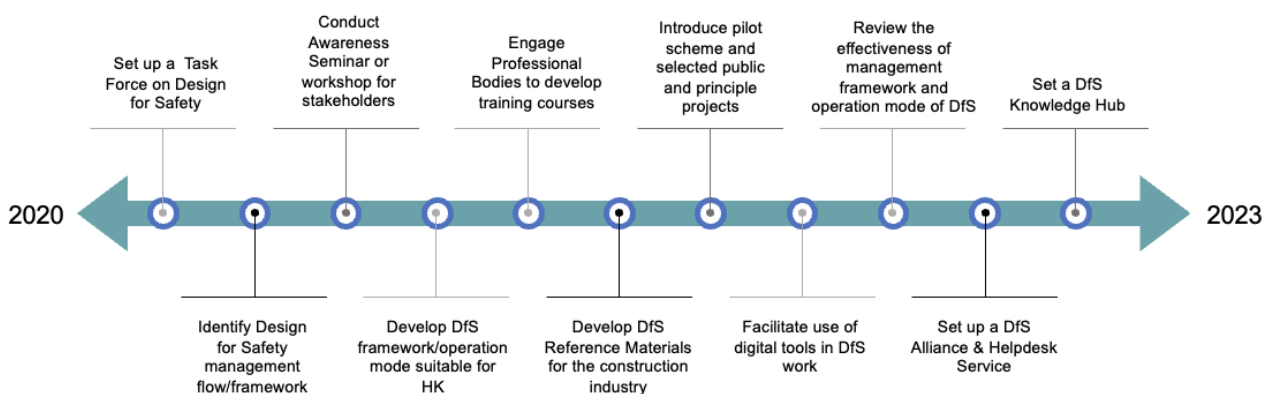


Figure 2 Roadmap on Design for Safety

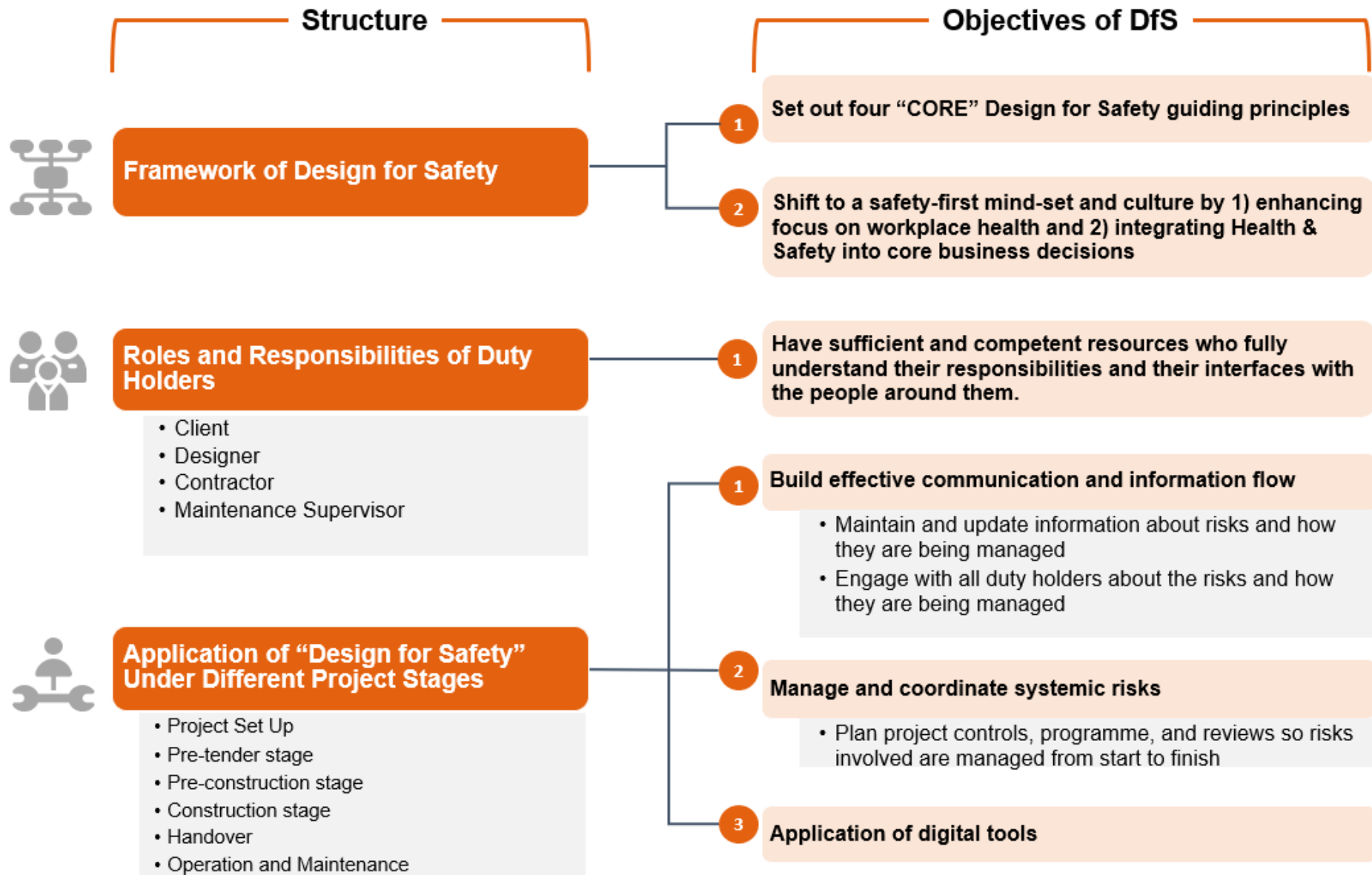


Figure 3 Report Structure and Objectives of Design for Safety

# 02

## FRAMEWORK OF DESIGN FOR SAFETY

## 2 FRAMEWORK OF DESIGN FOR SAFETY

### 2.1 Supporting Legislation and Regulatory Requirements

Currently, there are three major laws governing industrial undertakings and occupational safety (OSH) in Hong Kong: Boilers and Pressure Vessels Ordinance (Cap. 56), Occupational Safety and Health Ordinance (Cap. 509), Factories and Industrial Undertakings Ordinance (Cap. 59) and its their subsidiary legislation, as illustrated in Figure 4 below.

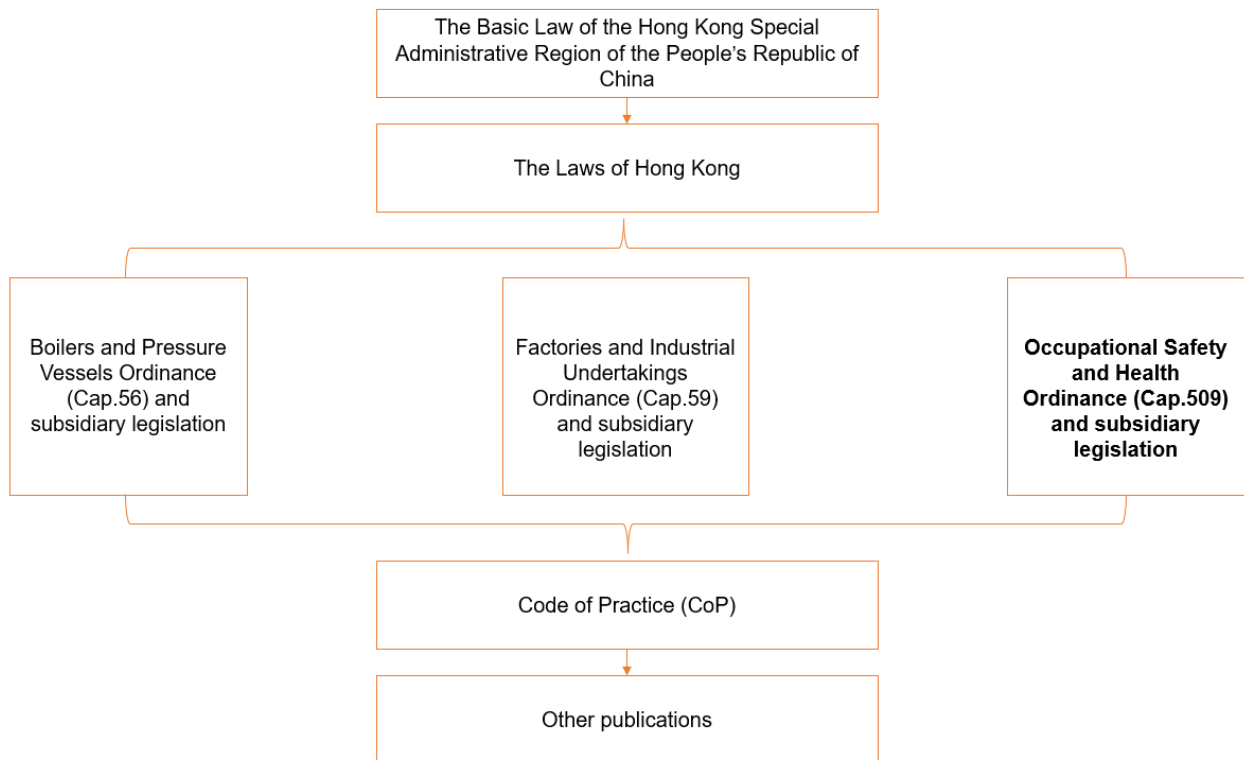


Figure 4 Framework chart of legal system of OSH in Hong Kong

In accordance with the section 7A(1) of the Factories and Industrial Undertakings Ordinance (Cap. 59), the Occupational Safety and Health Branch of Labour Department issued a Code of Practice (CoP) on Safety Management in 2002 to provide practical guidance for proprietors and contractors to comply with the legal requirements. In addition to its special legal status, this CoP enables proprietors and contractors to have a better understanding of their roles and responsibilities and provides guidance on establishing and maintaining a safety management system, as well as safety audits and reviews.

The Building (Construction) Regulation (Cap. 123Q) which has come into operation since February 2021 requires the provision of adequate means of access for maintenance and repair of external building elements of a building (i.e. external walls, external claddings, curtain walls and roofs, as well as their projections).

In this connection, the Buildings Department issued a Code of Practice on Access for External Maintenance in February 2021, superseding the advisory Code of Practice on Design for Safety – External Maintenance 2019, to provide guidance on compliance with these requirements. This new regulation and CoP articulate the approach to integrate the maintainability concept in the building design so as to facilitate maintenance and repair of building.

## 2.2 CORE Guiding Principles

The key principle of “Design for Safety” is to identify potential health and safety hazards and their associated significant risks with the corresponding mitigation and treatment measures at the planning or design stage of a project. This principle is beneficial for the project by addressing time and cost concerns, risk mitigation, and prevention of having to make design changes in the later stages.

Based on the existing legislation related to occupational safety and health, this report provides a Design for Safety framework that aims to cultivate safety best practices to strengthen the safety culture in Hong Kong under four “CORE” guiding principles (Figure 5). First, enhanced communication and coordination between all duty holders across the project lifecycle from project setup to maintenance/operation phase. Second, encouragement for industries to adopt greater ownership of safety and health outcomes. Third, risk reduction at the source by requiring all duty holders to remove, minimise, and communicate the risk they create. Finally, conduct iterative project and training to ensure project resources are equipped with necessary requirements and review lessons learned throughout the project.

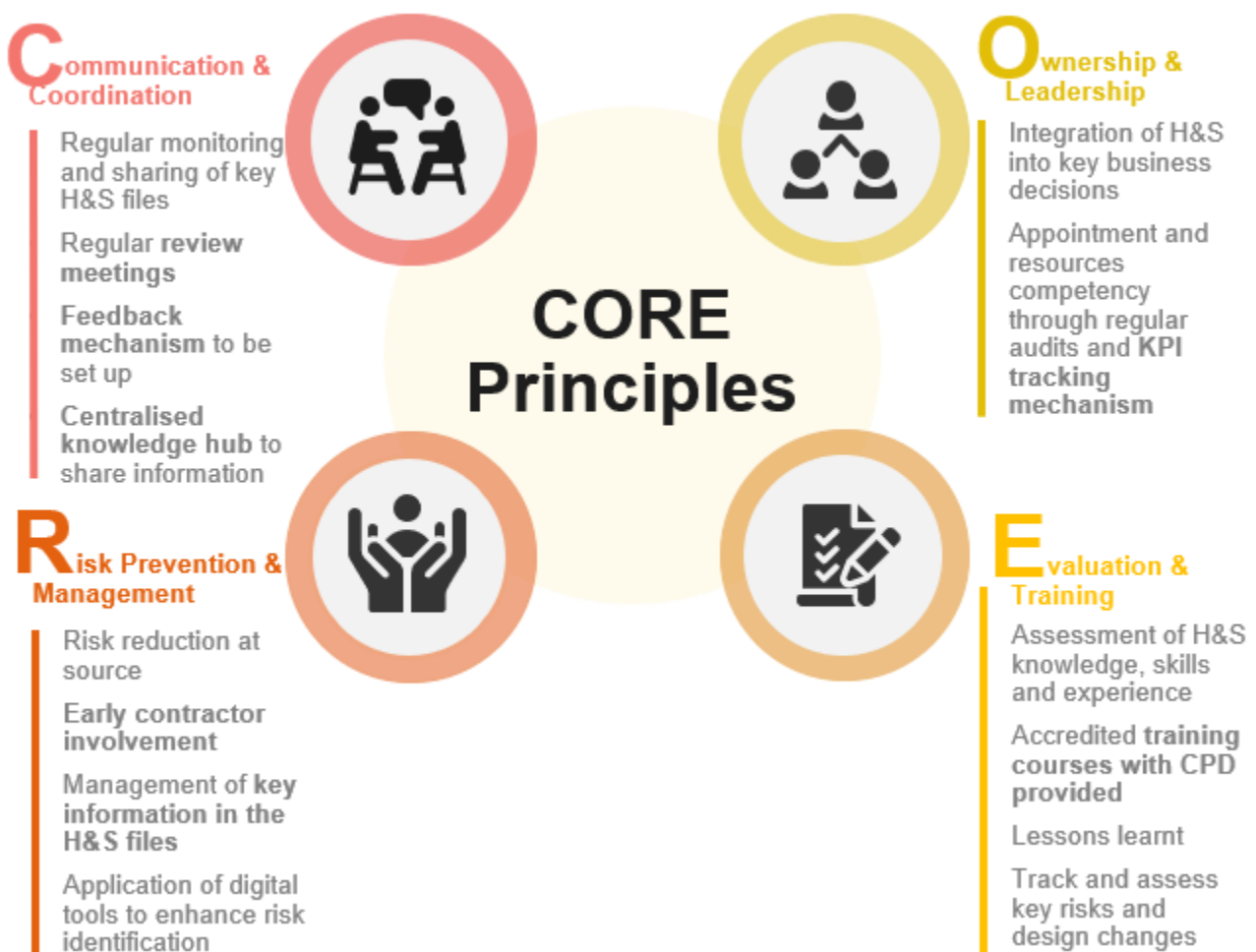


Figure 5 'CORE' Principles

### 1. Communication and Coordination

- Maintain, monitor, and regularly update **relevant information into Pre-Construction Information (PCI)/ Health and Safety File** (Asset / Building Manual)
- Conduct **regular review meetings** hosted by a competent duty-holder who understands design principles, when there is sufficient design concept / preliminary design, prior to

detailed design, to communicate lessons learnt, standards, and reduce risks prior to commencement of construction.

- Set up a **feedback mechanism** to notify Designers when there is design change or incidents occur during the construction stage, and operation and maintenance stage. Information collected should be reviewed regularly to identify core causes of safety problems encountered during the construction stage.
- Coordinate to share relevant information of identified risks to eliminate or mitigate risks related to the project, including within the design and enable duty holders, the construction industry and academia to collaborate, and share knowledge and information digitally through a **centralised knowledge hub** which will be provided by Client/project management team (please see in Reference Materials – Section 6 Templates & Tools).

## 2. Ownership & Leadership

- Encourage organisations in all industries to **adopt greater ownership** at the beginning of the project and demonstrate leadership of safety and health outcomes
- Ensure **competency** during appointment of resources, and maintain performance through regular audits and include suitable KPI tracking mechanism (please see in the Reference Materials – Section 6 Templates & Tools)
- Group key stakeholders in a **review team**
- Integrate **Health & Safety considerations** into key business decisions

## 3. Risk prevention and Management

- **Reduce risk at the source** by requiring all duty holders to remove, minimise, and communicate the risk they create
- **Promote early involvement of construction experts** in the initial conversation to help mitigate risks and improve project performance. In order to achieve Safe Design, Client's team with construction management experience or Contractors engaged as advisor at an early stage of the project to offer input into the design phase (please see in the Reference Materials – Section 6 Templates & Tools).
- Include more DfS factors and outline significant risks in a **Tender Stage framework**.
- Design around the identified risks, and **manage key information in the PCI/H&S file**
- **Promote application using digital visualisation (i.e. BIM, Virtual Reality etc.) and tools** to enhance identification of risks that can be eliminated or reduced at earlier stages and prevention measures are implemented during construction and in use stage.
- **Implement an operating model** that duty holders can respond quickly to identified hazards or risks

## 4. Evaluation and Training

- Assess that the project team has **necessary and relevant skills**, knowledge and experience, and update training requirements accordingly
- Provide **evidence of accredited training courses and have records of CPD** via professional institution for respective roles
- Provide **evidence of all relevant skills, knowledge and experience** by including accredited training courses and have records of CPD via their professional institution for their role.
- **Evaluate risks and lessons learnt** during the project life cycle, not just at the end of the project
- **Track and assess key risks and design changes regularly**, where any accidents or incidents require lessons learnt to be established and communicated (i.e. any related to lack of Pre-Construction Information (PCI), result of a design change etc.)

## 2.3 ‘Safety First’ Mentality

Most industry practitioners currently focus on cost-saving measures and are concerned about the lack of resources and competent workers. This mindset must change to focus on maintaining safety performance as a part of the industry professionalism. Project leaders, industry practitioners, and businesses must shift to a safety-first mind-set and culture that leads to safer behaviour committed by all duty holders. This mentality shift can be achieved by applying the following:

### 2.3.1 Enhance focus on workplace health

#### **Rethinking the approach to safety in the Construction Industry**

Drawing from global best practices, workplace health and safety practices should be taken forward to promote a “Safety First Mentality” to build one of the safest industries for the future of Hong Kong’s construction industry – by focusing on prevention and promotion.

To enhance focus on workplace health, the following guidelines should be considered:

#### Expand Physical and Mental Health Prevention Efforts throughout the DfS process

- Expand occupational disease prevention efforts
- Increase health hazard surveillance to more workplaces
- Consider practical solutions on site (e.g. mobile health kiosk, on-site regular health consultation kiosk)
- Consider on-site training that can cover the majority of frontline workers, especially non-skilled workers

#### Build Companies’ Capabilities to Promote Workforce Health

- Develop guidelines on job adaptations that employers can take to support workers in managing their diseases
- Build companies’ capabilities to promote workforce health by develop guidelines on job adaptations that employers can take to support workers in managing their chronic diseases and upskill professionals in workforce health
- Raise awareness of measures that promote workers’ mental health

#### **Integrate Health & Safety into core business decisions**

Core business decisions should be influenced by integrated Health & Safety considerations including:

#### Promote application of incentive programmes

- Aim to motivate workers to work with safe behaviour and to increase safety awareness among the workers on construction sites
- Consider and supplement government-led incentive programs (such as the Pay for Safety scheme) to encourage safety awareness by removing restrictions to safety-related items from the consideration of competitive bidding.
- Focus on incentive implementation in the new works, sizeable RMAA works, etc. when starting the adoption of DfS across the construction industry.
- Offer an incentive scheme that may include guidelines for cost savings, promotions of increased Contractor participation by outlining shared gains and benefits for Contractors, publication of H&S / DfS practices in annual report
- Consider the implementation of an incentive scheme for workers (such as the “Worker Safety Point Deduction Scheme” published by the Hong Kong Registered Contractors Association) in the construction sites in Hong Kong. The scheme should aim at reducing accidents at work by enhancing workers’ safety awareness, and providing opportunities to workers and management level to work hands in hands and to maintain a safety environment at work.



- Encourage safety awareness by removing restrictions to safety-related items from the consideration of competitive bidding. Typically, when selecting the duty holders (i.e. Designers and Contractors) in the tender evaluation, there should be incentive rating/scoring for those who are providing evidence of best practice and lessons learnt related to DfS.

### 2.3.2 Promote publication of H&S performance

- Promote publication of company's performance in terms of workplace fatality and major injury rates, normalised by workforce size and industry to facilitate meaningful comparison
- Share work injury compensation claims data with insurance industry, so that premiums can be differentiated according to the performance of a firm
- Labour Department issues suspension notices, improvement notice and Reference Manual for Inspection Reports on Workplaces to contractors in public and private sectors. Such actions reflect serious unsafe site conditions of construction firms

### 2.3.3 Training

#### Summary of Guidance for DfS Training Programmes

The following guidance for DfS Training Programmes was developed based on the survey findings and feedback from stakeholder workshops. A detailed programme will be further developed in Phase 2 of this Consultancy, and key recommendations include the following:

- **Specified training modules for different duty holders** – Training should be separated into two stages: general training on Health & Safety and DfS training for relevant duty holders (i.e. Design Engineers, architects, safety officers/supervisors).
- **Training modules should cover the safety in behaviour/attitudes** – Behaviour training on accountability will address the lack of clarity on roles and responsibilities, and their attitudes, ethics and mindset towards the safety. Training modules should include not only technical scope but also adopt a behavioural change.
- **Continuing Professional Development (CPD)** – Most Hong Kong architecture industry professional institutes now require members to undertake a minimum number of CPD hours each year (such as the RIBA, CIOB, RICS, RTPI, CIAT, ICE, IStructE). The training providers can offer relevant DfS training to obtain CPD points for the participants who need to earn sufficient CPD points every year.
- **Shared lessons learnt** – Local lessons learnt (i.e. hazards and risks related to particular stages) and case studies/ real-life examples should be provided across the training programmes to ensure they are applicable to real-world practice.
- **Partnership with universities and professional institutions** – Partnership is suggested among universities and professional institutions as reliable training in providing formal DfS training programmes. The collaboration can also help to implement DfS widely across the industry and make it as a mandatory training requirement in a long term.
- **"Next steps" after Training** – 'What's next' after training should be considered in the training programme – for example, the actions and incentives for duty-holders to implement and actively practice what they have learned should be considered in the development of training programmes.

# 03

## ROLES & RESPONSIBILITIES

## 3 ROLES AND RESPONSIBILITIES OF DUTY HOLDERS

### 3.1 Overview



The 2016 Guidance Notes of Design for Safety in Hong Kong have specified roles and responsibilities for four key duty holders, which include **Client, Designer, Contractor and Maintenance Supervisor**. This section of the report aims to enhance the demarcation of roles and responsibilities.



#### 3.1.1 Client

##### Definition

The Client is an individual, or a number of individuals, a company, or organisations, for whom a construction project is carried out for, who is 1) financing the project, 2) is able to influence many major decisions involved in the project. Clients only have duties when the project is associated with a business or other undertaking (whether for profit or not). This can include for example, developer, local authorities, school governors, insurance companies and project originators on Private Consortiums projects, as well as the owners of a residential unit.

##### Roles & Responsibilities

 <p><b>C</b>ommunication &amp; Coordination</p>	<ul style="list-style-type: none"> <li>• To provide management support (i.e. allocation of sufficient time and resource)</li> <li>• To establish and provide relevant information to the project team</li> <li>• To promote “safety first” mentality in the workplace; consider application of H&amp;S incentives or benchmarks to the duty holders, and alleviation of cost concerns that may hinder project health and safety</li> <li>• To coordinate sharing of identified risks to eliminate or mitigate risks related to the project</li> </ul>
 <p><b>O</b>wnership &amp; Leadership</p>	<ul style="list-style-type: none"> <li>• To clarify the time required for the completion of the project</li> <li>• To ensure clear contractual relationships and allocation of safety responsibilities</li> <li>• To appoint and empower the Designer, Main Contractor, and Maintenance Supervisor to carry out their duties safely</li> <li>• To appoint project roles including:             <ul style="list-style-type: none"> <li>- A Designer to undertake the project and ensure other roles are competent by assessing qualifications, experience, and professional membership status</li> <li>- A Designer to comply with their duties in terms of DfS</li> </ul> </li> <li>• To group duty holder leads in a project review team</li> <li>• To ensure management arrangements are in place, maintained and actioned through the project lifecycle</li> <li>• To ensure that sufficient welfare facilities are provided by the Main Contractor and checked by the Client or representative at the start and continued to be maintained throughout the project.</li> </ul>



 <p><b>R</b>isk Prevention &amp; Management</p>	<ul style="list-style-type: none"> <li>• To be advised by the Designer on safety and health aspects of the design, such as finalising the type of design and materials used</li> <li>• To reduce significant risks at the source by requiring all duty holders to remove or minimise the significant risk they create</li> <li>• To ensure the Contractor's Construction Phase Plan has sufficient arrangements to manage the identified risks obtained the provide Pre-Construction Information before works commence and ensure construction work can be carried out according to the plan safely without risk to health of any person who may be affected</li> <li>• To check completion and handover arrangement prior to completion</li> <li>• To promote rehearsals to help enhance identifying significant risks that can be eliminated or at least reduced</li> </ul>
 <p><b>E</b>valuation &amp; Training</p>	<ul style="list-style-type: none"> <li>• To set and review KPIs, both Lead &amp; Lagging Indicators, for the Designer, Contractor and Maintenance Supervisor</li> <li>• To set and review lessons learnt with the Designer, Designers, Contractor and Maintenance Supervisor throughout the construction lifecycle</li> </ul>



### 3.1.2 Designer

#### Definition

Designer is an organisation or individual who plan or alter a design or specify a particular method of work or material. This would include architects, architectural technologists, civil and structural engineers, mechanical and electrical engineers, quantity surveyors, interior designers, temporary work engineers, building surveyors, technicians or anyone who specifies or alters a design for permanent or temporary structures and works.

#### Roles & Responsibilities

 <p><b>C</b>ommunication &amp; Coordination</p>	<ul style="list-style-type: none"> <li>• To ensure full cooperation and coordination with other duty holders from inception throughout the construction lifecycle</li> <li>• To ensure all relevant information on design, construction and maintenance are available to duty holders</li> </ul>
 <p><b>O</b>wnership &amp; Leadership</p>	<ul style="list-style-type: none"> <li>• To make/check the Client is aware of their responsibilities</li> <li>• When preparing or modifying a design, the Designer must take into account the general principles of prevention</li> <li>• To assist the Client in preparing PCI</li> </ul>


 <p><b>R</b>isk Prevention &amp; Management</p>	<ul style="list-style-type: none"> <li>• To provide relevant information for the PCI</li> </ul> <p>Note*</p> <p>To prepare, develop, collect information for PCI, this function should be carried by the Designer with support of the design team.</p> <ul style="list-style-type: none"> <li>• To conduct a risk assessment for their own design, ensuring that all foreseeable significant design risks are eliminated or reduced through the design plan and collective protective measures are taken to manage any residual design risks.</li> <li>• To establish construction method and a structure of risk assessment</li> <li>• To inform the Contractor about any significant health and safety risks/hazards associated with the design</li> <li>• To reduce risk at the source by requiring all duty holders to remove or minimise the risk they create</li> </ul> <p>Note*</p> <p>Significant risks are not necessarily those that involve the greatest risk, but those (including health risks) that are not likely to be obvious, are unusual, or likely to be difficult to manage effectively (i.e. not trivial and obvious risks).</p>
 <p><b>E</b>valuation &amp; Training</p>	<ul style="list-style-type: none"> <li>• To demonstrate information is provided in relevant and uniformed format following a recognized and auditable process and procedure and where applicable using standardised templates</li> <li>• To share such information other than via meetings in accessible and usable format agreed by the Client such as using a Common Data Environment (CDE)</li> <li>• To review lessons learnt with themselves and Designer</li> </ul>




### 3.1.3 Contractor

#### Definition

A Contractor can be an individual or a company that carry out actual construction work. It is noted that a maintenance contractor can be classified under the Contractor role during the Maintenance Stage. It is noted that this role should be used purely during the asset / building lifecycle stage.

#### Roles & Responsibilities

 <p><b>C</b>ommunication &amp; Coordination</p>	<ul style="list-style-type: none"> <li>• If more than one contractors on the project, worker/contractors are to inform main contractor of any foreseeable risks</li> <li>• Information provided to the workforce must include a suitable site induction, where not already provided by the Main Contractor, including procedures to be followed in the event of serious and imminent danger to health and safety</li> </ul>
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	<ul style="list-style-type: none"> <li>• Information provided to the workforce on risks and required control measures to health and safety risks identified by the risk assessments</li> <li>• To inform duty holders on H&amp;S risks and control measures to as identified in construction stage</li> <li>• To cooperate with others and coordinating their work with others working on the project</li> </ul>
	<ul style="list-style-type: none"> <li>• If only the contractor for the project, prepare before any construction works start that the arrangements in the Construction Phase Plan (CPP) are adequate and regularly reviews and revises the plan to ensure it takes account of any changes that occur as construction progresses and continues to be fit for purpose. The Construction Phase Plan (CPP) depends upon the complexity of the project information obtained in the PCI at tender and prior to the commencement of works including Design Risk Register updates etc. Contractor has the flexibility to integrate elements suggested in CPP into Construction Health and Safety Plan when deemed suitable.</li> <li>• If only the contractor for the project, to plan, manage, and monitor the construction stage and coordinate health &amp; safety</li> <li>• If only the contractor for the project, to ensure that suitable welfare facilities are provided at the start and maintained throughout the works</li> <li>• To prepare and update H&amp;S File in construction stage and review regularly throughout the construction stage</li> </ul>
	<ul style="list-style-type: none"> <li>• To take reasonable steps to ensure that the H&amp;S risks identified in PCI and during construction stage are properly managed</li> <li>• To ensure the right arrangements and controls are adopted to prevent accidents and incidents</li> <li>• To plan, manage and monitor their own work to make sure that each worker is under their control with appropriate supervision, instructions and information so that construction work can be carried out, so far as is reasonably practicable, without risks to health and safety</li> <li>• Must not begin work unless reasonable steps have been taken to prevent access by unauthorised persons (risk to third parties i.e. members of the public etc) to that site</li> <li>• In the construction stage, to keep full records of all safety and health issues, e.g. accidents or any prosecutions.</li> </ul>
	<ul style="list-style-type: none"> <li>• To ensure that all the workers have been provided with suitable health and safety induction, information and training</li> <li>• To provide and share appropriate and relevant information related to health and safety</li> <li>• To check, monitor and coordinate that their managers, supervisors and workers are fulfilling their duties on health and safety</li> <li>• To review lessons learnt and if there is more than one contractors on the project with Main Contractor</li> </ul>

### 3.1.4 Maintenance Supervisor

#### Definition

The Maintenance Supervisor (e.g. Facilities Manager, Asset Building Supervisor) is in charge of overseeing operating and the upkeep of a building, including cleaning, maintenance, alterations, refurbishment and demolition during Maintenance Stage.

#### Roles & Responsibilities

 <p><b>C</b>ommunication &amp; Coordination</p>	<ul style="list-style-type: none"> <li>• To participate in meetings with Designer at the design stage where applicable (To best suit various construction projects in Hong Kong)</li> <li>• To work, coordinate, and cooperate with the Client</li> <li>• To suggest the contents, format for new projects and during any changes to the asset (i.e. replacing cladding, glazing, materials and changes to integrity of the structure during the asset lifecycle)</li> <li>• To provide key relevant information into H&amp;S File (Asset or Building Manual)</li> </ul>
 <p><b>O</b>wnership &amp; Leadership</p>	<ul style="list-style-type: none"> <li>• To study the H&amp;S File that records all the details specific to the maintenance stage (i.e. maintenance access strategy and plant replacement or removal strategy etc)</li> <li>• To appoint the competent maintenance contractors</li> <li>• To plan, manage and monitor the maintenance work and coordinate health &amp; safety</li> <li>• To update and hand over H&amp;S File to future owners</li> </ul>
 <p><b>R</b>isk Prevention &amp; Management</p>	<ul style="list-style-type: none"> <li>• To obtain all necessary information (e.g. the information from the H&amp;S File and / or supporting operational and maintenance manuals, in order to carry out the works safely)</li> <li>• To keep full records of all safety and health issues, e.g. accidents or any prosecutions</li> <li>• To ensure the right arrangements and controls are adopted to prevent accidents and incidents</li> </ul>
 <p><b>E</b>valuation &amp; Training</p>	<ul style="list-style-type: none"> <li>• Project team provides training to relevant duty holder (e.g. facility management workers, building operator, etc.) on how to operate and maintain the building or asset provide the H&amp;S File and any supporting Operation and Maintenance Manuals (O&amp;Ms) for fully understanding the maintenance procedures and ensuring a safe working environment so as to reduce the risk of injury to the maintenance workers.</li> <li>• To review lessons learnt with Designer (lead/coordinating role), Designers, and the Contractors</li> </ul>

### 3.1.5 Functional roles to coordinate DfS

The proposed addition of functional roles (i.e. *Designer (lead/coordinating role)*, *Main Contractor*) were introduced in the Draft Report and have been validated during the stakeholder engagement workshops. Across the workshops, stakeholders noted that the new terminology may cause confusion to local practitioners who are practising the current DfS requirements based on the 2016 DevB Guidance notes. Since many industry practitioners are still adapting to DfS practices, the



introduction of new terms may take time to be adopted by the industry. As a result, this section outlines the functional roles and responsibilities that are required by specific tasks to achieve enhanced Design for Safety throughout the project life cycle following the CORE guiding principles.

Functional roles and responsibilities of a Designer (lead/coordinating role) during the design stage



**Definition**

There should be a functional role of Designer (lead/coordinating role) to coordinate the DfS during the design stage and construction stage appointed by Client to coordinate with designers/contractors. This functional role can also be taken up by Client Representative, Architect, Authorized Person or Project Manager. The Client can decide to appoint a coordinator or team with a functional role of DfS if there is a lack of DfS capability of Designer (lead/coordinating role) when the Client does not have the in-house capability and resource of a competent person to advise the Health & Safety.

**Roles & Responsibilities**

 <p><b>Communication &amp; Coordination</b></p>	<ul style="list-style-type: none"> <li>• To convene regular DfS review meetings</li> <li>• To maintain the DfS Register/PCI</li> <li>• To establish and provide key relevant information</li> </ul> <table border="1" data-bbox="466 891 1428 1626"> <thead> <tr> <th data-bbox="466 891 971 943"><i>Pre-construction Stage</i></th> <th data-bbox="971 891 1428 943"><i>Construction Stage</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="466 943 971 1626"> <ul style="list-style-type: none"> <li>• Plan, manage, and monitor the design work during design phase (which can carry on during the construction phase) and coordinate Health &amp; Safety</li> <li>• Assist the Client to identify and gather the pre-construction information</li> <li>• Developing and provide pre-construction information to Designer (lead/coordinating role) and Contractors (incl. Main Contractor)</li> <li>• Oversee and coordinate with the designers to identify latest building techniques and mitigate foreseeable significant risks</li> </ul> </td> <td data-bbox="971 943 1428 1626"> <ul style="list-style-type: none"> <li>• Liaising with the Main Contractor to ensure the design is coordinated;</li> <li>• Providing information to the Main Contractor (the pre-construction information and the construction information)</li> <li>• Receiving information about any potential issues or proposed changes to the design</li> </ul> </td> </tr> </tbody> </table>	<i>Pre-construction Stage</i>	<i>Construction Stage</i>	<ul style="list-style-type: none"> <li>• Plan, manage, and monitor the design work during design phase (which can carry on during the construction phase) and coordinate Health &amp; Safety</li> <li>• Assist the Client to identify and gather the pre-construction information</li> <li>• Developing and provide pre-construction information to Designer (lead/coordinating role) and Contractors (incl. Main Contractor)</li> <li>• Oversee and coordinate with the designers to identify latest building techniques and mitigate foreseeable significant risks</li> </ul>	<ul style="list-style-type: none"> <li>• Liaising with the Main Contractor to ensure the design is coordinated;</li> <li>• Providing information to the Main Contractor (the pre-construction information and the construction information)</li> <li>• Receiving information about any potential issues or proposed changes to the design</li> </ul>
<i>Pre-construction Stage</i>	<i>Construction Stage</i>				
<ul style="list-style-type: none"> <li>• Plan, manage, and monitor the design work during design phase (which can carry on during the construction phase) and coordinate Health &amp; Safety</li> <li>• Assist the Client to identify and gather the pre-construction information</li> <li>• Developing and provide pre-construction information to Designer (lead/coordinating role) and Contractors (incl. Main Contractor)</li> <li>• Oversee and coordinate with the designers to identify latest building techniques and mitigate foreseeable significant risks</li> </ul>	<ul style="list-style-type: none"> <li>• Liaising with the Main Contractor to ensure the design is coordinated;</li> <li>• Providing information to the Main Contractor (the pre-construction information and the construction information)</li> <li>• Receiving information about any potential issues or proposed changes to the design</li> </ul>				
 <p><b>Ownership &amp; Leadership</b></p>	<ul style="list-style-type: none"> <li>• This role is appointed by the Client, and may undertake the duties of the Client, only on their behalf, contractually</li> <li>• To get subsequent feedback from users to assist designers in improving their future designs may be provided through the below methods:             <ul style="list-style-type: none"> <li>○ Post occupancy evaluations</li> <li>○ Defect reports</li> <li>○ Accident investigation reports</li> <li>○ Information regarding modifications</li> <li>○ User difficulties</li> <li>○ Deviations from intended conditions of use</li> </ul> </li> </ul>				



 <p><b>R</b>isk Prevention &amp; Management</p>	<ul style="list-style-type: none"> <li>• To plan, manage and monitor the pre-construction information flow and design coordination related to the health or safety of the project</li> <li>• To provide all relevant information on each foreseeable significant risk identified and its mitigation to the Client</li> <li>• To identify and analyse risks at source</li> <li>• To reduce risk at the source by requiring all duty holders to remove or minimise the risk they create</li> <li>• To lead application of digital visualisation (i.e. BIM etc) and rehearsals to help enhance the identification of significant risks that can be eliminated or at least reduced</li> </ul> <p>Note*</p> <p>A significant risk is not necessarily one that involves the greatest risk, but those (including health risks) that are not likely to be obvious, are unusual, or likely to be difficult to manage effectively (i.e. not trivial and obvious risks).</p>
 <p><b>E</b>valuation &amp; Training</p>	<ul style="list-style-type: none"> <li>• To demonstrate information is provided in a relevant and uniformed format following a recognised and auditable process and procedure and where applicable using standardised templates</li> <li>• To share such information other than via meetings in an accessible and usable format agreed by the Client such as using a Common Data Environment (CDE)</li> <li>• To demonstrate they have the necessary and relevant skills, knowledge and experience and provide evidence of such including accredited training courses and have records of CPD via their professional institution for their role. The accreditation can be covered in two ways - engaging with CIC to set up an accreditation scheme as used in UK under the Safety Scheme In Procurement (SSIP) where individuals and organisations require to provide evidence and are assessed annually and / or as undertaken in Singapore where the DfS Professional has to have attended an accredited course and passed an assessment in the last 5 years.</li> <li>• To check, monitor and coordinate that the designers are fulfilling their duties</li> <li>• To review lessons learnt with the Design team</li> </ul>

The benefits of this role include:

- 1) To **help and advise the Client** in bringing together PCI.
- 2) To **work with any other Designers** on the project, as a team, to eliminate or at least reduce foreseeable health and safety significant risks.
- 3) To become a **single point of contact** that advises the Client and Main Contractor when there is more than one Contractor on the project.
- 4) To **assist the Client** to select the right Designers.

**Proposed pre-qualification questionnaire for Designer (lead/coordinating role)**

1	Are you able to demonstrate that you have a policy and system for Health and Safety (H&S) management? Please provide.
2	Are you able to demonstrate arrangements for ensuring that your H&S measures are effective in reducing and preventing incidents and occupational ill health? Please provide including any lessons learnt.





3	Do you have access to competent H&S advice and assistance – both general and construction sector related? Please provide.
4	Do you have a policy and process for providing your workforce with information and training appropriate to the type of work for which your organisation is likely to bid and deliver work? Please provide.
5	Does your workforce have H&S or other relevant qualifications and experience sufficient to implement your H&S policy and procedures for the type of work for which your organisation is likely to bid and deliver work? Please provide.
6	Do you have a process to check and review for any H&S risks arising due to design as post project lesson learnt?
7	Do you have procedures in place to involve your staff in the planning and implementation of H&S measures? Please provide.
8	Do you conduct accident/incident and near miss reporting and undertake follow-up investigations? Please provide evidence.
9	Do you have arrangements for ensuring that your designers and consultants apply H&S measures to a standard appropriate to the work for which they are being engaged? Also, regarding employing designers overseas. Please provide evidence.
10	Do you check that the Client is aware of their duties? Please provide.
11	How do you ensure significant risks are eliminated by design, taking account of the principles of prevention and show how construction and lifecycle risks are eliminated or controlled (with reference to buildability, maintainability and use)? Please provide.
12	How do you effectively manage any design changes, with regard to ensuring H&S during and post-completion for the life cycle of that building or asset? Please provide.
13	Do you review and monitor your design performance, notably in relation to H&S? Please provide.
14	Are you able to demonstrate how you encourage cooperation, coordination and communication between Designers (and anyone else)? How do you review and monitor your design performance and effectiveness in relation to H&S for each project? Please provide.
15	Are you able to provide evidence of your field of knowledge and experience in the design and construction process? e.g. skills, knowledge and experience of H&S within design and construction. Please provide.

### Functional roles and responsibilities of a Main Contractor during the construction stage

#### Definition

The Client can decide to appoint a Main Contractor when the project engage more than one Contractor or a coordinator or team with function role of DfS if there is lack of DfS capability of Main Contractor to monitor the DfS during the construction stage. The objectives include to manage, monitor and coordinate with other Contractors and/or subcontractors they employ. If there is only one Contractor where they directly employ every trade and profession directly as an employee, the Client can evaluate the necessity of appointing this role directly.

## Roles & Responsibilities

 <p><b>C</b>ommunication &amp; Coordination</p>	<ul style="list-style-type: none"> <li>• To request from designers all information regarding the identified risks during design stage</li> <li>• To engage, coordinate, cooperate with all Contractors</li> <li>• To engage and communicate with workers, in order to 1) ensure clarity on requirements and issues, and 2) develop “safety-first” attitudes and behaviours</li> </ul>
 <p><b>O</b>wnership &amp; Leadership</p>	<ul style="list-style-type: none"> <li>• To prepare before any construction works start that the arrangements in the Construction Phase Plan (CPP) are adequate and regularly reviews and revises the plan to ensure it takes account of any changes that occur as construction progresses and continues to be fit for purpose. Main Contractor may choose to integrate the elements suggested in CPP into Construction Health &amp; Safety Plan where deemed suitable</li> <li>• To plan, manage, and monitor the construction stage and coordinate Health &amp; Safety</li> <li>• To ensure that sufficient welfare facilities are provided at start and continued to be maintained through the project</li> <li>• Preparing and developing during the Construction Stage the Health &amp; Safety File, and passing the file to the Client at the end of the construction</li> </ul>
 <p><b>R</b>isk Prevention &amp; Management</p>	<ul style="list-style-type: none"> <li>• To ensure all contractors are provided with the information they need to carry out their work safely and without risks to health</li> <li>• To take reasonable steps to ensure that the risks identified are properly managed</li> <li>• To prepare and enforce any necessary site safety rules</li> <li>• To reduce risk at the source by requiring all duty holders to remove or minimise the risk they create</li> </ul>
 <p><b>E</b>valuation &amp; Training</p>	<ul style="list-style-type: none"> <li>• To check, monitor and coordinate that the contractors are fulfilling their duties</li> <li>• To review lessons learnt with themselves and the Contractors</li> </ul>

The benefits of this role include:

- 1) To **take account of all the health and safety risks** to the individual workers
- 2) To ensure arrangements are in place and allow **sufficient time and resources** on site, which later becomes the Client’s responsibility
- 3) To be **a single point of contact** that liaises with the Client and Designer (lead/coordinating role) for the duration of the project
- 4) To prepare the Construction Phase Plan (CPP) or integrate into Construction Health and Safety plan before the construction phase begins with the necessary arrangements to manage the risks, and regularly review and revise it through the project

## Proposed pre-qualification questionnaire for Main Contractors





1	Are you able to demonstrate that you have a policy and system for Health and Safety (H&S) management? Please provide.
2	Are you able to demonstrate arrangements for ensuring that your H&S measures are effective in reducing and preventing incidents and occupational ill health? Please provide including any lessons learnt.
3	Do you have access to competent H&S advice and assistance – both general and construction sector related? Please provide.
4	Do you have a policy and process for providing your workforce with information and training appropriate to the type of work for which your organisation is likely to bid and deliver work? Please provide.
5	Does your workforce have H&S or other relevant qualifications and experience sufficient to implement your H&S policy and procedures for the type of work for which your organisation is likely to bid and deliver work? Please provide.
6	Do you check, review and where necessary to improve your H&S performance? Please provide.
7	Do you have procedures in place to involve your workforce in the planning and implementation of H&S measures?
8	Do you conduct accident/incident and near miss reporting and undertake follow-up investigations? Please provide evidence.
9	Do you have arrangements for ensuring that your suppliers apply H&S measures to a standard appropriate to the work for which they are being engaged? Please provide.
10	Do you operate a process of risk assessment capable of supporting safe methods of work including permits and reliable project delivery where necessary? Please provide.
11	Do you have arrangements for cooperating and coordinating your work with others (including other suppliers, notably other contractors) including measuring their performance? Please provide.
12	Do you have arrangements for ensuring that on-site welfare provision meets legal requirements and the needs/expectations of your employees and workforce? Please provide.

Functional roles and responsibilities of a party (either can be a dedicated person or a team) to coordinate DfS

### Definition

The Client can decide to appoint a party who is experienced in management of Health & Safety and can support design team to carry the DfS related works across different project phases. Client also has the flexibility to assign the role on DfS to the design team and Main Contractor.

## Roles & Responsibilities

 <p><b>C</b>ommunication &amp; Coordination</p>	<ul style="list-style-type: none"> <li>To coordinate the flow of construction project safety and health risks information among the duty holders</li> </ul>
 <p><b>O</b>wnership &amp; Leadership</p>	<ul style="list-style-type: none"> <li>This role is appointed by the Client</li> <li>To monitor and coordinate the Health &amp; Safety from the design stage to the construction stage, and until the handover to the client for operation and maintenance</li> </ul> <p>Note*</p> <p>It is the responsibility of the Designer (lead/coordinating role) to plan, manage, monitor and coordinate H&amp;S with the designer team in the Design Stage. While it is the responsibility of the Main Contractor to plan, manage, monitor and coordinate H&amp;S with their Contractors in Construction Stage. The DfS functional role either by dedicated coordinator or Designer or Contractor cannot be expected unless they are empowered by Client to do this (plan and manage) with each of the designers, let alone the Contractors who should be managed by the Main Contractor.</p>
 <p><b>R</b>isk Prevention &amp; Management</p>	<ul style="list-style-type: none"> <li>To mitigate the significant risks inherent in the design of the project</li> <li>To reduce the Health &amp; Safety risks during the construction, maintenance or repair phase, and demolition of the building and structure</li> </ul>
 <p><b>E</b>valuation &amp; Training</p>	<ul style="list-style-type: none"> <li>To check, monitor and coordinate that the duty holders are fulfilling their duties in terms of DfS</li> <li>To review lessons learnt with Client, Designer (lead/Coordinating role) and Main Contractor</li> </ul>

The benefits of this role include:

- To **allocate the responsibilities of DfS** to an experienced entity to manage the safety issues and provide timely audit.
- To monitor the competency from the beginning to the end of the construction project life cycle to effectively enhance site safety.
- The appointment of the functional role of DfS can help the Client to develop their initial Strategy Brief, a good to have document for project team which will list the key management

arrangements related to the scope of works and scope of services that need to be covered by each duty holder who are part of the project team during and at each project lifecycle, establishing who is doing what and who in relation to Design for Safety. The Strategy brief may consist of and not exhaustive, as follows:

- Project name
- Project description
- Type – New construction/ refurbishment/asset management/decommissioning
- Details of work scope
- Location/environment
- Anticipated project cost

This is a good way of outlining the Client's key requirements and expectations for the project, including any limitations or restrictions, such as budget, planning constraints and timescales. This Client's Strategy brief is likely to be developed further as the project progresses and may include specifications and standards as well as health and safety expectations. For example, the brief could highlight DfS, on the use of risk registers and Red-Amber-Green (RAG) lists.

The obstacles of introducing this role include:

- 1) The introduction of a functional role of DfS may **require significant time to train talent** since duty holders in this role should ideally have **background on design** (e.g. carrying out the building design).
- 2) Reporting lines and management responsibilities of **the function role of DfS** would be unclear (i.e. setting up a separate management position to manage DfS).
- 3) The introduction of such a role may cause the excessive reliance and give less care to site safety monitoring and promotion.
- 4) The role of H&S advisor or functional role of DfS in tender evaluation stage may be a challenge to **procurement practices**, as the proposed role may be expected to conduct a safety assessment in the tendering stage. In the current industry scenarios, it may not be easy to seek an external advisor support in tender stage as the Client may not want a third party to be privy or manage sensitive tendering/procurement information.

Key practical solutions to address the above obstacles of introducing functional role of DfS can include:

- 1) Clarifying the Roles and Responsibilities of this role
- 2) Clarifying the Roles and Responsibilities of the Client, Designers, Contractors, Maintenance Supervisor
- 3) Clarifying the minimum competence (i.e. knowledge, experience and training - CPD) required to fulfill the functional role of DfS i.e. Designer (Architect / Engineer etc & experience relevant to the type of project working. The functional role will usually be individual or team for an organisation or, on smaller projects, they can be an individual with:
  - A technical knowledge of the construction industry, relevant to the project
  - The understanding and skills to manage and co-ordinate the pre-construction phase, including any design work carried out after construction begins.

This functional role should have the organisational capability to carry out the role, as well as the necessary design skills, knowledge, and experience. Furthermore, this role will need to consider whether they have any gaps in their skills, knowledge, and experience for the project and, if so, seek further advice. The functional role of DfS needs the ability to develop good relationships with the Client and Main Contractor as well as the other designers working on the project.

- 4) All those taken the functional role of DfS should attend and participate on a CIC DfS 2-Day course with syndicate exercises and assessment to confirm obtaining minimum knowledge of who should be doing what, when and how.

# 04

## APPLICATION ACROSS PROJECT STAGES

## 4 APPLICATION ACROSS PROJECT STAGES

To ensure that design is safe, and that the duty holders fully understand the key processes, outcomes, and tools of each stage, an overview of the key five stages of a construction project is detailed in this chapter across the Design for Safety Management System.

Figure 8 outlines the key project stages, from project set-up to the operation and maintenance stage, and sets out the details of the roles and responsibilities of the duty holders and project milestones at each stage. The Design for Safety Management System includes the following information:

- Objective of each stage
- Roles and responsibilities of duty holders
- Critical success factors or project dependent notes
- Key outcomes of stage
- Key supporting PCI/ H&S file, documentation, and tools

The Design for Safety Management System is developed based on the 'CORE' DfS guiding principles, best practice benchmarking, and survey findings analysis.

The application of the 'CORE' DfS guiding principles throughout the project lifecycle is illustrated in Figure 9. The continuous integration of these guiding principles helps to ensure that the health and safety objectives can be achieved throughout the entire project through

- 1) Promotion of **early and regular communication and coordination** between all duty holders
- 2) **Clear demarcation of roles and responsibilities** to promote greater ownership of safety and health outcomes
- 3) **Early detection of health and safety risk or hazards** and proactive elimination at the source, and
- 4) **Regular review sessions and training courses** to ensure that project resources are equipped with necessary requirements.



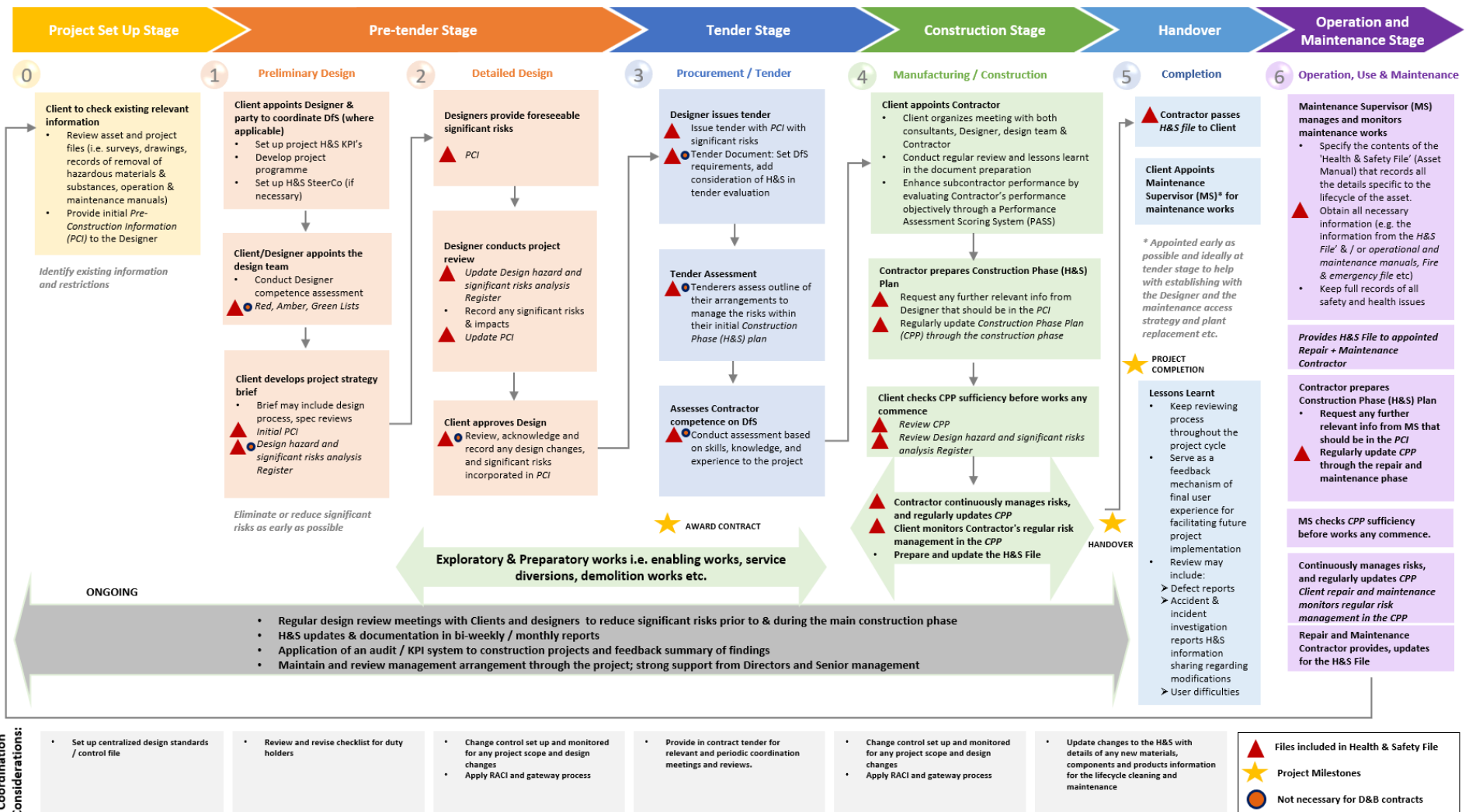


Figure 8 Design for Safety Management System

Note: The above process is for typical normal project lifecycle. As for Design and Built (D&B) Contracts, the appointed D&B Contractor will be taking up design as well as construction works. Therefore, the flow sequence of Design for Safety Management System and recommended files/documentations to be included will be adjusted to suit, e.g. there may be no tendering stage and tender assessment once D&B contract is awarded. However, if specialist

*contractor required to be involved, perhaps the equivalent assessment and evaluation will be conducted internally by the D&B contractor. Some of the documents that may not be necessary required have been identified for D&B contracts.*

*Similarly for the integration of CORE principles below, the appointed D&B Contractor will take up the Designer and also Main Contractor functional role as outlined in the CORE principle below.*

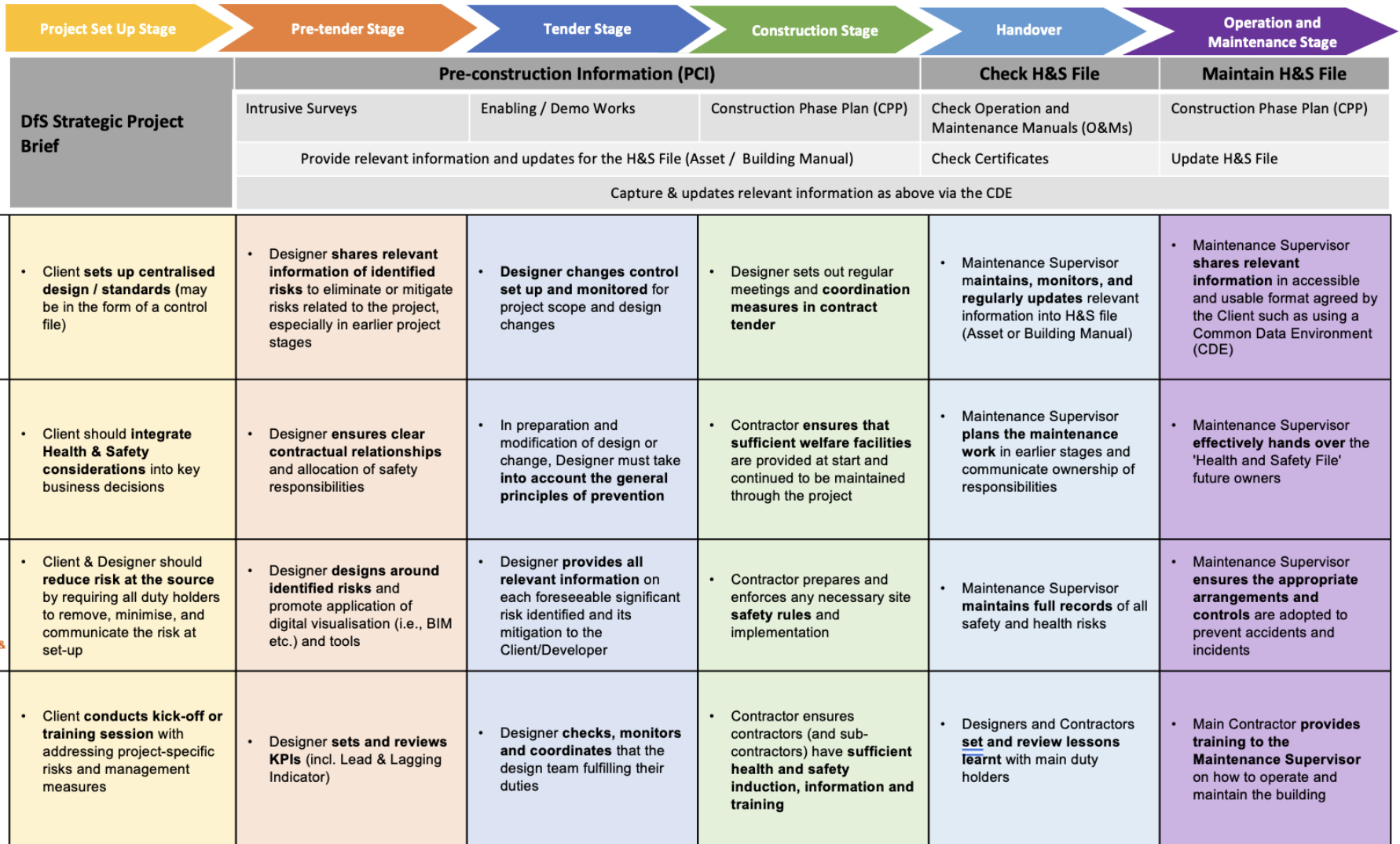


Figure 9 Integration of CORE Principles in the Design for Safety Management System

## 4.1 Pre-tender Stage (Project set up and Pre-tender stage)

### Objective of stage

The objective of the pre-tender stage is to set out a high-level project master program, identify milestones and deliverables, and determine the scope of a project and the detailed design in collaboration with the designers. This is a key stage in identification of areas where optimising manpower, resources, and finances can be optimised to reduce costs and workplace injuries.

### Key process

**Project Brief:** Prior to the commencement of this stage, the Client should have prepared a brief that outline information related to the project including relevant background information, project type, project objectives, stakeholders and criteria of to be achieved. It should include initial project delivery strategy including contract type and procurement strategy, Health and Safety goal, timeline, resources to be deployed, communication plan, etc. This brief will need to be updated as the project progress and it is good to share with project duty holders.

The purpose of the brief is to share with duty holders while keeping track of essential information related to the project establish whether the Client has identified who has been appointed in which role including specialists, Client commitment and involvement in Design for Safety, has there been sufficient preparation time for the design team and Main Contractor.

### Project Set-up

In order set the project up for success at the beginning, the Client should check existing asset and project files of relevant information (i.e. surveys, drawings, records of removal of hazardous materials and substances, Health & Safety File, the supporting Operation and Maintenance Manuals (O&Ms)) and provide initial Pre-Construction Information (PCI).

### Regular Monitoring and Management

Throughout the project life cycle, there are four critical elements that should be regularly reviewed and monitor to ensure health and safety in the project, and prevent risks in the early stages:

- *Regular Design for Safety review meetings with Client, Designer and his design team:* The objective is to reduce risks prior to the commencement of construction. In some specific projects, unsafe issues or problems can be found by the engineer and raised directly in the design coordination meeting and discussed with the designer for solution.
- Health and Safety documentation included in bi-weekly / monthly reports: The relevant files and reports will be monitored by Designer (lead/coordinating role) and Client through the project.
- Audit and KPI Tracking: Safety audits are carried out to assess health and safety processes and feedback summary of findings to all stakeholders
- Strong support from top management: this include allow sufficient time and resource for design for safety in project. Health and safety goals are expected to be set up at the forefront of the design phase with appropriate resources provided by the Client

### Preliminary design

Client or Designer should appoint Designers (i.e. a design team) who are preparing or modifying designs at this stage as well as the completion of appointing coordinator or team with functional role of DfS if applicable. The role includes to plan, manage and monitor the design or preparatory work which is carried out for a project, which may continue during construction, to coordinate health and safety. It can be combined with other activities such as Designer and / or project management. This will assist with the integration of health and safety in the project. This also enables the provision and flow of information to ensure that DfS / health and safety is considered when making decisions.

Parallely, Client develops the project strategy brief which describes the Client's requirements in sufficient detail of the Health & Safety goals, minimum standards and gets the relevant Health and Safety team involved with the Client's Project Manager, Designer and his design team in the project scope.

During the preliminary design phase, Designers should ensure the design can be constructed, maintained, used or demolished safely. Regular DfS review meetings will be convened with Client, Designer and his design team to understand the design requirements and identify the potential hazards and associated significant risks in their design. During the design process, the relevant Health and Safety team should also be involved to help ensure the appropriate safety & health measures are considered and adopted in the Design. Designers can use "Red, Amber and Green lists" to have suggestions on what hazards should be eliminated/avoided and if unable to do so reduce the associated significant risks in the design stage.

Once the preliminary design is completed, Designers need to provide the design information to the Designer and produce the list of foreseeable significant risks and all significant concerns / issues on health and safety. All the significant safety & health concerns/issues together with the corresponding responses should be recorded in the "Design Hazard and Significant Risks Analysis Register".

It is at this stage, where possible Client/Designer to engage construction expert (i.e. Client's team with construction management experience or Client to appoint an independent advisor or convene briefing sessions with contractors to provide feedback on projects during the design stage to be involved in DfS review meeting to provide input from contractor point of view) to review the design and support to identify any risk (e.g. if design solution is constructable, raise construction safety concerns, advise accessible issue during construction, operation and maintenance, raise any potential safety concerns due to design or solution) during construction stage that can be addressed through design.

After the completion of preliminary design, a feasibility study will be carried out to shape the final delivered design. Where the feasibility study has been completed, Designers must recommend an alternative design to meet client's need or the structure's requirement with the consideration of the identified safety & health concerns/issues. The "Design Hazard and Significant Risks Analysis Register" should also be updated and completed in this stage. This is a safety analysis tool for identifying hazards and their associated causal factor (i.e. significant risks) when detailed design information is not available.

### **Detailed Design**

Following completion of the "Design Hazard and Significant Risks Analysis Register" at the earlier stage, the design team should proceed with the detailed design. The drawings of design works are expected to include visualisation and hazard symbols where relevant. At this stage, hazard identification and risk analysis and control will be carried out in order to help designers modify their design works. During the hazard identification and risk analysis process, Designers should produce a list of foreseeable significant risks which should be recorded in the same file of "Design Hazard and Significant Risks Analysis Register". It should be constantly updated for recording the risk management activity across the project stages. It records all details of the hazard, the significant risks, the assessed risk exposure and the relevant party who is undertaking the treatment and their current progress. Subsequently, it should be updated regularly and communicated to downstream duty holders.

Designer should update the relevant PCI, and review Design Hazard and Significant Risks Analysis Register to record any significant risks and impacts when producing the design works. Where the detailed design stage is completed, Designer need to record and document all the significant hazards and impacts identified in the Design Hazard and Significant Risks Analysis Register to facilitate the design risk management.

Upon the Client's approval on the design works with design changes and any significant risks incorporated, it will be granted to proceed to the tendering stage.

## Critical success factors

- **Design for Safety Review Meetings**  
Regular DfS review meetings are convened by the Client or Designer and his design team for design related reviews and updates on the new construction, additions, demolitions and other major modifications. Clients or Designer can suggest how to prepare and run an effective DfS review meeting. Safety is enhanced when Designer performs design related safety review and constructability review in the design stage. Upon approval of the design works, Designer can update the Pre-Construction Information and proceed with tender and construction documents.
- **Pre-Construction Information (PCI)**  
The Designer (lead/coordinating role) has an important role in assisting the Client by taking control of the health and safety in the pre-tender phase. One of the key obligations of Designer (lead/coordinating role) is to prepare the Pre-Construction Information (PCI) which contains health and safety hazards and how they will be addressed. This starts during the pre-tender phase but is a continuing obligation. By updating and communicating this information with key duty holders in the project, the project team can share the health and safety information from one source.
- **Earlier involvement of Construction Experts in the initial conversation**  
Evidence from the Survey and Stakeholder engagement indicate that early involvement of construction experts in the initial conversation before detailed design can mitigate risks and improve project performance. In order to achieve Safe Design, construction experts should be engaged at an early stage of the project to offer input into the preliminary design phase. Involving contractors earlier can improve design quality, lessen variations during construction and prepare more accurate cost estimates. In addition, facility/property management or future owners (where applicable) should be engaged in the design stage to ensure suitable measures are provided to allow for maintenance and repair access or temporary safety measures are considered in the design.

## Key outcomes

- Check on existing H&S Files of previous projects
- Development of Pre-Construction Information (PCI)
- Approval of design works by Client
- Hazards identification and mitigation during the design stage by preparing and updating the files including “Design Hazard and Significant Risk Analysis Register” and “Red, Amber and Green lists”
- Drawings of design works

## Key supporting files

- Construction Project Notification (if applicable)
- Initial Pre-Construction Information in Preliminary Design
- Summary of Health and Safety Concerns
- Design Hazard and Significant Risks Analysis Register
- Red, Amber and Green (RAG) Lists
- Drawings
- Updated Pre-Construction Information (PCI) in Detailed Design by designers

## Technology solutions

Once the preliminary design has started, Client needs to set up Organisational Information Requirements (OIR) related to the Project Information Requirements (PIRs) & Asset Information Requirements (AIR) via Exchange Information Requirement (EIR). During the design phase, Designer with design team are recommended to use visualisation and 3D by using Building Information Modelling (BIM) as a minimum for clash detection and logging Health and Safety significant risks.

BIM is a shared digital representation of a built asset and is initiated for the sake of managing construction projects effectively and efficiently. In the local context, Construction Industry Council (CIC) released BIM Standards - General (Version 2 - December 2020) in 2020, which contains major enhancements to align with ISO 19650's Information Management principles, workflows and requirements, also providing Hong Kong 'Local Annex' of ISO 19650-2:2018.

## 4.2 Pre-construction Stage (Tender stage)

### Objective of stage

Following the Pre-tender stage, the tender stage will set out procedures for obtaining tenders for the agreed construction works afterwards. The purpose of the tender is to select a main contractor or Contractor to carry out the works on the basis of approved design and value for money. The Client is responsible for promoting the "safety first" mentality in the workplace and allocating the safety responsibilities and to ensure the main contractor has sufficient arrangements to manage the identified risks. Therefore, safety and health should be included as a parameter during the tendering phase.

### Key process

The Pre-Construction Information (PCI) of significant risks is the fundamental document for the invitation for tenders. This document incorporates the design changes with the known hazards and will be shared with Client and Client's Project Manager.

At this stage, those with the functional role in DfS that equipped with strategic design & construction knowledge and experience is appointed by Client to conduct tender evaluation. The accreditation of those involved in functional role of DfS can be covered in two ways - engaging with CIC to set up an accreditation scheme as used in UK under the Safety Scheme In Procurement (SSIP) where individuals and organisations require to provide evidence and are assessed annually and / or as undertaken in Singapore where the DfS Professional has to have attended an accredited course and passed an assessment in the last 5 years. It should not only include the considerations of tender price competitiveness, but also the safety and health performance of the tenderers and whether the tenders conform to the specifications, terms and conditions laid down in the tender documents. The detailed requirements on the tenderer's qualification (i.e. skills, knowledge, experience related to the project) are stipulated in the tender documents. An interested party may submit the Outline Construction Phase Plan (CPP) with the tender submissions based upon the received Pre-Construction Information (PCI) as well as Design Hazard and Significant Risks Analysis Register from the Client via the Designer. Tenderers are expected to detail their arrangements to manage risks in this document to ensure they comply with their duties in the Contract.

Upon receiving approval by the Client, the tenderer that conforms to the specifications and requirements will be awarded the construction contract.

### Critical success factors

- **Tender analysis and evaluation**

Each tender will be assessed to determine whether it meets all mandatory requirements of the tender document. The selection criteria may include the technical requirements, financial viability, management competence and relevant experience, quality assurance requirements. Tender analysis can include consideration factors such as knowledge of project and awareness for design for safety on this project. Tender can list out safety problems and let contractors address these problems during tender submission. In addition, the tenderer can prepare and submit an Outline Construction Phase Plan together with his tender to address the risks identified in the Pre-Construction Information (PCI) and Design Hazard and Significant Risks Analysis Register.

### Key outcomes

- Development of Pre-construction Information (PCI)
- Submission of Outline Construction Phase Plan (CPP) together with tender documents. Tender valuation on both quality, health & safety, environmental, a realistic programme with innovative solutions and not solely based on the lowest bid or cost
- Tender awarded

### Key supporting files

- Updated Pre-construction Information (PCI)
- Updated Design Hazard and Significant Risks Analysis Register
- Construction Phase Plan (CPP)

### Technology solutions

Prior to the commencement of construction, Main Contractor may use BIM to visualise the clash detection and logging health and safety significant risks.

## 4.3 Construction Stage

### Objective of stage

The construction stage is the execution phase of the planning and design. The designers, consultants, and engineers who are engaged for the construction services will review the technical submittals, perform quality control inspections, and ensure that the project is delivered as designed and on track. It is the Contractors' duty to ensure that the construction workers are aware of individual health and safety on the site. Significant residual risks that have not been eliminated or reduced, as so far as reasonably practicable in the pre-construction stage should be addressed and managed by Contractors at the start and during the construction. In cases of Design and Built (D&B) contract, where main contractor is appointed to carry out the design work in addition to delivering the construction work. In this case, the Contractor will have the flexibility to follow applicable stages and corresponding recommended documentation of the DfS management system. Details to refer to Note below Figure 8 – Design for Safety Management System.



## Key process

Main contractor is appointed by the Client and have various duties relating to coordinating health and safety on site by eliminating hazards identified both prior to and during actual construction works and particularly following any scope or design changes. Following the contract award, a pre-construction safety meeting will be conducted with the Client, Designer, the design team and Main Contractors to ensure that the contentious issues in health and safety are discussed and addressed.

It is the responsibility of Main contractor to make sure that **Construction Phase Plan (CPP)** is prepared and developed based on available information from Designer in the Pre-Construction Information (PCI) and will be updated with the significant information relevant to any demolition and construction works carried out during the construction phase.

The main contractor has the flexibility to integrate elements of CPP into their Construction Health and Safety Plan if suitable for the projects.

Main contractor should provide a safe working environment to the workers and ensure the construction works can be carried out safely. Therefore, main contractor has the duty to enhance the site management and facilitate effective communication which are two important aspects to improve safety. In an attempt to improve the quality management and safe construction, **performance assessment could be implemented similar to Performance Assessment Scoring System (PASS)** is implemented as a mechanism for evaluating the effectiveness of a contractor's ability to deliver projects to specified standards for Housing Authority projects. The performance evaluation system can be considered as a supplementary tool for supervision of safe works.

Prior to the commencement of works, Client should review the **Construction Phase Plan (CPP) or equivalent plan** to make sure the plan is sufficient and there after updated regularly by main contractor. Designer should review the **Design Hazard and Significant Risks Analysis Register** in order to ensure the appropriate management of the identified design risks. On the other hand, Main Contractors should ensure the subcontractors are fully involved in and encourage the worker engagement and participation of raising health and safety concerns and offering suggestions of improvement. In the regular liaison meetings with the Client, all duty holders will share information of the construction progress and health and safety concerns raised by workers and provide responses. During this stage, main contractor may consider an action plan showing how to ensure all site personnel complying with statutory and contractual safety requirements. There is a list of topics could be considered if applicable:

- (a) A description of the project such as key dates and details of key members of the project team;
- (b) The management of the work including:
  - (i) The health and safety management of the project
  - (ii) The site rules including induction training, delivery routing, etc.
  - (iii) Arrangements to ensure cooperation between project team members and coordination of their work, e.g. regular site meetings
  - (iv) Arrangements involving underground or overhead services diversion
  - (v) Site induction especially involving phasing
  - (vi) Traffic arrangement and diversion
  - (vii) Welfare facilities such as toilet, water, locker, changing area, etc.
  - (viii) Fire prevention and protection, dangerous goods storage and emergency procedures
- (c) The control of any of the specific site risks (i.e. Works involving particular risks):
  - (i) For example work which puts workers at risk of burial under earthfalls, high headroom installation or maintenance leading to falling from a height, limited access for use of

equipment, temporary structural support, in where the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or site.

Main contractors need to inform Designer of any significant risks related to the design that occur and should be identified and controlled during the construction phase. During and prior to the completion of construction works, information related to the asset and / or building for its use, maintenance and cleaning etc, is provided to the Designer (lead/coordinating role) for finalising the **Health & Safety File (Asset or Building Manual)** that will be passed to the Client.

### Critical success factors

- **Updating Construction Phase Plan (CPP) or equivalent such as Construction Health & Safety Plan**  
Main contractor prepares the “Construction Phase Plan” which records arrangements for managing significant health and safety risks associated with construction of the project. Contractor may incorporate CPP items into Construction Health & Safety Plan depending upon the complexity of the project including any temporary works, logistics and traffic management, heavy lifting operation and fire safety, security access and welfare facilities, etc. The objective is to achieve a desired outcome that safety and health is ensured, the injuries to workers and damage to property are prevented. Main contractor needs to track identified risks, identify new risks during construction and keep the document updated during the construction phase with assistance of regular inspections and audits. Apart from asking questions for Designer and main contractor, it is important to give all the design team and the contractor workers the opportunity to share their views and contribute to health and safety of the project.
- **Contractors should have basic DfS knowledge and awareness**  
Based on the feedback of stakeholders, there are some key factors to consider when engaging with the Contractor prior to and during the construction stage. In particular, the Client should exercise due diligence during procurement and tender stage to ensure the Contractor has basic knowledge and awareness on DfS, equip with sufficient skills and expertise to carry out the works safely. If concerns arise about the competence of the Contractor or their safety record including quality control, the Client should act promptly (i.e. provision of training on DfS) to reduce the onsite risks by having a thorough review meeting with immediate agreed actions.
- **Risk Assessments and Method Statements incl. Permits to Work**  
Main contractor and their subcontractors prior to carrying out their work not only require having attended site inductions before undertaking work. But be briefed on the risk assessments and method statement for their relevant tasks. But also, where applicable operate under a permit to work for any high-risk activities i.e. confined spaces, penetrating the ground, isolating live services, hot works etc,

### Key outcomes

- Ensuring the main contractor and their subcontractors are competent
- Development of Construction Phase Plan (CPP) or integrated into Construction Health and Safety Plan
- Safety management of construction work on site
- Open communication with duty holders on matters affecting health and safety
- Contractors’ performance evaluation

### Key supporting files

- Construction Phase Plan (CPP) or equivalent e.g. Construction Health and Safety Plan
- Design Hazard and Significant Risks Analysis Register

### Technology solutions

The development and integration of digital information and BIM models into a design can help main contractor and Contractor to detect significant risks on site. However, if BIM is created for a new project, some minor BIM changes may not catch up with the site progress. In this case, Main Contractor and Contractors can report the construction hazards/risks by mobile app or intranet reporting system.

## 4.4 In Use (Handover, Operations and Maintenance stage)

### Objective of stage

The objectives of operation and maintenance stage include the inspection process to identify and resolve potential issues before the building is handed over to the client. At this stage, the building systems will need a period of continuous operation and during this period, regular reviews will be taken place to document the identified defects or errors that arise after the completion of construction.

### Key process

When the construction work on site has been completed, there are some key steps to be followed prior to the handover stage. Main Contractor will carry out the inspection of the whole building or works to ensure the construction is completed as required and update the **Health & Safety File (Asset or Building Manual)**. The file should include details of any hidden features (e.g. high-tension cables, pre-stressed elements for Building Maintenance Units (BMUs) such as suspended cradles, safety harnesses anchorage for cleaning or maintenance, toxic materials, especially those that would be hazardous during removal, and fire prevention or emergency escape routes, etc.) Once the inspection process is done with satisfying outcomes, the **Health & Safety File (Asset or Building Manual)** will be sent to the Client before taking over the project for operation, use and maintenance.

Maintenance Supervisor (e.g. Facilities Manager, Asset Building Supervisor) is appointed by Client for maintenance works. This role has the duties to participate in meetings with Designer at the design stages of new projects, specify the contents of the **Health & Safety File (Asset or Building Manual)** that records all the details specific to the lifecycle of the asset, obtain all necessary information (e.g. the information from the “Health & Safety File” and / or Operational and Maintenance Manuals, **Fire and Emergency File**, etc), manage and monitor the maintenance work, keep full records of all safety and health issues as well.

The project team may provide training to the Maintenance Supervisor and their maintenance team on how to operate and maintain the building and / or provide the **Health & Safety File (Asset or Building Manual)** and any supporting **Operation and Maintenance Manuals (O&Ms)** which usually include operation and maintenance instructions along with Manufacturers literature, As-Built Drawings and Signed Test and Commissioning sheet. It can help fully understand the maintenance procedures and ensure a safe working environment so as to reduce the risk of injury to the maintenance workers.

After the Client taking over the building or structure, it is advisable to perform a post-project review meeting which will involve the Client, Designer, designer team, main contractor or Contractor, and Maintenance Supervisor to uncover the identified problems associated with health and safety to avoid significant issues/risks and or occurrences in the future.

It is important to note that designer at the stage may not be able to foresee all situation of future maintenance and repair (M&R) requirements. M&R contractors will be expected to conduct proper risk assessment and meeting statutory requirement, provision of adequate temporary safety precautionary measures is important to ensure conducting work safely.

### Critical success factors

- **Health and Safety track record**  
The “Health & Safety File” (Asset or Building Manual) is a live and dynamic document that should be reviewed and updated by Main Contractor during the inspection process. The Client can appoint a competent person to be the Maintenance Supervisor that will continue updating the “Health & Safety File” after practical completion of the project and satisfactory via an inspection. The key element in this stage is to make the relevant document on track since the risks of safety and health could arise throughout the construction life cycle even during the dismantling and demolition of the building or structure.
- **A holistic feedback mechanism**  
At this stage, it is suggested introducing some management systems / apps to effectively trace the feedback and retrieve the safety information for the design team when accidents occur and / or design amendments/changes are required. It could better prevent the claimed reasons for accidents as “human error”.
- **Shared lessons learnt**  
The Client is recommended to provide lessons learnt (i.e. significant risks / hazards related to particular stages in the project), case studies and / or real examples to all relevant duty holders. Applying lessons learnt among the project team members can allow them to take advantage of good practices in the project and prevent the team from conducting or repeating the “human errors” on the safety in design and construction. It is suggested establishing a common platform to promote shared lessons learnt in the future.

### Key outcomes

- Handover of “Health & Safety File” (Asset or Building Manual)
- Update “Health & Safety File” (Asset or Building Manual)

### Key supporting files

- Health & Safety File (Asset or Building Manual)
- Fire and Emergency File
- Operation and Maintenance Manuals (O&Ms)

### Technology solutions

After the completion of the project, end user or Maintenance Supervisor should ensure the BIM software procured is relevant to managing, monitoring and updating their AIRs.

## 4.5 Review & Feedback

### Objective of stage

On completion of construction, the review session aims to evaluate the effectiveness of safety in design. This will enable identification of the most effective design practices and any design innovations that could be used on other projects.

## Key process

At this stage, a project review session will be organised by Client with Designer and his team, main contractor, Contractor, subcontractors and Maintenance Supervisor in a post-construction meeting to gain valuable feedbacks from all relevant parties involved in the project. Maintenance Supervisor has the duty to review the defect reports, accident investigation reports and discuss with other duty holders regarding the modifications. The Client will share information on user difficulties and deviations from intended conditions of use. The ultimate goal of the "reviewing the project" is to achieve continuous improvement in the future projects. It is advisable to stipulate the "lessons learnt session" in the Contract during Tender stage.

## Critical success factors

- **A knowledge portal/hub of DfS**  
It is suggested that a knowledge portal/ hub with BIM model (i.e. centralised system/ database) can be incorporated in the Review & Feedback stage in order to consolidate all incidents feedback/ lessons learnt/ similar designs etc., and capture any good practices for designers' better referencing.
- **A structural assessment report / safety report**  
The report will be needed by Structural Engineer to their design which is already in the current system. It could cover either or both the temporary works and permanent works, where the structural design requires to be checked / validated to ensure that the asset should have sufficient loadings and meet the design codes during construction and after completion of the project.
- **Post operation surveys for end-users**  
A post operation survey will be undertaken by the end-users and / or the maintenance staff to evaluate the effectiveness and efficiency of the project delivery process. It also consists of the safety plans and the supporting Operation and Maintenance Manuals for end-users' reference.
- **Consistent review and feedback across the project lifecycle**  
The requirement of review and feedback starts from inception, concept, tender and during the construction phase following any significant scope and design changes. The Client should use the key milestones to make mandatory for all key duty holders to undertake and document this – as good risk management.

## Key outcomes

- Review of defect reports and accident investigation reports
- Discussion on modifications, user difficulties and deviations from intended conditions of use

## Key supporting files

- N/A



05

**NEXT STEPS**

## 5 NEXT STEPS

To facilitate support the DfS Management System, this report also includes a separate **reference materials to support different duty holders across the project life cycle**, including but not limited to the following sample:

- Project Brief of Construction Project
- Pre-Construction Information (PCI)
- Red, Amber, Green Lists
- Preliminary Hazard and Significant Risks Analysis
- As-Built Drawings
- Design Risk Register
- Risk Assessment Rating (Risk Rating Matrix)
- Hazard and Impact Summary
- Construction Phase Plan (CPP) or equivalent e.g. Construction Health and Safety Plan
- Health & Safety File (Asset or Building Manual)
- Fire and Emergency File
- A Centralised Knowledge Hub for Design for Safety
- Key Performance Indicators (KPIs) for Design for Safety
- Promotion of Early Involvement of Construction Experts in the Initial Conversation
- Tender Stage Framework
- Digital Visualisation (i.e. BIM, Virtual Reality, etc.) and Tools

Going forward as next step, Phase 2 DfS training programme and the training materials will be developed based on the Design for Safety Management System. The content will cover:

- Principles and intent for implementing Design for Safety
- Design hazards and risks
- Design risk analysis and management
- Technique for design hazards and risks identification in respect of the construction lifecycle and elimination and / or reduction
- Ways to conduct effective Design for Safety reviews
- Application of the Design for Safety Management System
- Reference material on the Design for Safety Management System
- Roles and responsibilities of different key duty holders, in particular the designer, in the management system framework, and expectation on them

A two-day (16 hours) full course training material will be developed for management personnel, who will perform as designer role. A half-day (4 hours) course training material will be developed for general construction personnel. Further to preparing the training programme and materials, the Phase 2 Report will be developed taking into account any significant risks, issues, comments, solutions and suggestions received from the consultation process. The report with the detailed training programme and course materials will be shared with CIC and Task force for comments.

At the end of each training session, participants should be able to effectively analyse the hazards and associated risks and identify and apply mitigation / controls by following the guidelines set out in this report.



06

REFERENCE



## 6 REFERENCE

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