

Phase 2 Final Report

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

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ABBREVIATIONS & TERMS

Abbreviation	Definition
ACEHK	Association of Consulting Engineers of Hong Kong
APS	Association of Project Safety
BIM	Building Information Modelling
CABE	Chartered Association of Building Engineers
CDM	Construction Design and Management (CDM) Guidance Regulations 2015 and HSE's L153 Guidance – United Kingdom (UK)
CIAT	Chartered Institute of Architectural Technologists
CIC	The Hong Kong Construction Industry Council
CIOB	Chartered Institute of Building
CPP	Construction Phase Plan
DEVB	Development Bureau
DfMA	Design for Manufacture and Assembly
DfS	Design for Safety
H&S	Health & Safety
HKCIOB	The Chartered Institute of Building (Hong Kong)
HKECA	Hong Kong Electrical Contractors' Association
HKFEMC	The Hong Kong Federation of Electrical and Mechanical Contractors
HKIA	Hong Kong Institute of Architects
HKIDA	Hong Kong Interior Design Association
HKIE	Hong Kong Institution of Engineers
HKILA	Hong Kong Institute of Landscape Architects
HKIS	Hong Kong Institute of Surveyors
HKIUD	Hong Kong Institute of Urban Design
HKPIDA	Hong Kong Professional Interior Designer Association
ICE	Institution of Civil Engineers
IOSH	Institution of Occupational Safety & Health

Abbreviation	Definition
IStructE	The Institution of Structural Engineers
MiC	Modular Integrated Construction
O&Ms	Operation and Maintenance Manuals
PCI	Pre-Construction Information
RAG	Red, Amber & Green Lists
RIBA	Royal Institute of British Architects
RICS	Royal Institution of Chartered Surveyors
RTPI	Royal Town Planning Institute
SWOT	Strengths, Weaknesses, Opportunities, Threats

01

INTRODUCTION

1 INTRODUCTION

1.1 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.

1.2 Project 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.

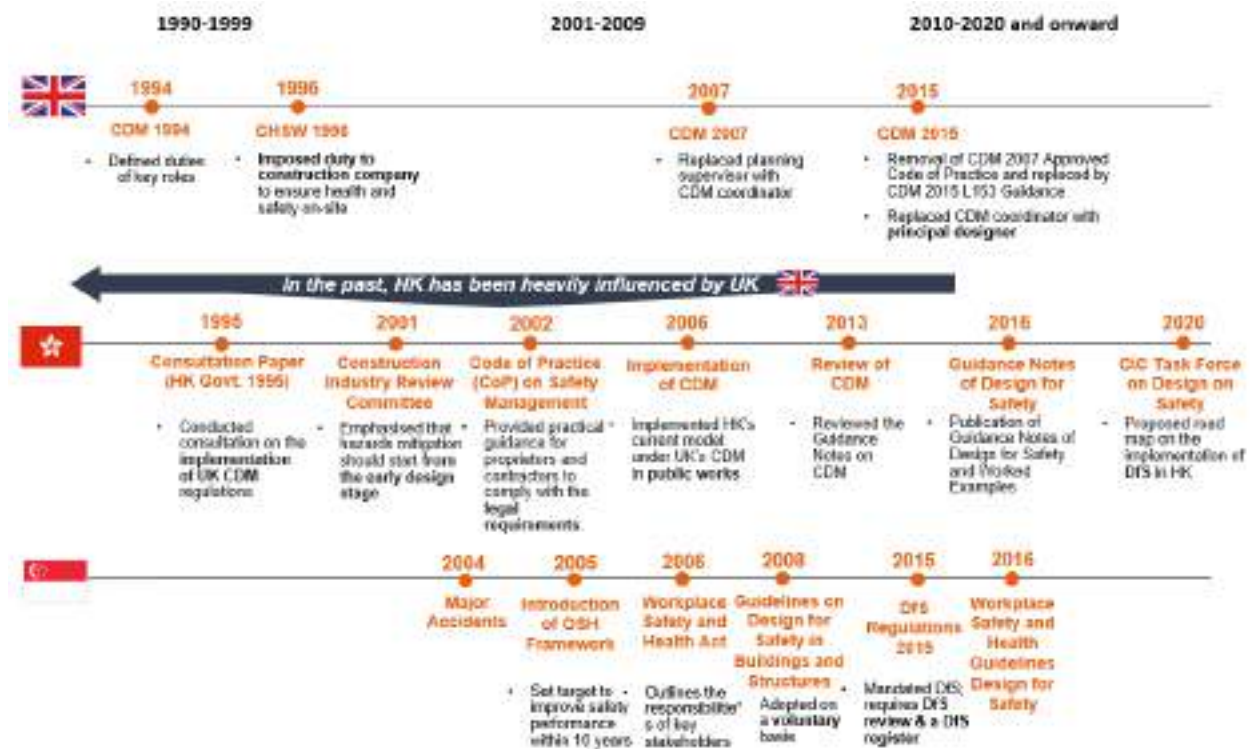
The Safety Management System in Hong Kong is mandatory under Cap.59AF Factories and Industrial Undertakings (Safety management) Regulation. It is applicable based on industrial undertakings' size of employment and the value of work undertaken. This includes factory, shipyard workplace or construction site. Basically, it has 14 key elements covering safety policy, organisation, training, identify health and safety job related hazards, accident control and hazard elimination, safety review and audit.

Design for Safety Management System, however, is a voluntary based management system and applicable to all type of construction projects with focus on managing health and safety risk during construction, operation and maintenance phase of the project through design, throughout the project lifecycle.

Therefore, the Design for Safety Management System and Reference Materials should not be in any contradiction to the existing Code of Practice on Safety Management issued by Labour Department.

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.

In Stage 3, based on analysis of survey findings and global benchmarking, Arcadis has proposed the key enhancement (compared to the Guidance Notes of Design for Safety published by Development Bureau in 2016) by:

- Developing the 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
- Improving the clarity on the demarcation of roles and responsibilities of responsible parties across the construction life cycle by applying ‘CORE’ principles
- Enhancing the focus on safety mentality and promote the integration of Health and Safety (H&S) into key business decisions

- Developing 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
- Revising the DfS reference materials

In Stage 4, the Draft Report together with a draft Design for Safety training programme for industry stakeholders has been developed and submitted in December 2022 to facilitate the adoption of Design for Safety in the Hong Kong Construction Industry. As part of the contract with CIC, it should include two training courses:

- DfS Designers Course for Management Personnel (Course 1) - for planning, procurement, cost, design management personnel, who directly and indirectly, perform the role as “designer” for no more than 16 hours over 2 days duration, and
- DfS Awareness Course for General Construction Personnel (Course 2) - for general construction personnel, which should include the Client personnel and not just Contractors for basic awareness, which in the contract is for no more than 4 hours over half day period.

In the training programme, there were 17 independent modules included in the DfS Designers Course 1 and 5 modules for DfS Awareness Course 2 to cover all the required topics as per the Contract. In addition to the course materials, Arcadis has also developed a train-the-trainer training pack for the two training courses above.

There is a provision of train-the-trainer course, conducted by Arcadis on request of CIC for up to a maximum of 10 participants per class and is open to any organisations (e.g. HKIC, other tertiary institutions, etc) who would like to organise the Design for Safety training course according to the developed training programme in Clause 3.3(b) of the contract.

The recent and upcoming project milestones are listed in Table 1.

Date	Project milestones
December 2022	Phase 2 Draft report submission with training plan
April 2023	CIC Masterclass on Design for Safety for (1) Management Personnel, and (2) General Construction Personnel
May 2023	Phase 2 Final report submission with training plan
<i>August 2023 (estimated submission date)</i>	Draft report submission with Executive Summary
<i>September 2023 (estimated submission date)</i>	Final report submission with Executive Summary

Table 1 Project Milestones

1.3 CIC Masterclass on Design for Safety (April 2023)

Arcadis provided support to CIC in developing and delivering a signature course on Design for Safety (DfS) for industry practitioners, including a version for management personnel and another version for general construction personnel in the industry. The course is designed to provide learning experience from both overseas and Hong Kong cases and best practices and is linked to the development and adoption of DfS in the Hong Kong construction industry.

Both versions of the course were trialled in the form of a Masterclass at the HKIC, facilitated by Arcadis in April 2023. The trial also served the purpose of collecting feedback from participants to further enhance the final training program and course materials.

During the courses, the trainer guided the participants to go through the details of identifying hazards and associated significant risks, methods and techniques of control, mitigation, reduction and treatment to communicating, consulting, cooperating, coordinating and capturing relevant information, etc.

The objectives of carrying out DfS masterclass course include the following but not limited to –

- (1) To build industry capacity for supporting the development and adoption of DfS in the Hong Kong construction industry.
- (2) To provide a basic understanding of why, what and how to adopt and use the DfS Management System and requirements through the project lifecycle stages, regarding the application of Design Risk Management
- (3) To specify the DfS components, materials and products and the ways to ensure a design change control process followed that can help assist cost and enable programme certainty

In addition to the sharing of relevant information and case studies, interactive exercises were incorporated throughout the course to enhance learning—these took the form of small group discussions or presentations on assigned topics. The CIC also invited external guest speakers to share their experience to enrich the content of the course. Finally, to ensure an adequate understanding of the course content, participants were also required to complete and pass a written assignment before a certificate could be obtained.

The total number of registered participants in this DfS Masterclass reached 72, including 29 for the General Construction Personnel Course and 43 for the Management Personnel Course. They held various relevant roles, including Client, Designer, Contractor, or Maintenance Supervisor, across the public and private sectors of the Hong Kong construction industry.

Questions and comments were collected throughout the course and has been considered in the refinement of the training program and materials where applicable.

1.4 Purpose of This Report

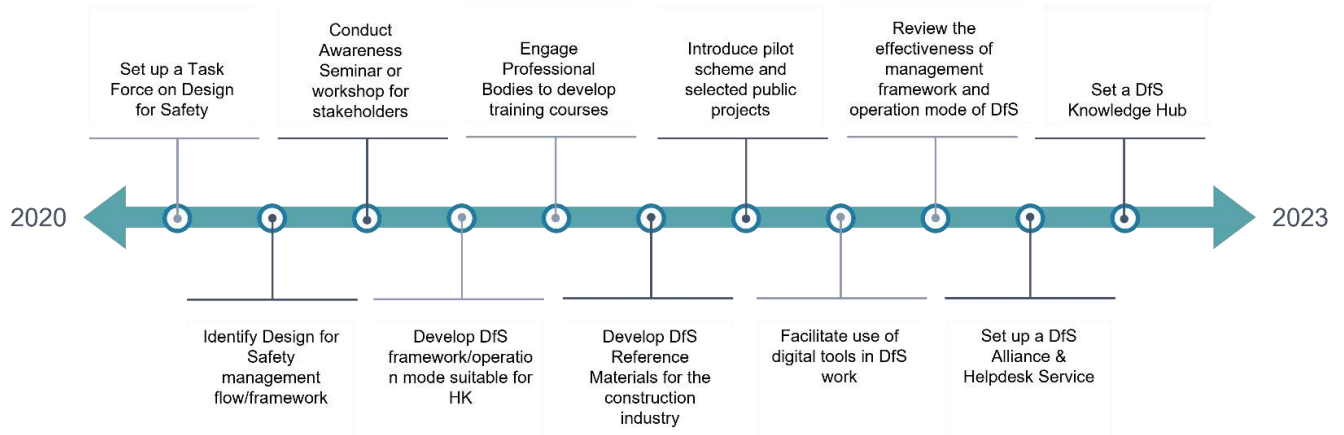
This Phase II Final Report is developed to provide information on 1) the Masterclass of Design for Safety (DfS) held in April 2023, 2) detailed methodology of training programme, training materials and syllabus, and minimum learning outcomes after the training for different duty holders, 3) the key comments and feedbacks received from course participants and stakeholders. The training programme includes:

- Development of a Two-Day DfS Designers course training for management personnel, who will perform as designer role
- Development of a half-day DfS Awareness course training for general construction personnel

1.5 Importance of Training

The purpose of DfS is to improve the overall management of health, safety and welfare in the construction industry. As digitalisation advances and construction technologies evolve, there comes a need for duty holders and professionals to align with these changes in terms of knowledge and skills to improve the health & safety performance in the workplace. 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



Training of the DfS Management system and the requirements is extremely important process because it helps empower professionals to realise the importance of good risk management with the necessary tools so that it can adequately identify and deal with potential risks early and appropriately. There are several reasons for duty holders to take the training programme, such as:

- **It prepares the duty holders for clearer responsibilities in their health & safety role** – The training programme will help them to learn the skills that are required to function effectively in their positions and improve the communication and interactions with other duty holders in terms of health & safety.
- **It shares the lessons learnt from major accidents/incidents and statistics in Hong Kong, Singapore and United Kingdom** - The training programme can help to improve the knowledge and skills of duty holders to face the various circumstances in the industry. It will also include the knowledge of work ethics, identification of human errors and foreseeable risks in the project.
- **It improves accident reporting process and specific software skills** – The training programme will provide the participants with specific supporting documentation (i.e., tools and templates) applied in their work to better understand the health & safety arrangements and digital technologies (i.e. database, BIM) that could be used on site to help accident prevention.
- **It includes explanation of successful cases of DfS examples to illustrate merits of DfS.** The training materials will include the local and overseas DfS examples so that the duty holders can appreciate the merit of making effort in design to avoid the accidents/incidents for safety of workplace.

Given the maturity of design for safety in most organisations is at the early stages, structured training is the most critical way to help professionals understand their responsibilities and of others to make positive contributions and outcomes through the project life cycle stages.

1.6 Training Prerequisites

The training programme includes:

- A Two-Day DfS Designers course training for management personnel, who will perform as designer role
- A half-day DfS Awareness course training for general construction personnel

Those attending the two-day DfS designers course should be attended and undertaken by any of the following designer roles: Architect, Civil, Structural, Geotechnical, Mechanical & / or Electrical,

Temporary Work design, also those who specify and make changes to the design incl. value engineering: Clients/Developers, Quantity Surveyors, Design & Build Contractors. Specialist Contractors with design responsibility etc. It is proposed the attendee should hold at least a recognised Diploma or Degree in a Design discipline and a member of recognised professional institute i.e. HKIDA, HKPIDA, HKIA, HKCIOB, HKIUD, HKIE, HKIS, ACEHK, HKFEMC, HKECA, HKILA, RICS, RIBA, CIAT, CABA etc.

Those attending the half-day DfS Awareness Course is wide ranging with individuals who are actively working during construction, operation and maintenance of a project/asset including Clients/Developers, Contractors and Subcontractors, supervisors, facilities management or maintenance supervisors and maintenance surveyors, etc. The course attendee should be competent in their area of work.

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METHODOLOGY OF TRAINING PROGRAMME

2 METHODOLOGY OF TRAINING PROGRAMME

2.1 Gap Analysis and Training Needs

2.1.1 Identifying the Knowledge & Skill Gaps

In terms of enhancing the education of DfS among the duty holders in the Hong Kong construction industry, one of the goals is to bridge the skill gaps through various interventions (i.e. training courses, hands-on exercises, etc.). The significant knowledge that can influence the performance of DfS will include:

- Clearer demarcation of roles and responsibilities of those who take up functional roles to coordinate DfS
- Clearer demarcation of roles and responsibilities of the duty holders (i.e. Client, Designers, Contractors, Maintenance Supervisor) in terms of ensuring the health & safety
- The clarified minimum competence (i.e. knowledge, experience and training) required to fulfil the functional role to coordinate DfS (i.e. Designer/Architect/Engineer/Contractor with experience relevant to the type of project working). The party who coordinates DfS will usually be a team/ a person 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 deep understanding of DfS and skills to manage and coordinate the pre-construction phase, including any design work carried out after construction begins. The person with function role of DfS should 1) have the organisational capability to carry out the role, as well as the necessary design skills, knowledge, and experience, 2) consider whether they have any gaps in their skills, knowledge, and experience for the project and, if so, seek further advice, and 3) develop good relationships with the Client and Contractor as well as the other designers working on the project.

Furthermore, in the past stakeholder engagement workshops, feedbacks from stakeholders can also help to identify skill gaps in performing the DfS in the ongoing projects. It was suggested by stakeholders that training courses was considered important to ensure that project resources are equipped with necessary requirements. Their key recommendations include the following:

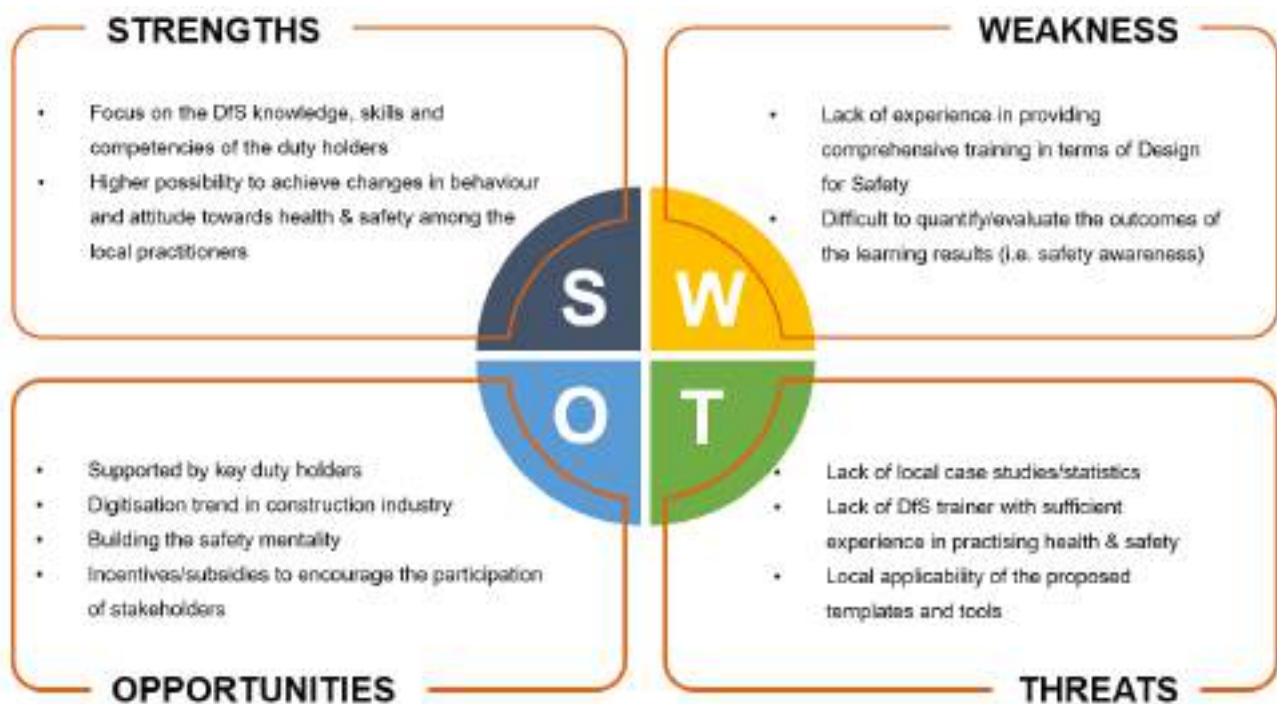
- **Specified training modules for different duty holders** – Training should be separated into two stages: general training on Health & Safety and DfS training for relevant duty holders (i.e. Design Engineers, architects, safety officers/supervisors).
- **Training modules should cover the safety in 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.
- **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.
- **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, HKIE, ICE, IStructE). It is suggested offering relevant DfS training with CPD points to increase the attendance rates in the training.
- **“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.

2.1.2 SWOT Analysis on Current Training Needs

Further to the feedback received from the stakeholders, a SWOT analysis (see in Figure 3) of the training can also gain an overview of the current needs of Design for Safety among the duty holders by assessing internal and external factors that affect the Hong Kong construction industry in terms of promotion of DfS and that allows highlighting its strengths and weaknesses in relation to the opportunities and the threats existing in the industrial environment.

- **Strengths** – The training courses will help the duty holders to gain the DfS knowledge, skills and competencies and ultimately, to achieve changes in behaviour and attitude towards health & safety among the local practitioners.
- **Opportunities** – Based on the stakeholders' feedback, there is a need to train the duty holders for DfS enhancement in the project. To identify hazards and significant risks that can be addressed early in the procurement and design phases / stages saving time and costs than found later. Furthermore, there is a digitisation trend in construction industry which requires the duty holders to have knowledge on the application of technological solutions (i.e. BIM, digital twins, etc.). The templates and tools will be offered to duty holders for future references. Even though the application of DfS management system is on voluntary basis at the current moment, there might be incentives/subsidies to encourage the participation of stakeholders in the future.
- **Weaknesses** – Hong Kong has less experience in providing comprehensive training in terms of Design for Safety, so that it will rely on the feedback of the participants to refine the proposed training programme. On the other hand, it will be difficult to quantify/evaluate the outcomes of the learning results (i.e. safety awareness).
- **Threats** – When preparing the Reference Materials, it is found that there is lack of local case studies/statistics in application of DfS. In addition, there is no existing platform for keeping information / studies in application of DfS and not many organisations would like to spare effort and are willing to share successful examples in local context. It will lead to difficulty in assessing the local applicability of the proposed templates and tools in the future. Furthermore, since there is shortage of experienced trainers in the field of DfS, the number of sessions and the course size will be limited and it may not be able to benefit all interested parties.

Figure 3 SWOT Analysis of DfS training



The courses require to generally cover the purpose of the DfS management system and its requirements from inception to completion following a set of project lifecycle stages, including the lifecycle of the built asset during its ongoing maintenance and operation.

The DfS Designers' course will go through the detail of identifying what are hazards and significant risks, methods and techniques of control, mitigation, reduction and treatment to communicating, consulting, cooperating, coordinating and capturing the relevant information etc.

While the half day DfS Awareness course will focus on the importance and benefits of why the DfS should be applied and utilised across all projects.

Although DfS encourages making design decisions that affect safety early and up front, it is never too late for stakeholders to contribute to DfS. Stakeholders should therefore be reminded that during implementation, operation, maintenance or even decommissioning, one should be conscious of the need to provide feedback to the loop to ensure the DfS system can perform better next time around.

For cases where risks are found to not have been identified or there are obvious gaps in terms of design change control and providing the right information to the right people as required, there should be provisions in the system to facilitate stakeholders to file reports with the aim of providing feedback to the system with a view to continuously improving the system.

2.2 Training Objectives for Different Duty Holders

In general, the training programme aims to help the duty holders:

- Understand the purpose of the Design for Safety (DfS) Framework
- Outline the process of health & safety and provide knowledge about the supporting documentation
- Provide the right information to the right people at the right time in order to achieve good risk management
- Appreciation of using digital technology for information management and visualisation (e.g. 4 Projects, BIM-Revit, etc.)

Typically, the training programme has two distinct target audience.

Management personnel (i.e. who plan, procure, cost, design and specify or arranging for, or instructing, others to do the “designer role”) – The 2-day course aims to –

- Enable designers to recognise the benefits of good procurement, identifying hazards & significant risks and mitigating or at least treating them early
 - Understand the importance of collaborative working to help identify and manage risks
 - Establish whether the Client's existing information is sufficient and what steps are needed to ensure good Pre-Construction Information is gathered for tendering and sharing with the Contractor
 - Understand how important it is to design and specify the right components, materials and products and ensure a design change control process followed will help assist cost certainty
 - Realise by providing the right information to the right people through the project lifecycle stages will help prevent accidents and incidents that would delay the project and increase unnecessary costs
- **General construction personnel (i.e. those who are actively working during construction, operation and maintenance of project cover both Clients and Contractors)** – The half-day course aims to –
- Be able to recognise the purpose and benefits of the Design for Safety Management system and requirements with collaborative working to help identify and manage risks early
 - Understand how important it is to design and specify the right components, materials and products and ensure a design change control process followed will help assist cost certainty

- Realise by providing the right information to the right people through the project lifecycle stages will help prevent accidents and incidents that would delay the project and increase unnecessary costs
- Understand what key areas that Clients, Designers, Contractors and Maintenance Supervisor including the functional role of coordinating DfS should carry out and provide to ensure workers work safely

2.3 Training Materials Resource

The training material has been developed mainly based on the following key resources:

- Guidance Notes of Design for Safety (DevB)
- Worked Examples of Design for Safety (DevB)
- DfS Final Report and Reference Material developed for the Development of Design for Safety Management System and Training Programmes for the Hong Kong Construction Industry (CIC)

The modules have been reviewed with CIC and Taskforce members to ensure they are in line with their expectations.

2.3.1 Guidance Notes of Design for Safety

The training course may reference to the DEVB's publication Guidance Notes of Design for Safety, also reviewing whether any of the case studies and examples could be utilised in conjunction with any modules presented. While explanations with sign posting will be with the presentation slides for train-the-trainer training packs for both training courses developed.

2.3.2 Reference Materials

The Reference Material has been referencing DEVB's DfS framework with the intention of supplementing it with more details, drawing from experiences and practices of CDM in United Kingdom and Design for Safety in Singapore as well as comments received from the stakeholder during the consultation in Stage 3. The key elements of the Reference Materials include:

- Introduction of the Design for Safety Management System
- Outline of construction life cycle
- Workflow and process required in the construction life cycle for the management system
- Roles and responsibilities of the key duty holders, in particular the designer, in the management system framework and their competence requirements
- Application of Design for Safety under different key project stages
- Risk assessment and development of safe design in early design stage
- Information flow i.e. communication and documentation of design and risk control information between different key duty holders
- Relevant legislative requirements
- Checklists, forms, etc. used in the management system framework
- Safe design in practice
- The principal tools used by construction industry to assist the application of Design for Safety
- Case study/good practices sharing/example on the implementation of the developed Design for Safety Management System

2.4 Post-training Evaluation

The post-training evaluation is a crucial part of the training programme since it could provide CIC with an insight from the participants' perspective of what they have acquired through the course and how effective the course is for them. It can also identify the training gaps and even discover opportunities for future training. The proposed evaluation can include but not limited to:

- **Open book multi-choice and written assessment** for each course – The assessment aims to assess the critical application of the course materials. It will test the participants' understanding of what they have learnt and their application of Design for Safety knowledge in the scenarios. The assessment for both the ½ day awareness course and the 2-day DfS Designers Course will contain 10 different multiple-choice questions related to the respective course content.
- **Survey on incentives of DfS implementation** – The actions and incentives for duty-holders to implement and actively practice what they have learned could be further explored after the completion of the training programmes.
- **CIC Feedback forms for both courses** – This can help the project team understand whether the course aim and objectives were achieved, together with what has worked well and needs improving or changing covering course material, venue and the trainers' delivery.

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 / treatment by following the guidelines set out in the framework of Design for Safety and Reference Materials as well.

03

TRAINING PROGRAMME & COURSE CONTENT

3 TRAINING PROGRAMME AND COURSE CONTENT

3.1 Training Programme

There are two types of courses for the proposed training programme: 1) a two-day full course for management personnel, who will perform as designer role, and 2) a half-day course for general construction personnel. The content covers but not limited to:

- 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

The key content as shown in the table below:

#	Required content as per tender document	Relevant topics included in the training programme
1	Principles and intent for implementing Design for Safety	<ul style="list-style-type: none"> • DfS Requirements in Context – Project Life Cycle Stages
2	Design hazards and their significant risks	<ul style="list-style-type: none"> • Design & Construction Health & Safety Lessons learnt from Major Accidents/Incidents & Statistics in HK also Singapore & UK • Identifying Hazard & Risks & Key Topics
3	Design risk analysis and management	<ul style="list-style-type: none"> • Principles of Prevention – ERIC – IERCI & ALARP etc. • DfS Design Risk Management • Working at Height (WAH) with extracts of UK HSE film • Digital Design Engineering
4	Technique for design hazards and risks identification in respect of the construction lifecycle and elimination and / or reduction	<ul style="list-style-type: none"> • DfS Case Studies • Syndicate Exercises
5	Ways to conduct effective Design for Safety reviews	<ul style="list-style-type: none"> • Client Strategy Brief • Pre-Construction Information • DfS Case Studies • Syndicate Exercises
6	Application of the Design for Safety Management System	<ul style="list-style-type: none"> • DfS Requirements in Context – Project Life Cycle Stages

#	Required content as per tender document	Relevant topics included in the training programme
7	Reference material on the Design for Safety Management System	<ul style="list-style-type: none"> • Client Strategy Brief • Pre-Construction Information
8	Roles and responsibilities of different key duty holders, in particular the designer, in the management system framework, and expectation on them	<ul style="list-style-type: none"> • DfS Roles & Responsibilities • DfS Competence Skills, Knowledge and Experience

3.2 Syllabus for the Training Courses

The syllabus is prepared to help the participants to better understand the purpose of the Design for Safety (DfS) Framework, have the knowledge of the construction life cycle and consideration of the impact on asset lifecycle with an outline of the supporting documentation, and acknowledge the importance of the right information to the right people at the right time to achieve good risk management.

3.2.1 Syllabus for 16-hour DfS Designers Course for Management Personnel

Day 1

Kick-off Ceremony for the CIC DfS Course:

- Welcome | Opening | Keynote Speeches for the DfS Course

Part I: DfS Introduction, Requirements, Roles and Responsibilities

- Introduction, Aims & Objectives
- Design & Construction Health & Safety Lessons learnt from Major Accidents/Incidents & Statistics in HK also Singapore & UK
- DfS Requirements in Context – Project Life Cycle Stages
- DfS Roles & Responsibilities
- DfS Competence Skills, Knowledge and Experience

Part II: Client Strategy Brief, Pre-Construction Information, Hazards and Risks

- Client Strategy Brief
- Pre-Construction Information (PCI)
- Identifying Hazard & Risks & Key Topics
- Review of today – Day One

Day 2

Part III: Principles of Prevention and Design Risk Management (DRM)

- Principles of Prevention – ERIC – IERCI & ALARP etc.
- DfS Design Risk Management
- Working at Height (WAH)

Part IV: Case Studies, Syndicate Exercises, Digital Design & Engineering

- DfS Case Studies
- Syndicate Exercises
- Digital Design Engineering

Part V: Course Summary and Assessment

- Q&A, Assessment and Summary & Closing

3.2.2 Syllabus for 4-hour DfS Awareness Course for General Construction Personnel

Day 1 (AM)

Kick-off Ceremony for the CIC DfS Course:

- Welcome | Opening | Keynote Speeches for the DfS Course

Master Class for General Construction Personnel

- Introduction, Aims & Objectives
- Design & Construction Health & Safety Lessons learnt from Major Accidents/Incidents & Statistics in HK also Singapore & UK
- DfS Requirements in Context – Project Life Cycle Stages
- DfS Roles & Responsibilities
- DfS Competence Skills, Knowledge and Experience

Course Assessment

- Course assessment, Q&A, Summary & End of Close

3.3 Training Materials

We have and are collating a library of innovative training materials and supporting tools, including use of films to enable visualisation, discussions and input from delegates for the appointed trainers to utilise in delivery of these courses to create both technical and engaging behaviour based face-to-face or virtual learning. Therefore, help inspire the delegates and drive change, by providing a cohesive range of experiential learning tools supported by a passionate Arcadis HK team.

The Arcadis team have obtained and utilised some training material used on UK accredited seminars and courses delivered via IIRSM, APS and CIOB covering Design Risk Management, Building Safety, Principal Designer, Fundamentals of CDM 15 and CDM15 for Clients.

While the contents particularly of the two-day DfS Designers course will be capturing relevant and important examples and information such as data, methodology and templates from previously released industry research papers and the latest industry reports and guidance such as those listed below, which is not exhaustive.

Accident & incident data from HK DEVB, Workplace Safety & Health (WSH) / Ministry of Manpower (MoM) SGB & HSE UK <https://www.hse.gov.uk/statistics/>;

Strategy brief, survey schedule, gateways and programme working with HSE's CONIAN KPWC, BIM4 WK Groups, RIBA, CIOB & IIRSM Seminars.

Integrated gateways: planning out health & safety risk prepared by Glasgow Caledonian University for the HSE 2004 <https://www.hse.gov.uk/research/rrpdf/rr263.pdf>; .

RIBA Plan of Work covering various strategies. <https://www.architecture.com/knowledge-and-resources/resources-landing-page/riba-plan-of-work>;

ICE Guidance for design risk management <https://myice.ice.org.uk/getattachment/knowledge-and-resources/best-practice/design-risk-management/DRM-Guidance-Version-2-March-2020.pdf.aspx>;

Case study extracts from live or recent projects in UK and Hong Kong.

3.4 Train-the-Trainer

Train the Trainer is preferably a face-to-face course for experienced trainers who will be delivering the Design for Safety courses – 2 days DfS Designers' course and half a day DfS Awareness Course for training the local practitioners (i.e. designers, engineers, contractors' workers, maintenance staff, etc.) for enhancement of Design for Safety.

Eligible participants

Participants will be CIC's designated trainers/tutors who have previous training experiences in the construction industry and they learn how to deliver and run training sessions, observe teaching and provide feedback. The participants who successfully complete the *Train the Trainer* course and will be monitored during the 2 x 4 hour sessions, regarding in their contribution and input i.e. attitudes and behaviours partially during the exercise scenarios and case studies and be required to pass the final assessment will be considered eligible and approved to train the future attendees in the DfS courses.

Objectives of *Train the Trainer* training

This training is made up of 2 x 4 hour sessions totalling up to 8 hours guided learning hours with the primary aim of developing the potential trainers' ability to deliver productive Design for Safety courses. To achieve this, the training will cover all the key training content & materials required in the Designer's course and awareness course, the essential training skills and promote a clear understanding of how to teach effectively, ensuring the delegates/participants have a good understanding of the training content & materials and to get well-equipped to deliver quality training sessions that will draw out the best input and get the best results from the DfS courses participants.

Key benefits of *Train the Trainer* course

- It will enhance and develop the participants' knowledge of DfS and enhance the overall level of understanding and practices in Hong Kong construction industry
- It will help the participants deliver engaging, learner-focused training, to fully maximise the potential of the DfS training materials
- Participants can complete the course in 2 x 4 guided learning hours.

Train the Trainer Kit

Train the Trainer Kit will be included in Design for Safety Training pack, which is to be approved by CIC Hong Kong. It serves as a guide to DfS courses trainer on how to use the training material/deliver the training course in an interactive way. It includes a training guide with a complete package of training materials

Assessment

After completion of the *Train the Trainer* course, the nominated tutors/trainers will be taking a multi-choice answer and written paper test to demonstrate their learning and understanding. They will be awarded either a pass or fail with comments and feedback.

04

EXPECTED LEARNING OUTCOMES

4 EXPECTED LEARNING OUTCOMES

The training programme of Design for Safety is an integral and stated part of the educational program for local practitioners who will participate in the construction projects. It has clearly defined the learning goals and expected outcomes which are regularly reviewed by CIC. The Council has comprehensive responsibility for major programmatic changes and the way of evaluation and assessment in order to optimise the learning outcomes.

- **Goal 1:** To strengthen the education on ethics/attitudes/behaviours for stakeholders.
Expected outcomes: In their positions, duty holders can exhibit their accountability and respect for their role of health & safety.
- **Goal 2:** To apply the principles of Design for Safety under different key project stages
Expected outcomes: The duty holders can have knowledge of the key areas that need to be reviewed across the construction life cycle.
- **Goal 3:** To get familiar with the templates/tools to complete risk assessment in early design stage
Expected outcomes: The duty holders can use the appropriate documentation of Design for Safety to track identified hazards and their associated residual significant risks.
- **Goal 4:** To utilise visualisation and digital tools on safe design
Expected outcomes: The duty holders can demonstrate through their work, the specific skills of digitalisation to enhance the construction and building safety.

05

KEY COMMENTS & FEEDBACKS FROM PARTICIPANTS

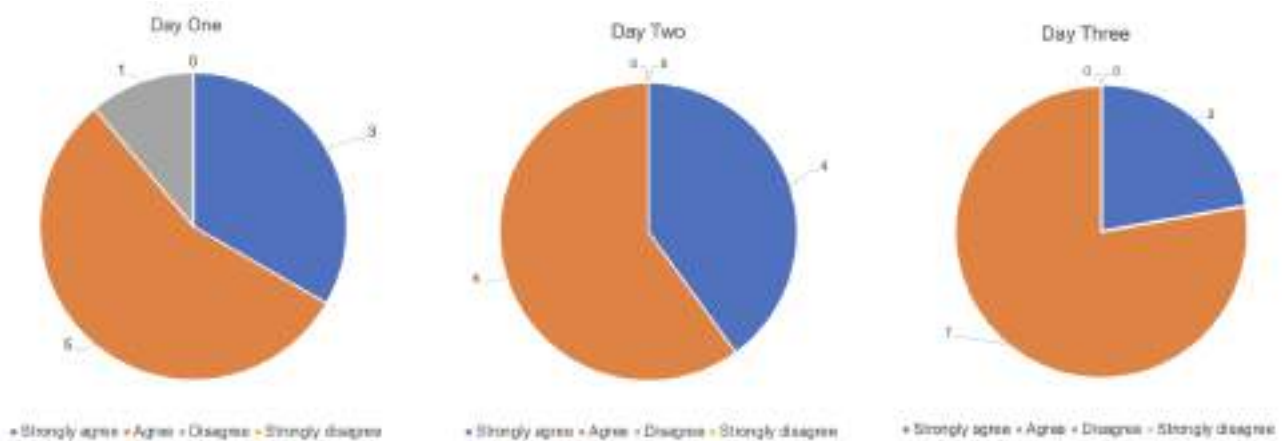
5 KEY COMMENTS & FEEDBACKS FROM PARTICIPANTS

Followings are the comments and feedback collected from the participants of the Masterclass in April 2023. At the end of each training session, participants were asked by CIC to help fill in a course evaluation survey and provide feedbacks that are considered constructive and highly valued for future actions. The survey questions aim to address issues related to course content, instructors, and the connection of course materials with real-life situations. The key findings include:

- **2.5-Day Course for Management Personnel**

- Course content – Participants’ satisfaction on overall programme contents and design

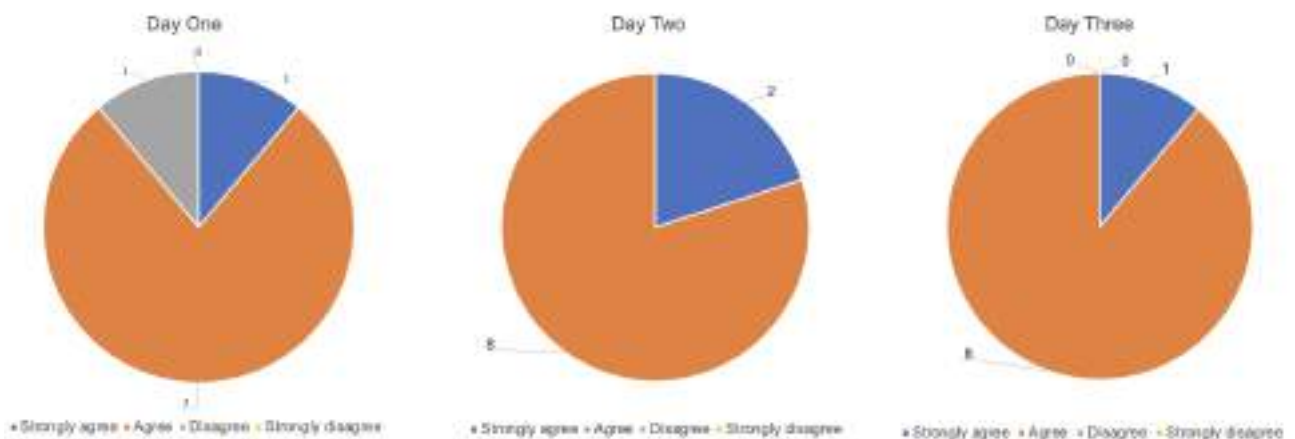
Figure 4 Participants’ satisfaction on overall programme contents and design (Management Personnel)



On the first day of the Masterclass, around 88.9% of the participants expressed their overall satisfaction towards the programme design and course content, among which 60% strongly agreed on the effective course design, while 1 participant found it less effective and needed to be improved. On the 2nd and 3rd day of the course, 100% of the participants were satisfied with the course content after expanding on course materials and performing more depth on course content with interactive group discussions.

- Instructor-related evaluation – Participants’ satisfaction on overall performance of teaching

Figure 5 Participants’ satisfaction on overall performance of teaching (Management Personnel)

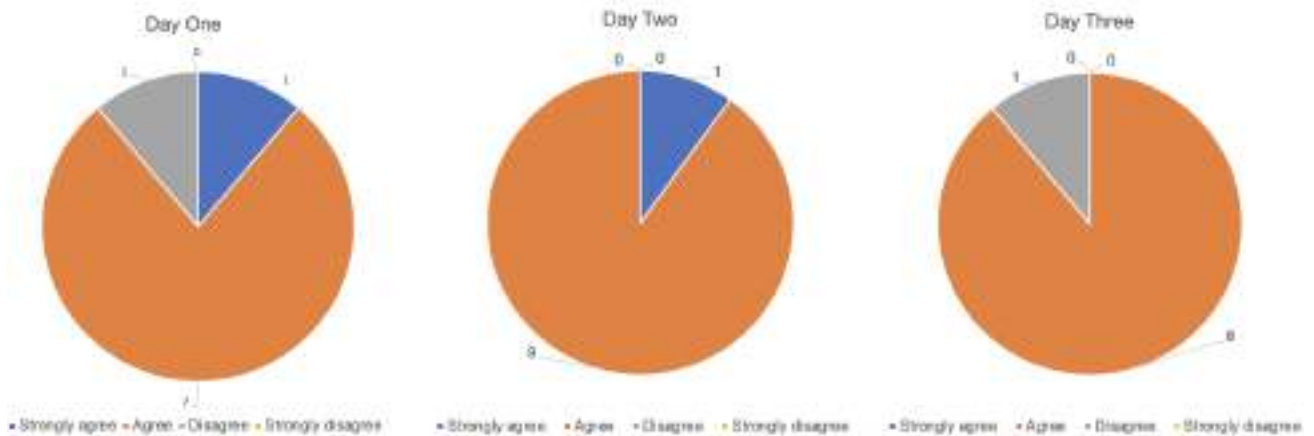


In terms of trainer satisfaction, around 88.9% of the participants were satisfied with the trainer’s performance which might be influenced by some key factors, such as teacher’s competence, pedagogy used, responses to students’ questions and so on. There was one participant provided negative feedback on teaching performance. On the 2nd and 3rd day of

the course, however, 100% of the participants have shown their positive and supportive attitudes towards the trainer's performance, especially with integration of more syndicate exercises and enhanced communication between the trainer and the trainees.

- o Connection with real-life situations

Figure 6 Connection with real-life situations (Management Personnel)

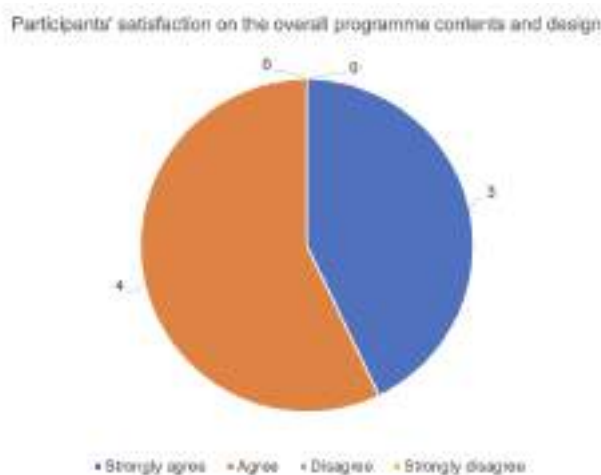


One of the key objectives of this DfS Masterclass is to promote the adoption and implementation of DfS in real-life projects. Overall, most participants tended to agree rather than disagree with the statement on the construction health & safety and DfS requirements that were useful and closely related to what they were performing in their real projects. There were still negative feedbacks on Day One and Day Three as the participant might have difficulty understanding the DfS framework, process flow, and digital engineering, especially if he/she did not recognise the concept of DfS, how the DfS being implemented and the trends that could impact their work.

- **Half-Day Awareness Course for General Construction Personnel**

- o Course content – Participants' satisfaction on overall programme contents and design

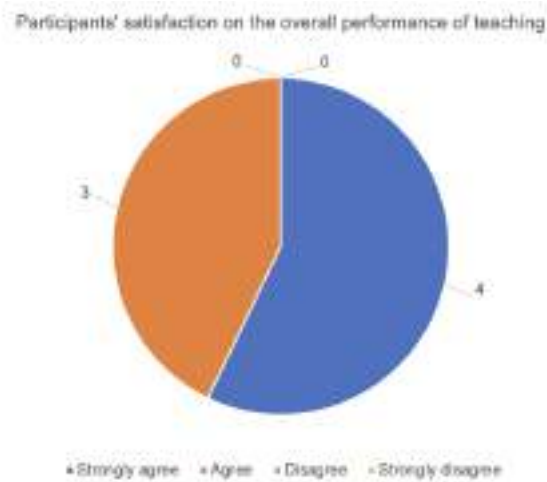
Figure 7 Participants' satisfaction on overall programme contents and design (General Construction Personnel)



The overall feedback on the programme contents and design was relatively positive as most participants agreed on the clarity of course design, interactions with the trainer and active discussion among the participants that have significantly influenced their satisfaction and attitudes.

- Instructor-related evaluation – Participants’ satisfaction on overall performance of teaching

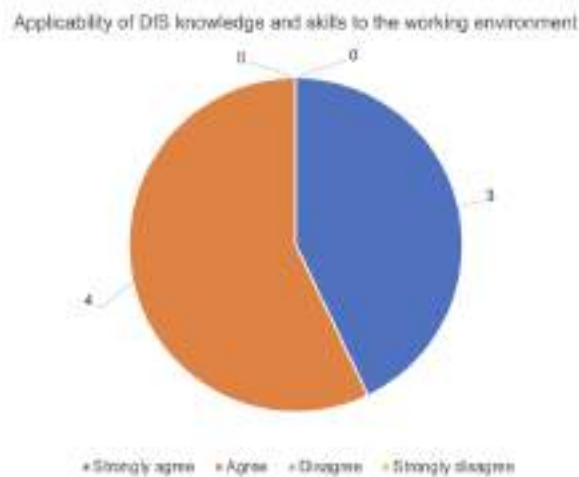
Figure 8 Participants’ satisfaction on overall performance of teaching (General Construction Personnel)



The figure above suggests that the participant’s satisfaction level on the overall performance of teaching was relatively high. The teaching effectiveness can be seen from how the trainer planned, implemented, and evaluated the DfS learning during the course. Around 57% of the participants strongly agreed on the effective teaching methodology that helped them to identify significant hazards across project lifecycles and develop problem-solving strategies in hands-on practices.

- **Connection with real-life situations**

Figure 9 Applicability of DfS knowledge and skills to the working environment



All participants agreed that the DfS knowledge and skills were relevant to the working environment. They were more engaged in the classroom when diving into the syndicate exercises with sample projects and recognised how the DfS documentation was relevant to the real-life situation around them.

- **Other key comments from participants**

	Course Content and Structure	Course Delivery and Logistics
Areas of Satisfaction	<ul style="list-style-type: none"> • Rich and broad coverage of DfS content • Clear definition and explanation of DfS concept • Well-organised course structure • Good coverage of topics on the subject • Useful references from guest speakers' presentations (e.g., temporary works management) • Clear demarcation of roles and responsibilities (e.g., safety is not solely the Main Contractor's responsibility but the whole project team including Client and Designer) • Well-organised methodology on course assessment • Useful sharing of case studies and videos for illustration 	<ul style="list-style-type: none"> • Concise and clear teaching methodology • Overall comfort of the lecture venue • Photo taking sessions after distribution of certificates • Provision of food and beverage
Areas of Improvement	<ul style="list-style-type: none"> • More case studies related to the Hong Kong construction industry 	<ul style="list-style-type: none"> • More guidance to be provided by the trainer to help participants discuss the case studies and present their ideas in front of the class • Time management during the course • Small font size in handouts • Distribution of certificates during the class is not necessary

Overall, the project team has noted the key comments received during the course and will work towards the areas of improvement and maintaining the areas of satisfaction.

06

NEXT STEPS

6 NEXT STEPS

To facilitate the future training on Design for Safety, Arcadis has developed the training materials including 1) DfS Masterclass presentation deck, 2) independent modules on key topics under DfS, and 3) a standalone “Train-the-Trainer kit” to support the different duty holders who coordinate DfS across the project life cycle.

Going forward as next step, Arcadis has refined the course materials to –

- Reflect greater relevance to Hong Kong by incorporating more local case studies*
Note: The training materials conclude with some example cases in Hong Kong that have reflected on the different types of contracts and offered practical direction for attaining an in-depth understanding of how DfS has been implemented by duty holders and acknowledging the importance of DfS throughout the project lifecycle. While they do possess clear limitations, such as the difficulty of generalizing findings from one case study to other settings, potential risks of bias, etc. Therefore, this should be supplemented by trainers drawing experience of past projects when delivering the courses.
- Support the future trainer by developing the Train-the-Trainer Kit.
- Review the overall time needed for course delivery.

This Final Report with the detailed training programme and course materials will be shared with CIC and Task force for comments. Upon the completion and approval of Phase 2 Final Report and the training programme and course materials, a draft report will be developed with executive summary to outline the works that have been carried out so far and the impactful achievements that have been made.



07

REFERENCE

7 REFERENCE

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Occupational Safety and Health Council. (2021). Occupational Safety and Health Management Courses. Design for Safety Workshop for Construction Industry. [Online] available at <https://eform.oshc.org.hk/course/eng/course/CourseDetail.asp?Could=586>

Association of Project Safety (APS) Principal Designer (2 Day) and CDM2015 for Clients (1 day) virtual and face to face courses available via <https://www.aps.org.uk/membership/accredited-courses>

Chartered Institute of Building (CIOB) Academy have three related virtual courses available via

CDM15 Principal Designer - CIOB Academy

Fundamentals of CDM Regulations 2015 - CIOB Academy

30-20-10 CDM: Managing Health and Safety - CIOB Academy

Institute of Risk Safety Management (IIRSM) (2022). CDM and Building Safety - An Evolving Picture virtual and face to face course available via <https://www.iirms.org/events/cdm-and-building-safety-evolving-picture>;

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