HDB
Design for Safety (DfS) Framework



15 Aug 2017

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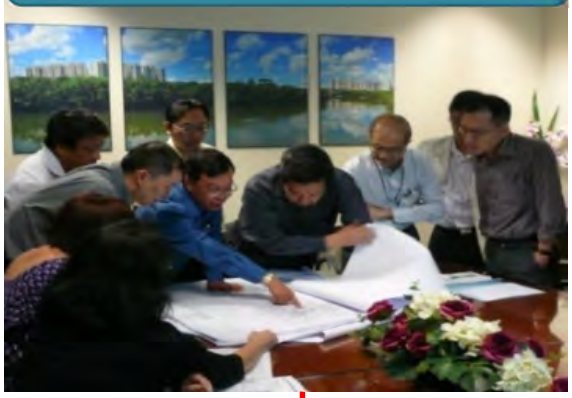
Housing & Development Board

Outline

- DfS Considerations in HDB Projects
- HDB DfS Framework
- DfS Register
- Observations From Past Projects
- DfS Good Practices

WSH(DfS) Regulations Duty Holders

Developer



Designer



Contractor



Role & Responsibilities of Developer

- Eliminate or reduce foreseeable design risks
- Hire competent personnel to perform duties
- Provide relevant information to designers and contractors
- Allocate sufficient time & resources
- Convene DfS review meetings
- Record and maintain DfS Register

Lead Consultant or DfSP



DfS Considerations in HDB Projects



Cast-In Pipe Sleeve @ Column Stump



Provision of cast-in pipe sleeve at column stump for the safe installation of gondola

Steps with Handrails for Safe Access



Provision of steps with handrail at locations with pipes for safe access

Vertical Ladder With Safety Cage



Provision of safety cage for vertical ladder exceeding 3m

Cat Walk @ Water Tank Roof



Provision of cat walk for safe access at water tank roof

Life Line @ MSCP Roof Shelter



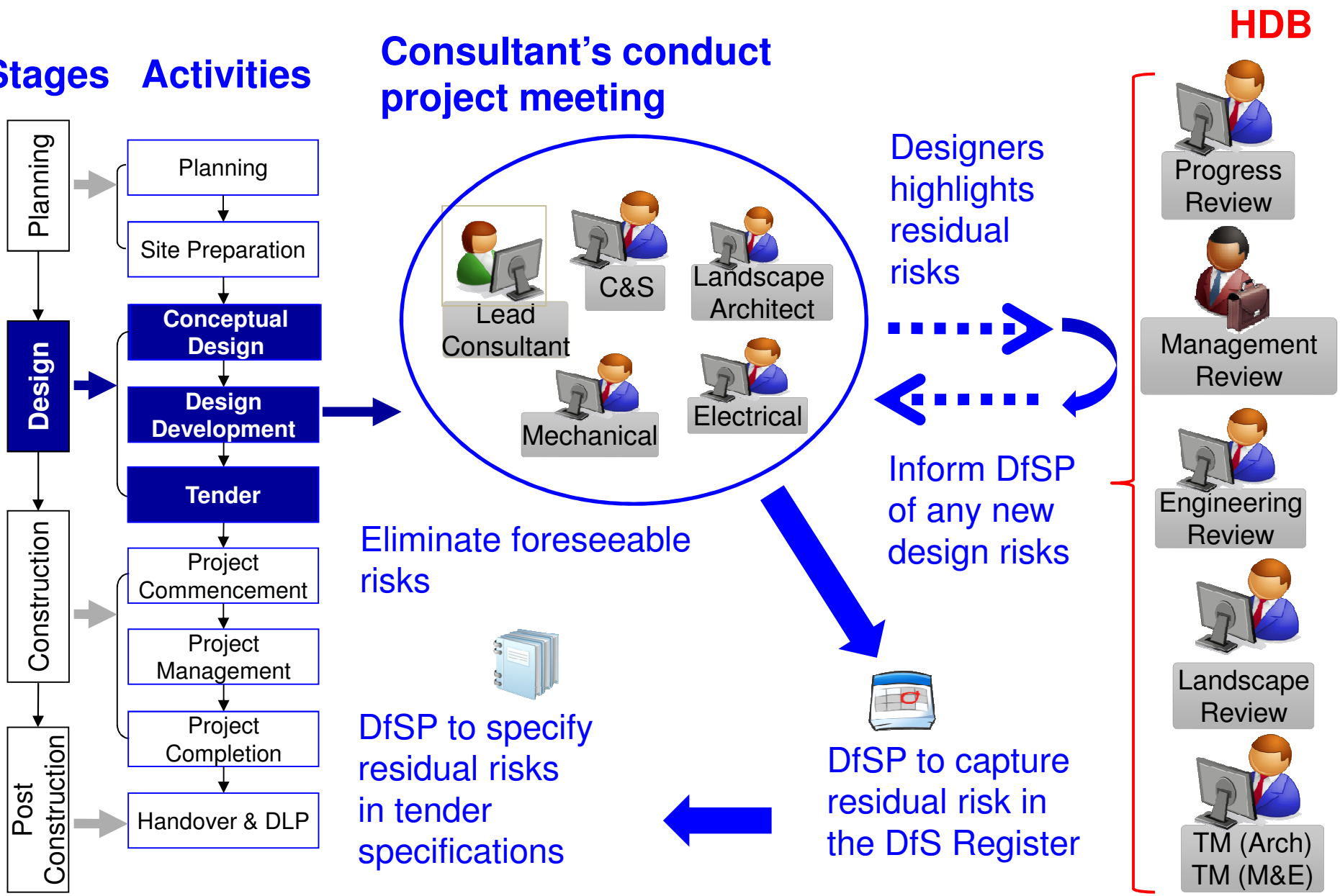


Provision of life line for anchorage of safety harness

HDB DfS Framework

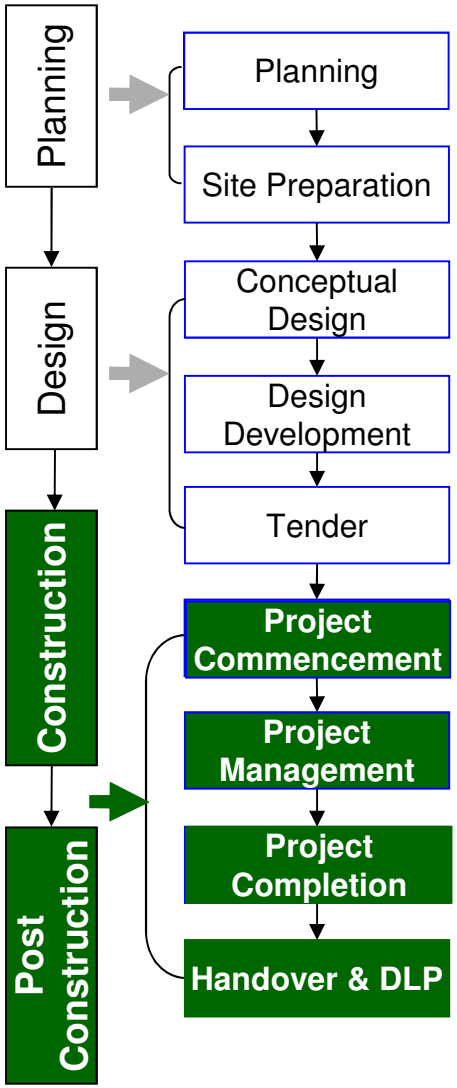


Design Stage: Review Process

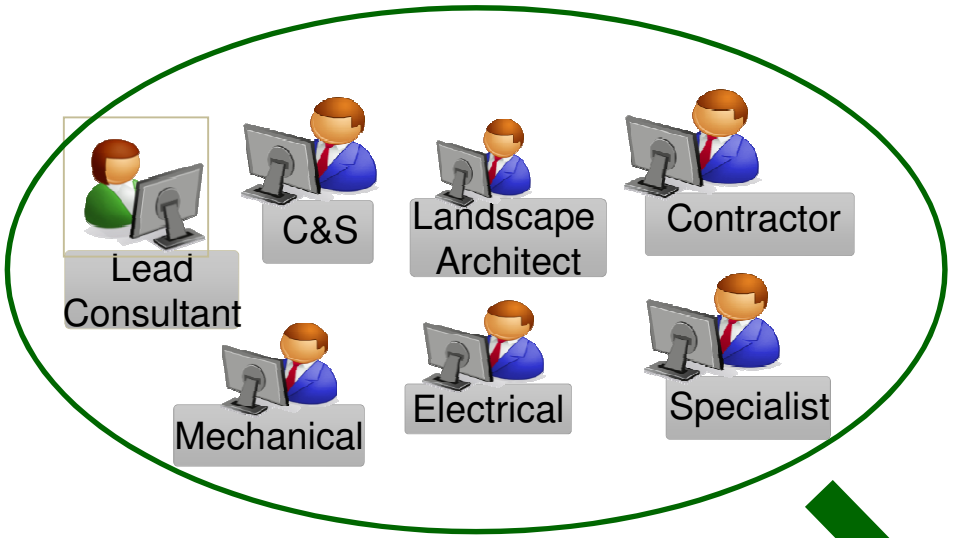


Construction Stage: DfS Review Meetings

Stages Activities



Project Site



DfSP to convene DfS review meetings at project site meeting.

Identify new design risks arising from design modification, temporary / specialist works, etc.



DfSP to brief TC and handover DfS Register to them upon completion of buildings.

DfSP to capture residual risk in the DfS Register.

Role and Responsibilities of DfSP

I/C: HDB Project Coordinator

Design & Tender Stage

- Convene DfS review meetings
- Capture residual risks in Risk Register
- Highlight residual risks in HDB Review meetings
- Specify key residual risks in Specifications

I/C: HDB Project Director

Construction & Handover Stage

- Convene DfS review meetings
- Brief Managing Agent & handover DfS Register

Example – Excavation Next To Slope





Hazard:
Soil erosion during excavation of trenches.

Control Measures: PE to check for slope stability and design shoring for the excavation.

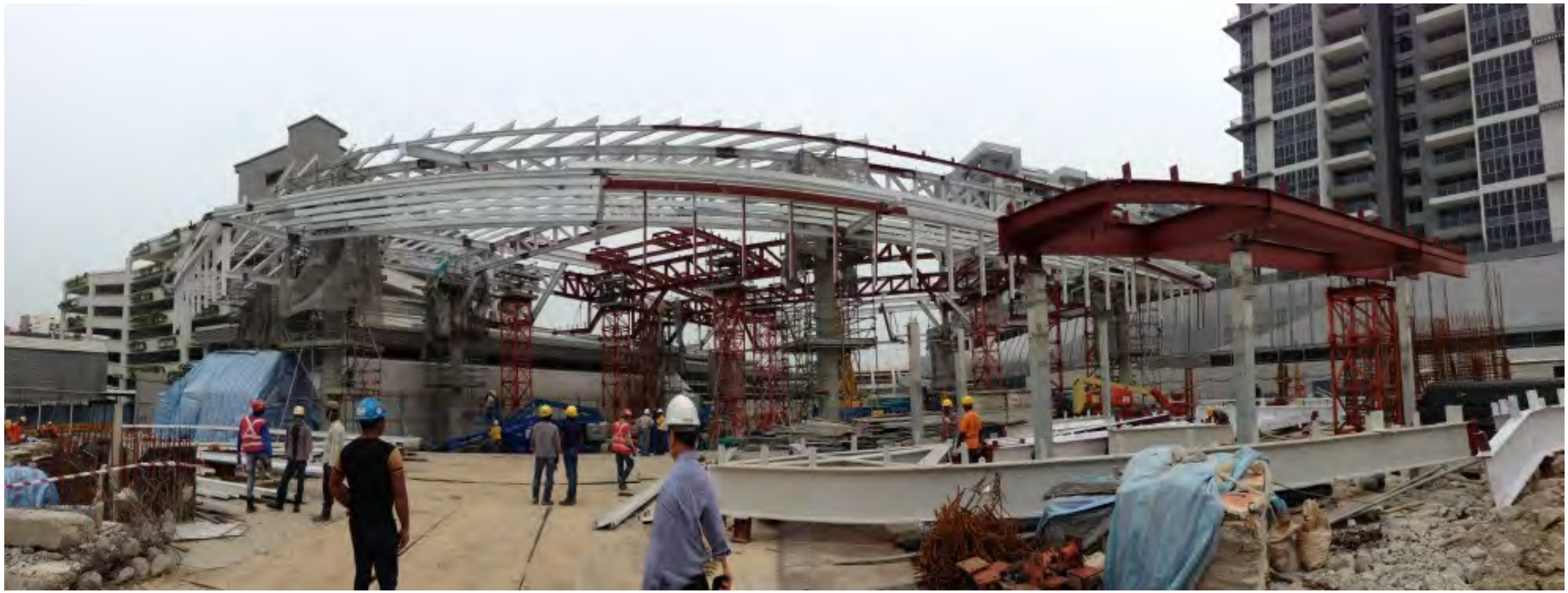
Example – Temporary Shoring



Hazard:
Soil on neighboring site collapsed onto building site.

Control Measures:
PE to design retaining wall to resist the lateral forces.

Example – Installation of Roof Structure



Hazard:

Column failed under the load of steel structure

Control Measures:

PE to design the steel structure and check the column design.

DfS Register



Registration of Project Details



Register DFS Professional

Create New Dfs Professional Record

NRIC	:	Search
Name	:	
Company	:	
Project	:	- Please select one -
Contact	:	
Email	:	
Certificate	:	Browse...
Form	:	Browse...
Others	:	Browse...

- DfSP to access the BG portal using SingPass
- DfSP to register all the project team members.

Creation of DfS Register



Create Risk Register

Dfs Register Details

Project Milestones :

GUIDE 1

Project Name :

Sembawang N1C1

- DfSP to create Risk Register for project

Identify Hazards & Determine Risk Level

Create Risk Register

Create Risk Register

Project Milestones :
GUIDE 1
Project Name :
Sembawang N1C1
Lead Consultant Name :
Dfs Professional Name :
Status : **Version :**
DRAFT 1.1

Likelihood / Severity	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost Certain (5)
Castastrophic (5)	5	10	15	20	25
Major (4)	4	8	12	16	20
Moderate (3)	3	6	9	12	15
Minor (2)	2	4	6	8	10
Negligible (1)	1	2	3	4	5

Consideration Classification :
- Please select one -

Design Consideration :

Risk :
- Please select one -

Hazards Identified :
- Please select one -

Risk Assessment

Risk Level :

Can hazards be designed out :
- Please select one -

- Identify hazards and the associated risks
- Calculate the risk level

Propose Control Measures & Determine Risk Level

Likelihood / Severity	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost Certain (5)
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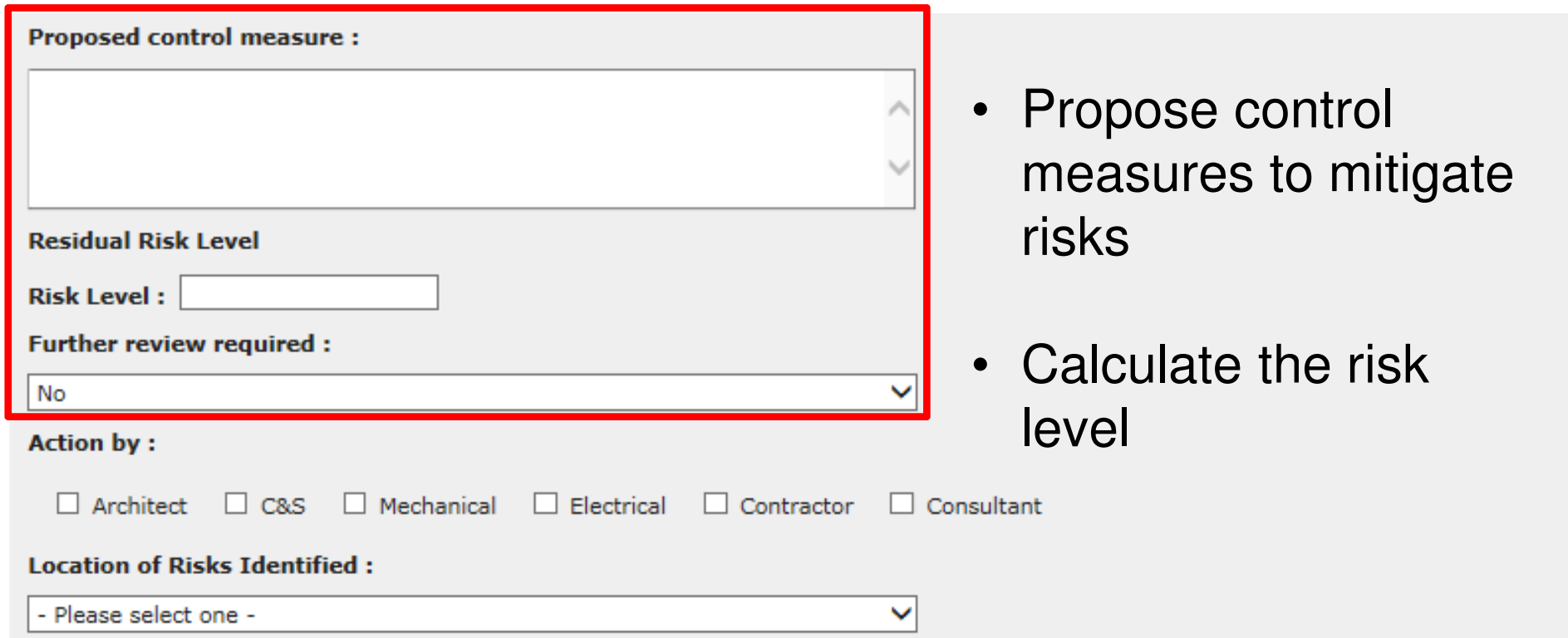
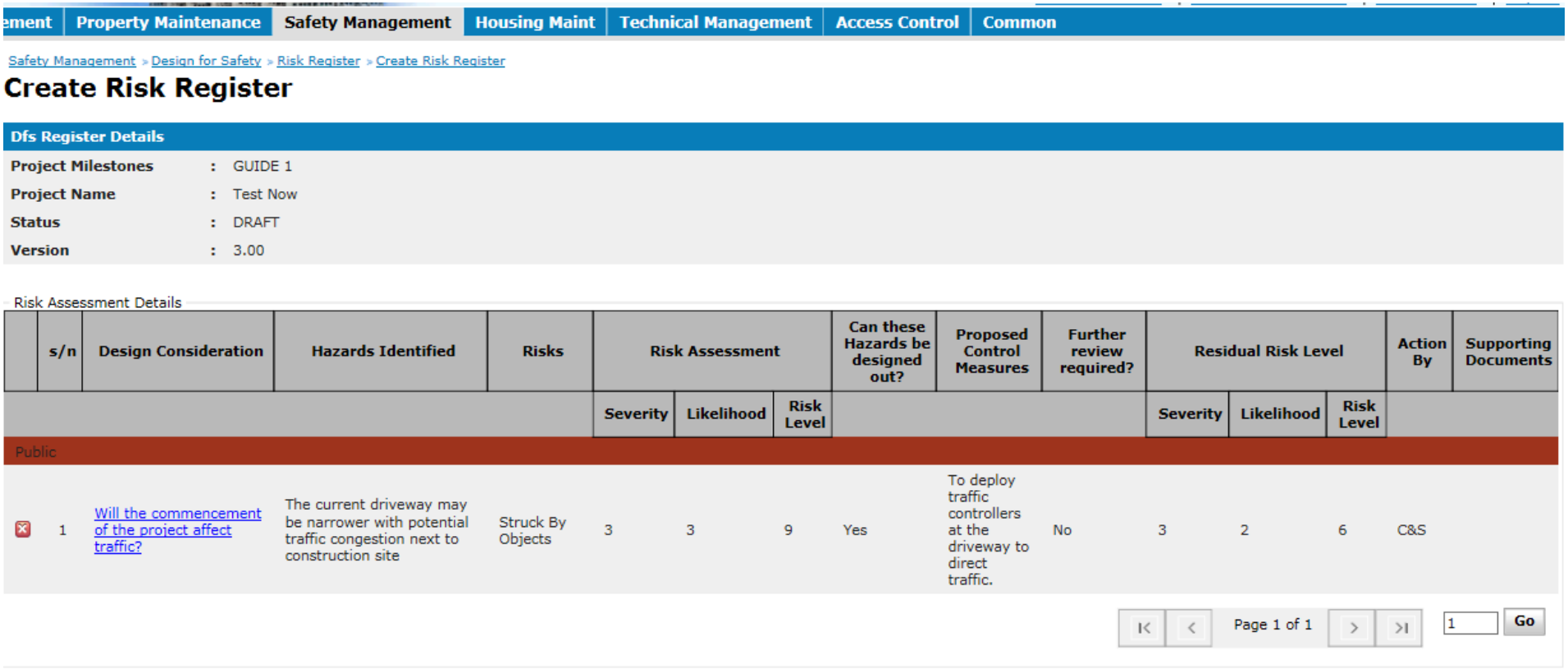


- Propose control measures to mitigate risks
- Calculate the risk level

Preview of DfS Register



ement | Property Maintenance | Safety Management | Housing Maint | Technical Management | Access Control | Common

Safety Management » Design for Safety » Risk Register » Create Risk Register

Create Risk Register

Dfs Register Details

Project Milestones	:	GUIDE 1
Project Name	:	Test Now
Status	:	DRAFT
Version	:	3.00

Risk Assessment Details

	s/n	Design Consideration	Hazards Identified	Risks	Risk Assessment			Can these Hazards be designed out?	Proposed Control Measures	Further review required?	Residual Risk Level			Action By	Supporting Documents
					Severity	Likelihood	Risk Level				Severity	Likelihood	Risk Level		
Public															
	1	Will the commencement of the project affect traffic?	The current driveway may be narrower with potential traffic congestion next to construction site	Struck By Objects	3	3	9	Yes	To deploy traffic controllers at the driveway to direct traffic.	No	3	2	6	C&S	

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- DfS Professional save document before proceeding to the next entry of hazard identification

DfS Register

- DfS Register can only be created and updated by DfSP.
- Project team members are allowed to view the DfS Register under their own project.
- Training will be provided for the Lead Consultant / DfSP on the use of DfS Register in Aug/Sep 2017.
- DfS Register will be launched in Oct/Nov 2017.

Observations From Past DfS Projects



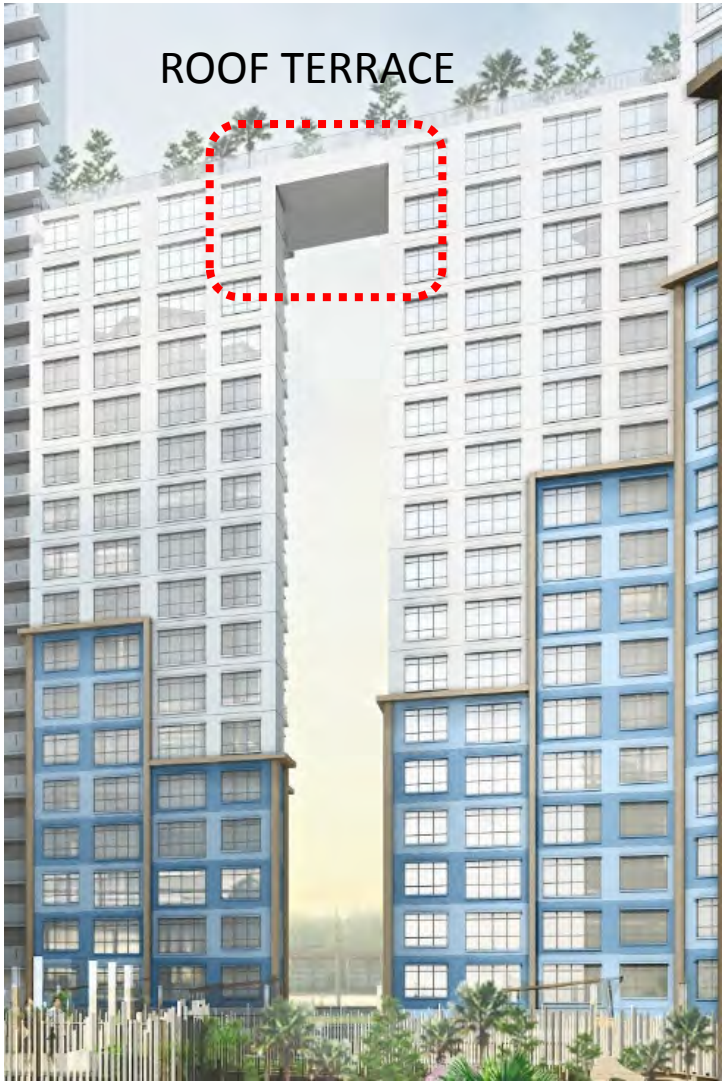
Observations

- Proposed to adopt non-standard HDB features to mitigate the risks (e.g. specify gondola rails)

- Highlighted control measures that are already specified in HDB Standard Specifications. (e.g. specify the capacity of tower crane)

- Included the entire DfS Register in the Supplementary Specifications

Safe Maintenance of High Void Area





- Designer proposed to install gondola rail for workers carrying out maintenance works.
- For non-standard HDB features, designer to seek HDB review panel for endorsement.

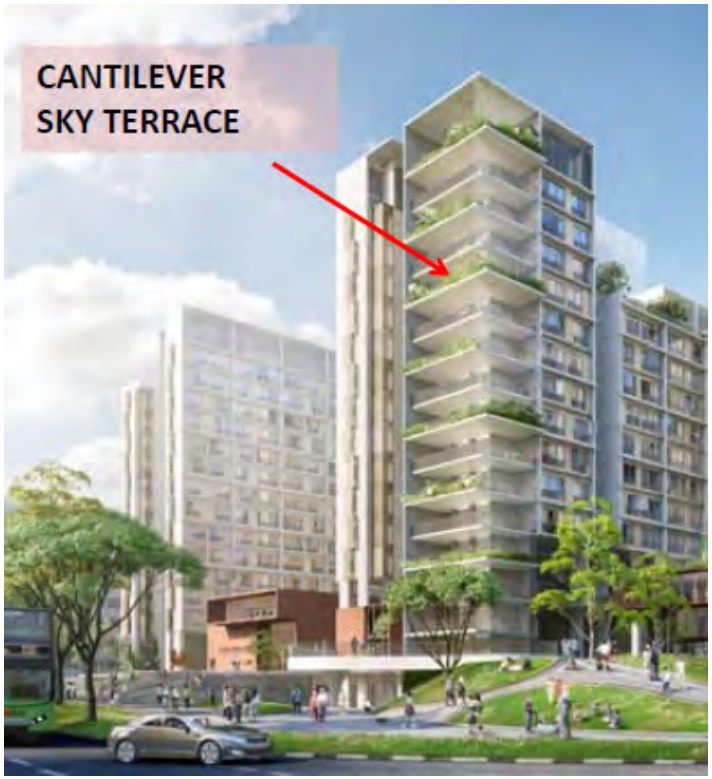
DfS Register in Tender Specifications

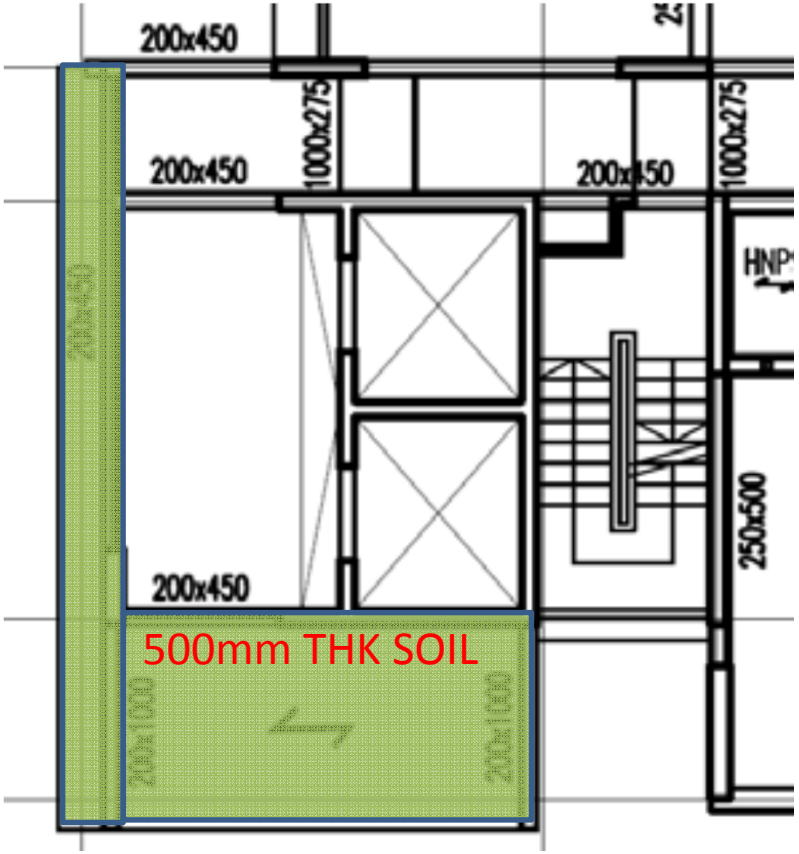
S/No	Design Consideration	Hazards Identified	Risks	Risk Assessment			Can these hazards be designed off?	Proposed control measures	Residual Risk Level			Further review required?	Action by
				Severity	Likelihood	Risk level			Severity	Likelihood	Risk level		
(D) Civil and Structural Works													
1	Construction of Cantilever Sky Terrence	Workers working at the building edge; Equipment falling from height	Falling from height; Hit by falling object	5	4	20	Yes	Propping is required to allow the precast beam and the precast slab planter to be constructed. Contractor's PE to design a robust temporary propping for constructing the cantilever sky terrace. The design and a comprehensive method statement of the construction to be submitted for QP(C&S) for review prior to construction.	5	2	10	Review in GUIDE 3	QP(C&S); Contractor
2	350mm retaining wall next to Bedok Mall	Pedestrians/ Maintenance workers falling off edge of wall	Falling from height; Injury	3	2	9	Yes	The height of the retaining wall is around 5m. A railing to be erected on top on the retaining wall to prevent people from falling from height.	3	1	3	Include in Design	QP(A); QP(C&S)
3	Precast Roof Screen Wall	Workers working at the building edge; Equipment falling from height	Falling from height; Hit by falling object	5	4	20	Yes	The screen wall, located at the edge of the building, consists of a 3.5m fin wall, and an overhanging ledge at the top. Anchoring points for maintenance gondola to be designed and affixed to the ledge. Contractor to propose sequence and safe method of installation for erecting the screen wall.	5	2	10	Include in design; Review in GUIDE 3	QP(C&S); Contractor
4	Construction of 5m wall on top of roof	Workers working at the building edge; Equipment falling from height	Falling from height; Hit by falling object	5	4	20	Yes	The scaffolding for casting the intermediate beam may obstruct the erection of the top wall panel. QP(C&S) has reviewed and reduced the wall panel size to about 2m wide so as to ease the erection process and minimise the risk associated with handling large pieces of wall panel at height. Contractor to propose the sequence and method for the erection of the wall for review by QP(C&S).	5	2	8	Include in design; Review in GUIDE 3	QP(C&S); Contractor;

Good DfS Practices



Example – Cantilever Sky Terrace



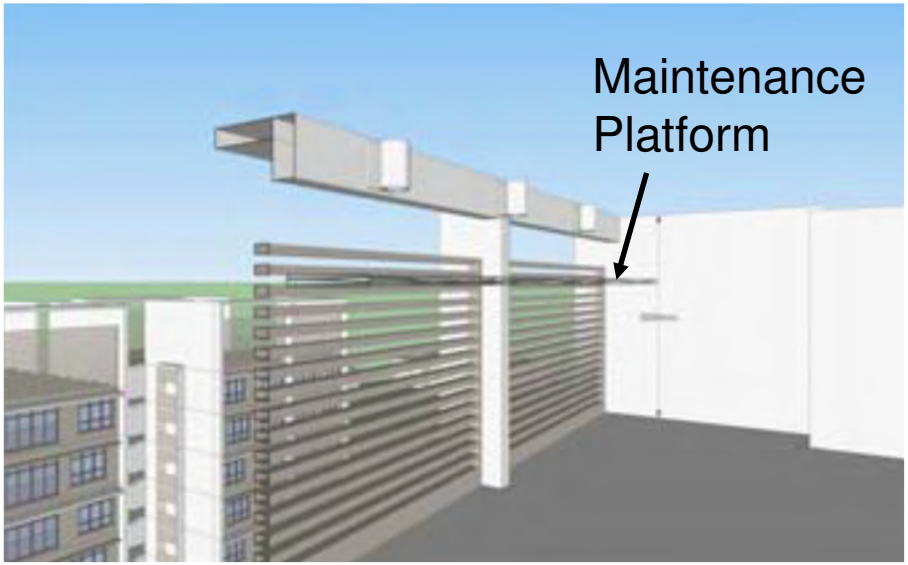


PRECAST BEAM WITH KERB AND PRECAST PLANTER SLAB

Hazard: Cantilever structure may collapsed during construction.

Control Measures: Contractor's PE to design a temporary propping for constructing the cantilever sky terrace. Comprehensive method statement for the construction to be submitted to QP(C&S) prior to construction.

Example – Roof Screen Wall

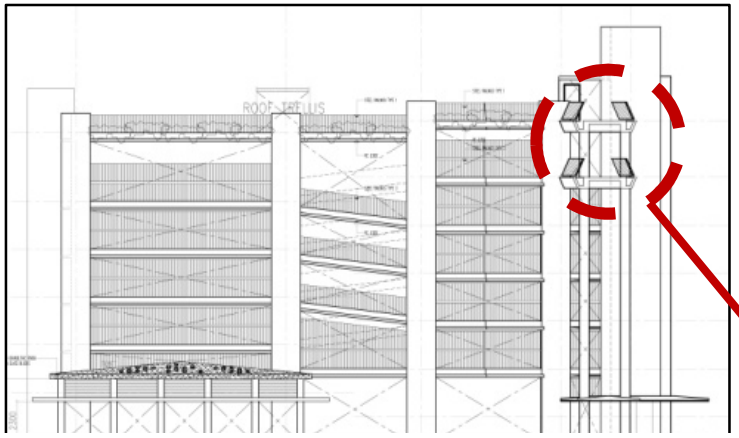




Hazard: Workers working at the edge of building may fall from height when erecting the screen wall.

Control Measures: The screen wall, located at the edge of the building, consists of a 3.5m high fin wall and an overhanging ledge at the top. Proposed contractor to work out the method and sequence for safe installation of the screen wall.

Example – Link Bridge



Elevation of MSCP and sectional view of link bridge



Hazard: Elevated link bridge connecting residential blocks and MSCP – maintenance worker is at risks of falling from height during replacement of light fittings if they are located at height.

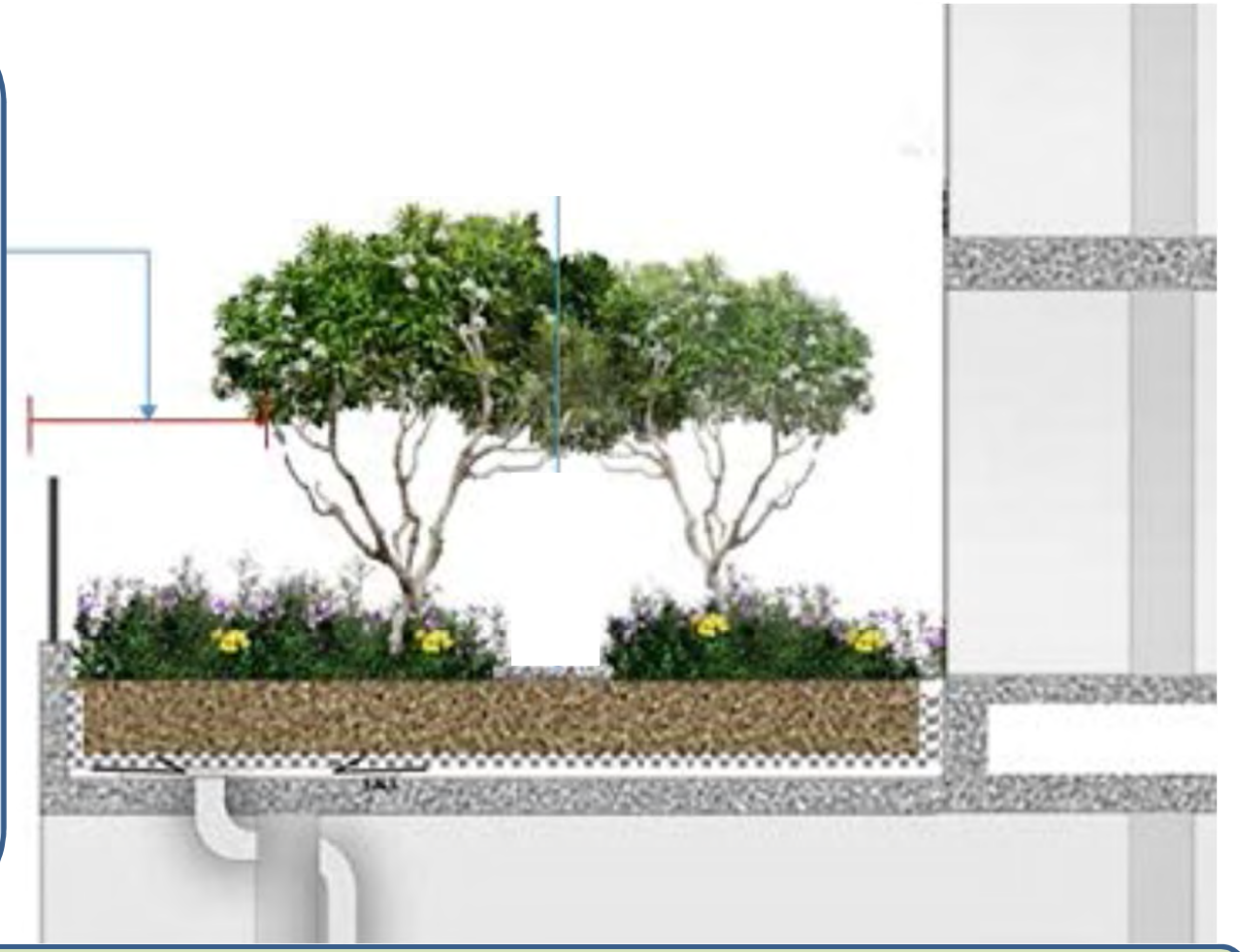
Control Measures: To propose the lightings to be located at low level, within reach for workers to carry out maintenance works.

Example – Maintenance of trees @ Sky Terrace

Control Measures:

(a) To locate the trees away from the edge of building by providing sufficient set back distance. Railings to be installed near the edge.

(a) To select full-grown height for trees of not more than 2m.



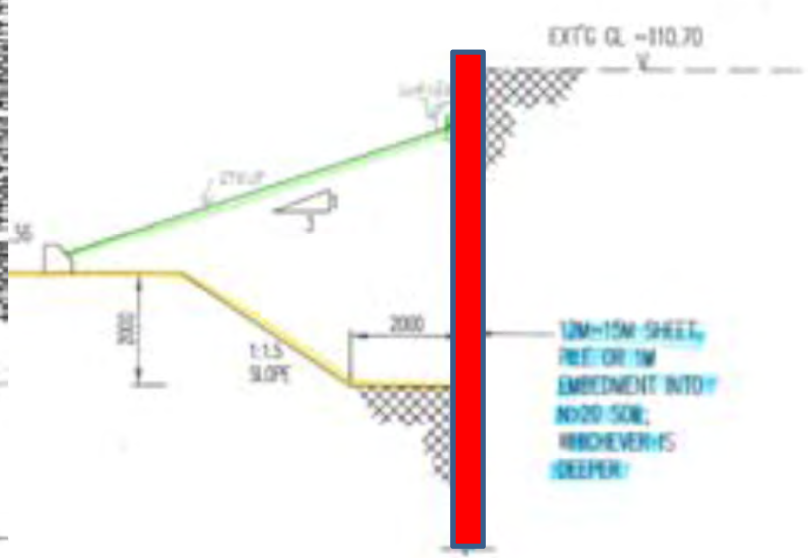
Hazard: (a) Risk of workers falling from height when doing maintenance works.
(b) Risks of falling branches hitting people below the building.

Example – Retaining Wall

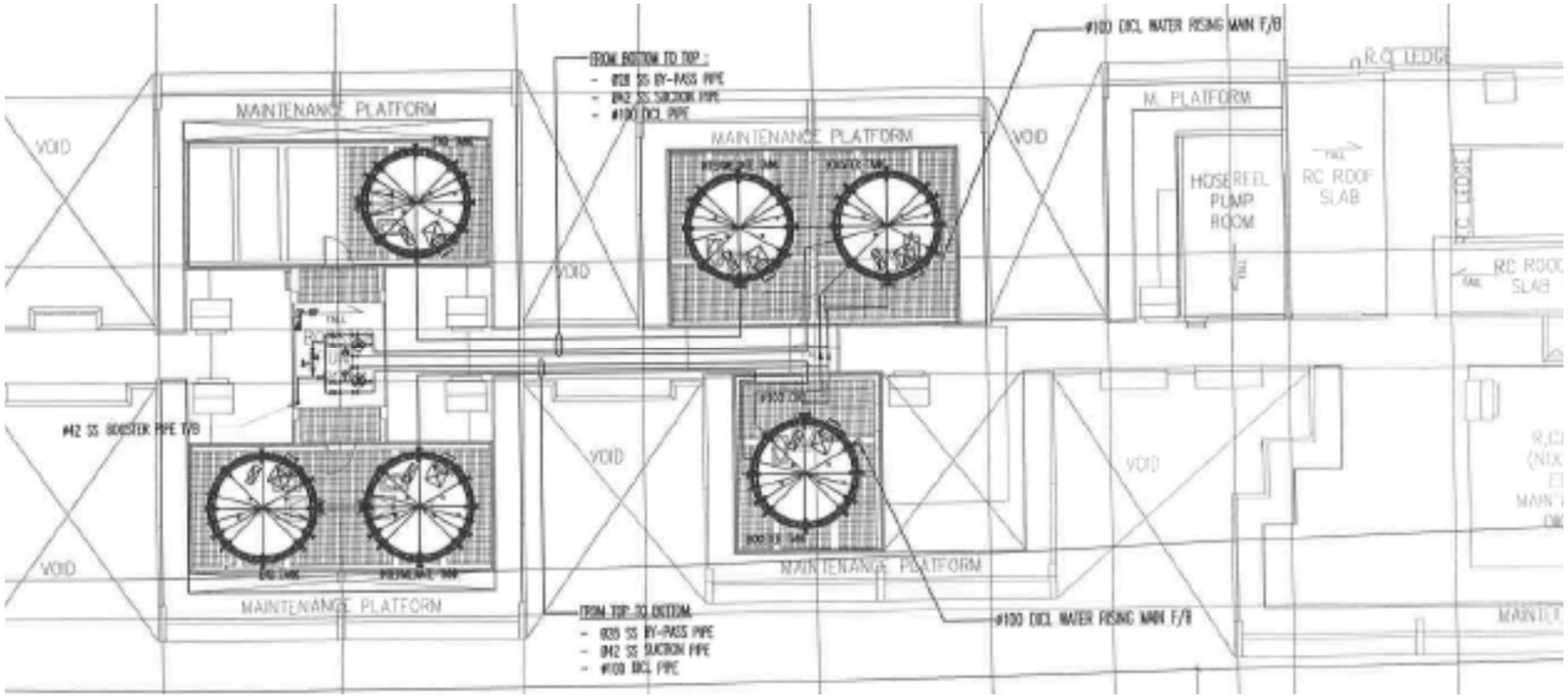


Hazard: Maintenance workers falling off edge of wall.

Control Measures: Railing to be erected on top on the retaining wall to prevent people from falling.



Example – Maintenance Access to Pumps & Valves



Hazard: Lack of space for workers to carry out installation & maintenance of equipment and elevated services.

Control Measures: To provide permanent access such as stairs or ladder for equipment servicing and allow maintenance space within plant room

Example – Pedestrian & Vehicular Movement



Hazard:
Pedestrian risks of being hit by vehicle when waiting at drop off pouch.

Control Measures:
To propose bollards at drop off pouch to prevent car hitting pedestrian

Conclusion

- All stakeholders required to work together and participate actively in DfS review meetings.
- Designers are to constantly review the designs and construction methods to eliminate safety risks at source.
- Consultants and Contractors are encouraged to attend the DfS courses to level up the competency in DfS.



Thank you

