

# OCCUPATIONAL SAFETY & HEALTH IN CONSTRUCTION INDUSTRY (MANAGEMENT)

DEPARTMENT OF  
OCCUPATIONAL SAFETY & HEALTH  
MINISTRY OF HUMAN RESOURCES



TRAINER'S MANUAL (MODULE 3)

## OSHCIM TRAINER'S MANUAL

### MODULE 3: PRINCIPAL DESIGNER & DESIGNER(S) DESIGN RISK MANAGEMENT

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THIS TRAINER'S MANUAL CONSISTS OF ENGLISH AND MALAY VERSION  
THAT COMPRISES OF:

*MANUAL PENCERAMAH INI MENGANDUNGI VERSI BAHASA INGGERIS DAN BAHASA MELAYU  
YANG MERANGKUMI:*

**1**

**OSHCIM MIND MAP**  
*PETA MINDA OSHCIM*

**2**

**LESSON PLANS**  
*PELAN PEMBELAJARAN*

**3**

**TRAIN THE TRAINERS' (TTT) GUIDANCE NOTES**  
*NOTA BIMBINGAN BAGI PENCERAMAH (TTT)*

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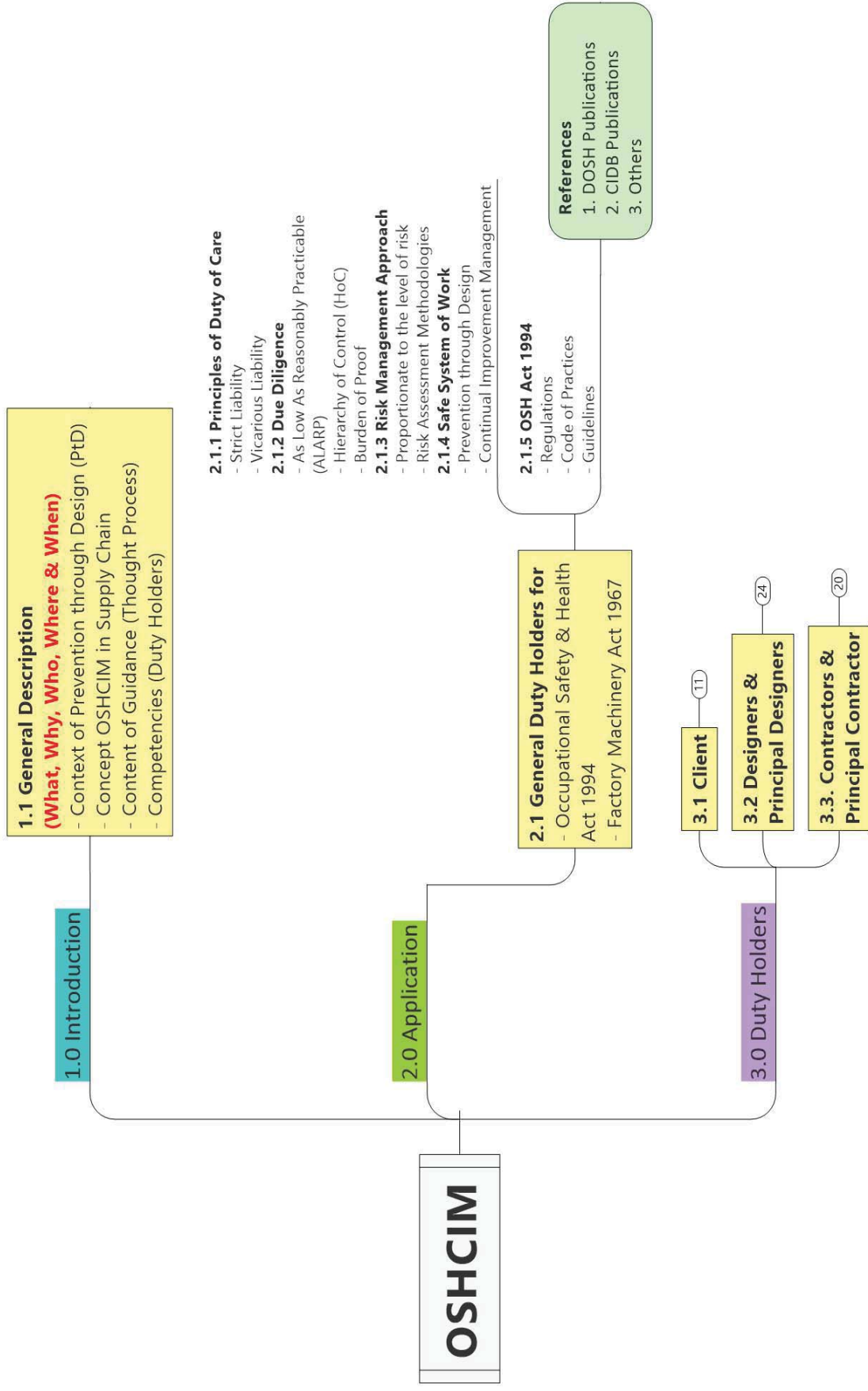
**TRAIN THE TRAINERS' (TTT) GUIDANCE NOTES**  
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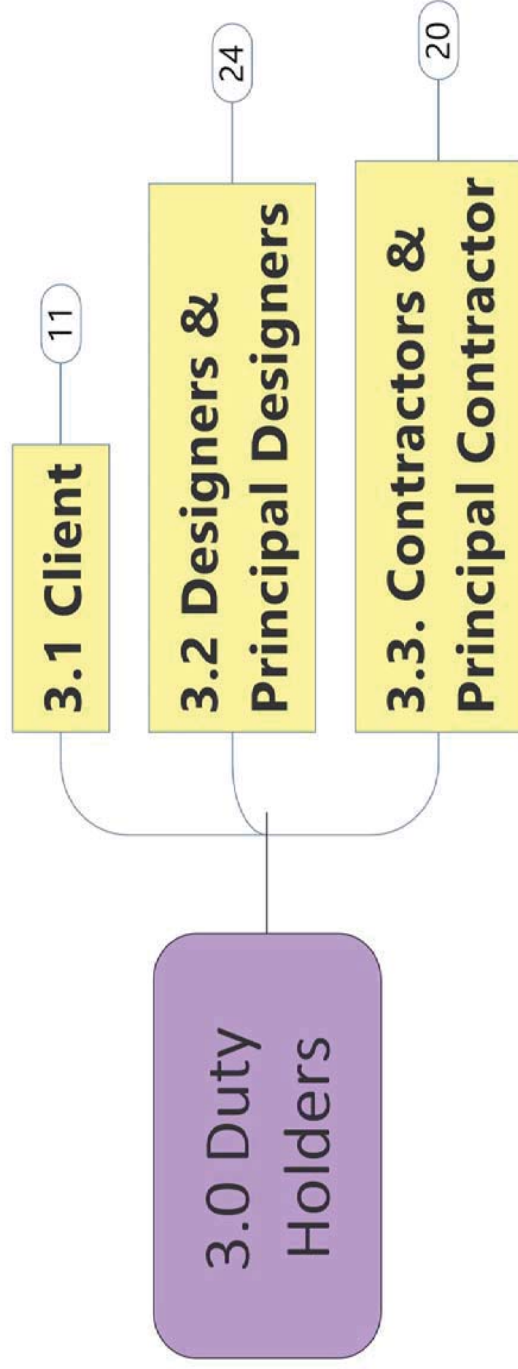


# **OSHCIM**

## **MIND MAP**







### 3.1.1 Introduction

- General Information

### 3.1.2 Who are Clients

- Client Roles

## 3.1 Client

### 3.1.3 What should Client do?

#### A. Preparation: the client brief

- A1- What is a **client brief**?
- A2- What should the client brief include?
- A3- Appointment of Designers & Contractors

#### B What do you have to do in the pre-construction phase?

- B1- Make suitable arrangements for managing the project
- B2- Select the project team and formally appoint duty holders
- B3- Provide information to help with design and construction planning  
(Pre Construction Information-PCI)
- B4- **Notify the project to the enforcing authorities, where required**
- B5- Ensure the management arrangements are working
- B6- Pre-construction client checklist

#### C. What do you have to do in the construction phase?

- C1- Ensure the **construction phase plan** is in place
- C2- Ensure welfare facilities are in place
- C3- Ensure the management arrangements are working
- C4- Check completion and handover arrangements
- C5- Co-operate with the principal contractor

#### D. The health and safety file

- D1- What is the **safety and health file**?
- D2- What should duty holders do?
- D3- Check that the health and safety file has been prepared
- D4- Maintain and make available the health and safety file

### 3.1.4 Client Work Process

- Process Map
- Checklist
- Documented Outputs

### 3.1.5 Attachments

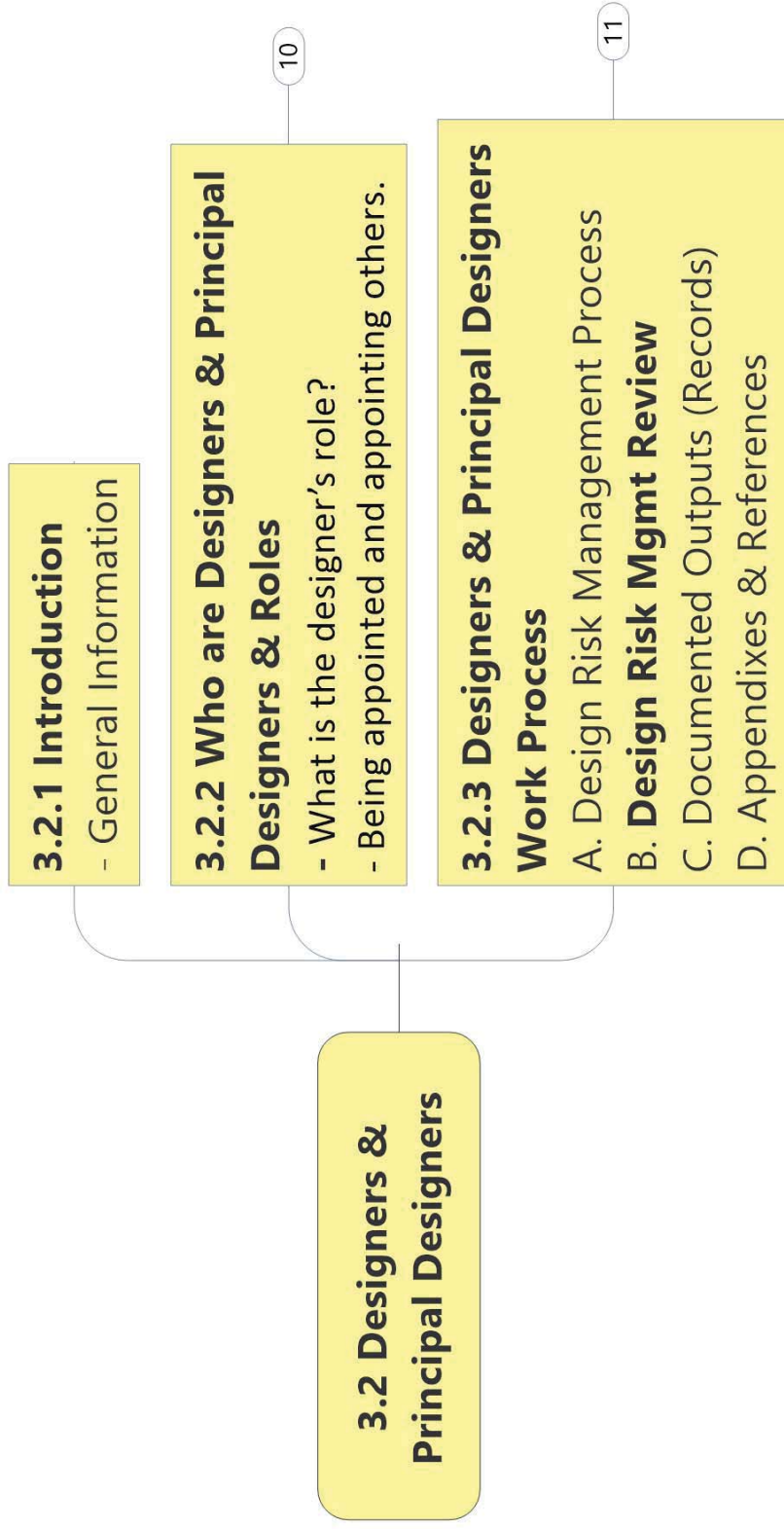
#### A. Appendices

- A1- Client Brief
- A2- Pre Construction Information
- A3- Construction Phase Plan
- A4- Safety & Health File
- A5- DOSH OSHCI(M)GL 2017**

#### Appendices

#### B. References

- B1- DOSH Publications
- B2- CIDB Publications
- B3- Other Publications



### 3.2.2 Who are Designers & Principal Designers & Roles

- What is the designer's role?
- Being appointed and appointing others.

#### 3.2.2.1 What should Designer do?

##### A. What do you have to do?

- A1- Make clients aware of their duties
- A2- Prepare and modify designs for safety and health
- A3- Eliminate, reduce and control risks through design
- A4- Co-operate and co-ordinate with others

##### B. What information do you need?

- B1- Preparation
- B2- Information from the client and principal designer
- B3- Information from other designers
- B4- Information from contractors
- B5- Information from other interested parties

##### C. What information must you provide?

- C1- Preparation
- C2- Information for the client
- C3- Information for the principal designer
- C4- Information for other designers
- C5- Information for principal contractors and contractors

##### D. What could it look like in practice?

- D1- Provide a schedule on appointment
- D2- Develop a good relationship with the client
- D3- Ensure you understand the brief
- D4- Clarify roles
- D5- Hold regular meetings
- D6- Undertake an early site visit
- D7- Use building information modelling (BIM)**
- D8- Use Red-Amber-Green (RAG) lists**



### 3.2.2 Who are Designers & Principal Designers & Roles

- What is the designer's role?
- Being appointed and appointing others.

#### 3.2.2.2 What should Principal Designer do?

##### A. What do you have to do at project set up?

- A1- Carry out your duties on appointment
- A2- Help with the client brief
- A3- Obtain information from the client

##### B. What do you have to do during the pre-construction phase?

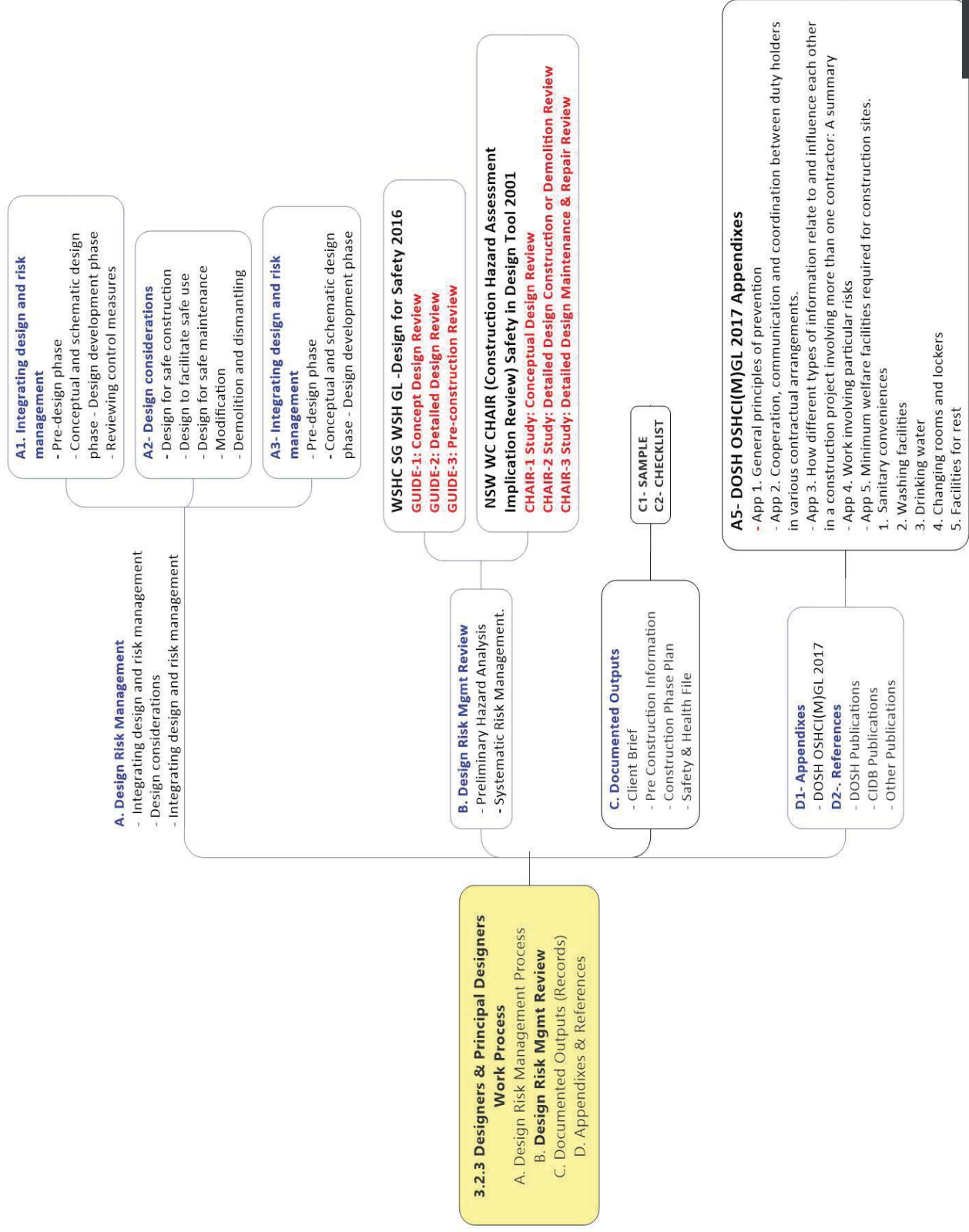
- B1- Liaise with the client
- B2- Provide information to the designers
- B3- Ensure co-ordination with and between the designers
- B4- Oversee the design
- B5- Develop the pre-construction information

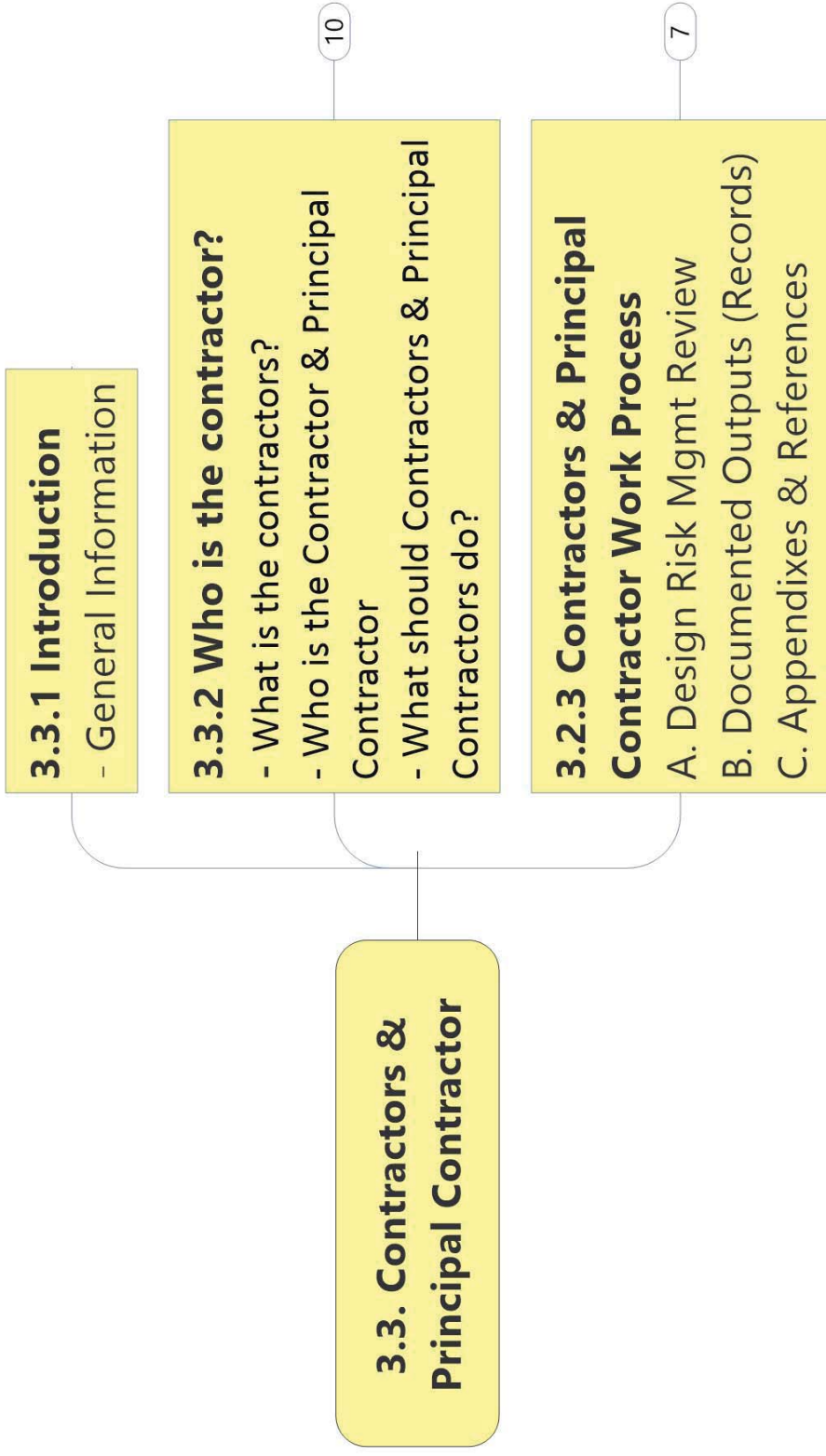
##### C. What do you have to do during the construction phase?

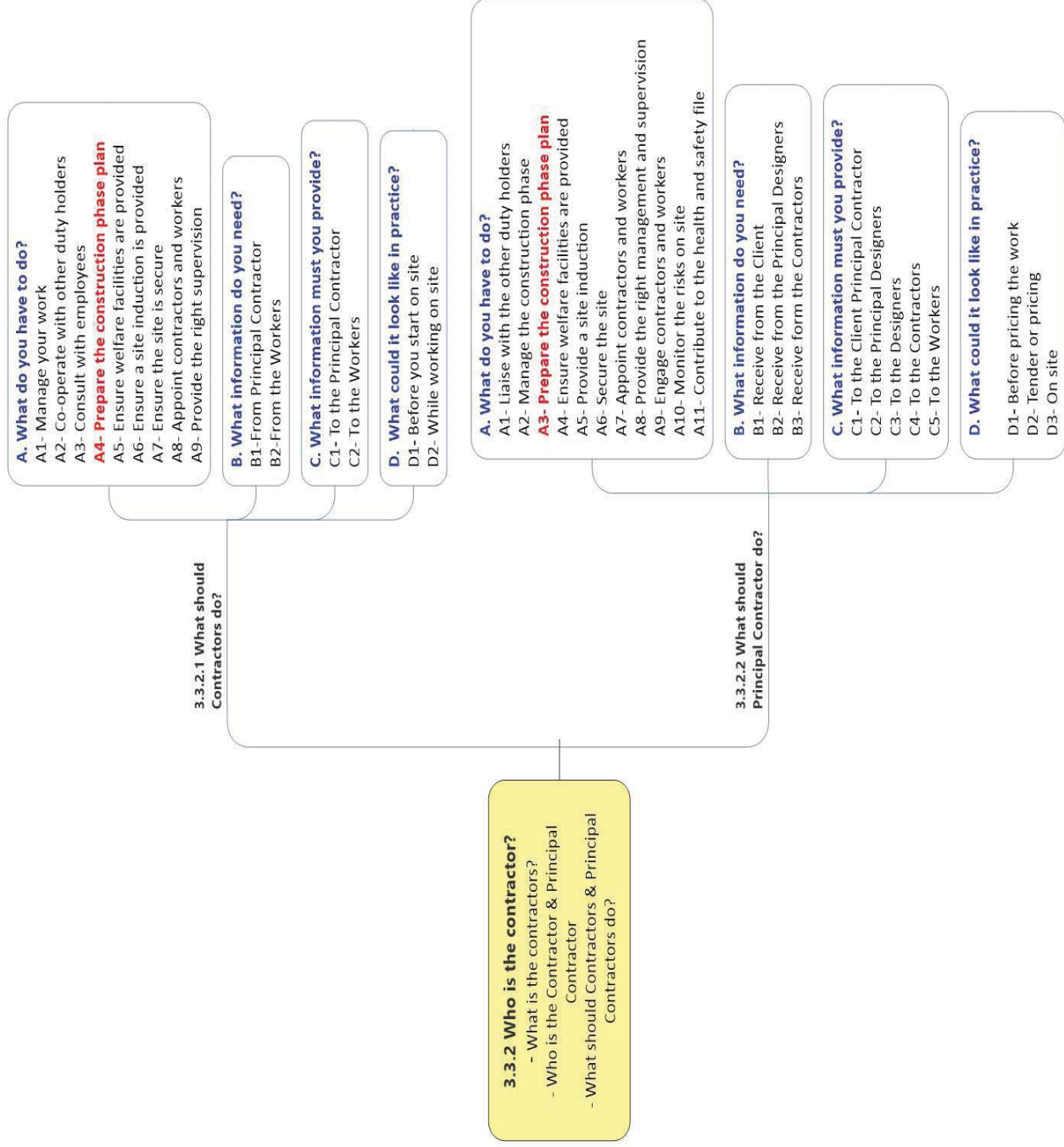
- C1- Liaise with the principal contractor
- C2- Provide information to the principal contractor
- C3- Receive information about design changes
- C4- Prepare and develop the health and safety file

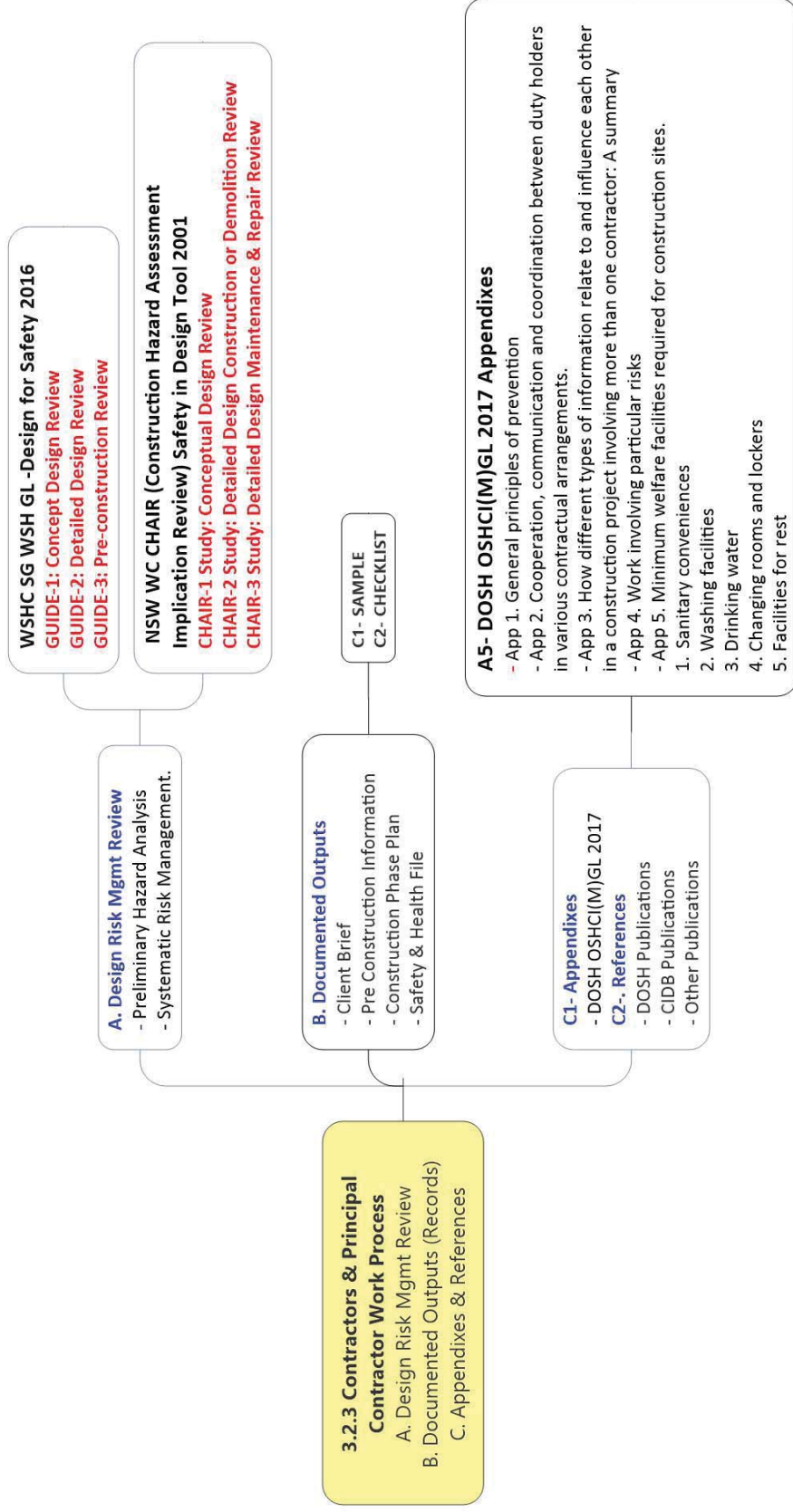
##### D. What could it look like in practice?

- D1- Project set up
- D2- Pre-construction phase
- D3- Construction phase











The background features abstract geometric shapes in various shades of blue and grey. A large, light blue 'V' shape is prominent, with darker blue and grey shapes filling the remaining space. The word 'ENGLISH' is centered in the white area.

ENGLISH



# **LESSON PLANS**

<b>OVERALL SUMMARY OF MODULE 3 – PRINCIPAL DESIGNER AND DESIGNERS (DESIGN RISK MANAGEMENT)</b>	
DAYS NEEDED TO CONDUCT THE MODULE	2 Days (Day 1: Start 8.30 am sharp; Day 2: Start 9 am) * A lot of topic for day 1, need to start early
OBJECTIVE	<ol style="list-style-type: none"> <li>1. Equipped designers with complete, suitable and appropriate knowledge to implement OSHCIM in the design process</li> <li>2. Make safe by design a priority in the design process</li> </ol>
OUTCOME	At the end of this program, designers will be able to describe: <ol style="list-style-type: none"> <li>1. OSHCIM Guideline               <ol style="list-style-type: none"> <li>a) Duty Holders Duties;</li> <li>b) Client Duties and Due Diligence</li> <li>c) Design Risk Management Principles</li> </ol> </li> <li>2. OSH Legislation               <ol style="list-style-type: none"> <li>a) Legal Structure of Secondary Legislations</li> <li>b) PD &amp; D DRRULE 1 2 3</li> <li>c) Review Aide Memoirs</li> </ol> </li> <li>3. Manage and Update OSHCI(M)               <ol style="list-style-type: none"> <li>a) Documentations</li> <li>b) Design Review Process</li> <li>c) Distributing &amp; Verifying Advisory Notes</li> </ol> </li> <li>4. Upon qualifying for the Written Assessment &amp; Report Assignment Assessment delegates will be able to commence their journey as a Principal Designer under OSHCI(M)</li> </ol>
BENEFIT OF THIS MODULE TO PARTICIPANTS	<ul style="list-style-type: none"> <li>• Participants will have knowledge on OSHCIM guidelines, OSH legislation and updating and managing OSHCIM</li> </ul>
VALUE	<ul style="list-style-type: none"> <li>• Care and compassion</li> <li>• Integrity</li> <li>• Responsibility</li> <li>• Respect</li> <li>• Honesty and Trustworthiness</li> </ul>

APPROACH	<ol style="list-style-type: none"> <li>1. Lecture &amp; Discussion in group</li> <li>2. Video presentation &amp; Group Presentation</li> <li>3. Learn from experience</li> <li>4. Question and answer session</li> <li>5. Answering exam questions</li> </ol>
MATERIALS TO BE USED DURING LECTURE	<ul style="list-style-type: none"> <li>• Speaker</li> <li>• Microphone</li> <li>• Audio recorder</li> <li>• Marker pen for all groups</li> <li>• LCD (fix/cordless/portable)</li> <li>• Laptop</li> <li>• White board</li> <li>• Mahjong paper</li> <li>• Camera</li> <li>• Video recorder</li> </ul>
TRAINING MATERIALS FOR PARTICIPANTS	<ul style="list-style-type: none"> <li>• Power point handouts @ notes</li> <li>• Blank A4 papers</li> <li>• A3 Question for group activities</li> <li>• Pen</li> <li>• Pencil</li> <li>• Eraser</li> <li>• Exam paper</li> </ul>
MATERIALS REQUIRED FOR TRAINER	<ul style="list-style-type: none"> <li>• Soft copy of Power point slides</li> <li>• A3 paper containing questions in these slides (185, 217, 237, 251)</li> <li>• Hardcopy of Power points handouts @ notes</li> <li>• Exam paper</li> </ul>
<p>** All materials to be used such as speaker, LCD, Camera, Microphone, Video, Audio recorder can be from any brand, any shape and any form (cordless, portable or fix) as long as the materials can be used to do the purpose it intended for. These applies to other materials to be used as well such as A4 papers, pen, pencil, marker pens, eraser and others.</p>	

TIME	SLIDE	DETAIL	ESTIMATED DELIVERY TIME	REQUIREMENTS
8.30 am	1	<ul style="list-style-type: none"> <li>Ice breaking (Getting participant attention through jokes and stories on what happened yesterday or today morning before workshop)</li> <li>Brief explanation on the topic, what the overall module is all about</li> </ul> <p>* Important for ice breaking to be successful, so that participant will feel engaged with the speaker</p>	3 minutes	**Handouts to be used during the workshop
	2	<ul style="list-style-type: none"> <li>Trainer profile               <ol style="list-style-type: none"> <li>Name</li> <li>Education background</li> <li>Experience in safety, health and environment sector</li> <li>Experience in construction sector</li> <li>Awards and recognition national and international level</li> </ol> </li> </ul>	2 minutes	
	3	<ul style="list-style-type: none"> <li>Brief explanation regarding DISCLAIMER</li> </ul>	1 minute	
	4	<ul style="list-style-type: none"> <li>Tell participants the DO's and DON'T during you class. It can be anything. What you favour, pleasure and displeasure</li> </ul> <p>* Important to prevent inconvenience to the presenter and other participants involved</p>	2 minutes	
	5	<ul style="list-style-type: none"> <li>Explain topic to be discussed for day 1</li> </ul>	3 minutes	
	6	<ul style="list-style-type: none"> <li>Explain topic to be discussed for day 2</li> </ul>		



	7	<ul style="list-style-type: none"> <li>State the objectives of this module</li> </ul>	2 minutes	
	8	<ul style="list-style-type: none"> <li>Clarify terms unfamiliar to the participants and will be used along the seminar</li> </ul>	5 minutes	
	9			
	10			
	11	<ul style="list-style-type: none"> <li>Give overview on the topic OSHCIM guidelines</li> </ul>	1 minute	
	12	<ul style="list-style-type: none"> <li>State objectives of the guidelines</li> </ul>	2 minutes	
	13	<ul style="list-style-type: none"> <li>Explain illustration on the traditional construction stages</li> </ul>	2 minutes	
	14	<ul style="list-style-type: none"> <li>Explain illustration on the construction stage for OSHCIM</li> </ul>	2 minutes	
	15	<ul style="list-style-type: none"> <li>Define project and give relevant example</li> </ul>	1 minute	
	16	<ul style="list-style-type: none"> <li>State key elements of DRRULELINES</li> </ul>	2 minutes	

	17	<ul style="list-style-type: none"> <li>Describe the general principles of prevention</li> </ul>	2 minutes	
	18	<ul style="list-style-type: none"> <li>Explain in detail the illustration in the slide</li> </ul>	5 minutes	
	19	<ul style="list-style-type: none"> <li>List out who is duty holders</li> </ul>	1 minute	
	20	<ul style="list-style-type: none"> <li>State the roles of duty holders</li> </ul>	2 minutes	
	21	<ul style="list-style-type: none"> <li>Clarify the connection between client, designer and contractor in OSHCIM</li> <li>State PD roles and duties</li> </ul>	2 minutes	
	22	<ul style="list-style-type: none"> <li>Clarify the connection between client, designer and contractor in OSHCIM</li> </ul>	6 minutes	
	23	<ul style="list-style-type: none"> <li>State PD roles in tendering process</li> </ul>		
	24	<ul style="list-style-type: none"> <li>State PD roles and duties in construction activities for:               <ul style="list-style-type: none"> <li>Slide 23: domestic residence and apartment complex</li> <li>Slide 24: hospital or airport terminal</li> <li>slide 25: management roles carried out by specialist construction manager</li> </ul> </li> </ul>		
	25			

	26	<ul style="list-style-type: none"> <li>Explain duty holder process map for client</li> </ul>	2 minutes	
	27	<ul style="list-style-type: none"> <li>Explain duty holder process map for principal designer and designers</li> </ul>	2 minutes	
	28	<ul style="list-style-type: none"> <li>Explain duty holder process map for principal contractor and contractor</li> </ul>	2 minutes	
	29	<ul style="list-style-type: none"> <li>Give overview on OSH Legal Framework</li> <li>Describe OSH legal structure starts with:               <ul style="list-style-type: none"> <li>➤ Slide 30: OSHA 1994 and</li> <li>➤ Slide 31 : FMA 1967</li> </ul> </li> </ul>	4 minutes	
	30			
	31			
	32	<ul style="list-style-type: none"> <li>Explain FMA enforcement and prosecution</li> </ul>	2 minutes	
	33	<ul style="list-style-type: none"> <li>Describe how OSHA 1994 being implemented</li> </ul>	2 minutes	
	34	<ul style="list-style-type: none"> <li>State components that guide OSHA 1994 principles</li> </ul>	1 minute	
	35	<ul style="list-style-type: none"> <li>State employer duty of care</li> </ul>	1 minute	
	36	<ul style="list-style-type: none"> <li>State general duty of care in OSHA 1994</li> </ul>	1 minute	

	37	<ul style="list-style-type: none"> <li>Describe the illustration of employer duties in OSH</li> </ul>	2 minutes	
	38	<ul style="list-style-type: none"> <li>State section 16 in OSHA 1994</li> <li>Explain the meaning of slide 39 and 40</li> </ul>	4 minutes	
	39			
	40			
	41	<ul style="list-style-type: none"> <li>Explain each point in the illustration</li> </ul>	4 minutes	
	42			
	43	<ul style="list-style-type: none"> <li>Give overview on stages of OSHCIM development</li> </ul>	1 minute	
	44	<ul style="list-style-type: none"> <li>Differentiate between BOWEC and OSHCIM</li> </ul>	3 minutes	
	45	<ul style="list-style-type: none"> <li>Download QR Codes and explain about this document</li> </ul>	3 minutes	
	46	<ul style="list-style-type: none"> <li>State OSHCIM DRRULELINES key elements</li> </ul>	2 minutes	
	47	<ul style="list-style-type: none"> <li>Describe UK CDM</li> </ul>	2 minutes	

	48	<ul style="list-style-type: none"> <li>Describe Enforcement Prosecution HSE UK</li> </ul>	2 minutes	
	49	<ul style="list-style-type: none"> <li>Explain CDM failing cost</li> </ul>	2 minutes	
	50	<ul style="list-style-type: none"> <li>Explain fine charges to developer who breach CDM</li> </ul>	2 minutes	
	51	<ul style="list-style-type: none"> <li>Explain what happen when PD and PC fail to comply with CDM</li> </ul>	2 minutes	
	52	<ul style="list-style-type: none"> <li>Describe what the document is all about</li> </ul>	2 minutes	
	53	<ul style="list-style-type: none"> <li>Define designers</li> </ul>	2 minutes	
	54	<ul style="list-style-type: none"> <li>Explain why designers is important in safety and health implementation</li> </ul>	4 minutes	
	55			
	56	<ul style="list-style-type: none"> <li>Explain and clarify the checklist of designers</li> </ul>	6 minutes	
	57			



	58	<ul style="list-style-type: none"> <li>• Explain designers duties for project required legal notification</li> </ul>	3 minutes	
	59	<ul style="list-style-type: none"> <li>• These 3 slides will give definition on principal designers and what they are about in OSHCIM</li> </ul>	6 minutes	
	60			
	61			
	62	<ul style="list-style-type: none"> <li>• State the duties of principal designers</li> </ul>	2 minutes	
	63	<ul style="list-style-type: none"> <li>• Explain safety and health files needed by principal designers</li> </ul>	4 minutes	
Coffee Break 30 minutes (10.30 am – 11.00 am)				

64	<ul style="list-style-type: none"><li>• Give overview on the topic</li><li>• Describe risk management principles</li><li>• State types of risk</li></ul>	3 minutes	
65			
66			
67	<ul style="list-style-type: none"><li>• Watch the video on risk management principles</li></ul>	3 minutes	
68	<ul style="list-style-type: none"><li>• Discuss and explain this topic 'accident causation theories consequences'</li><li>• Who developed these theories and what they are all about?<ol style="list-style-type: none"><li>1. Domino theory</li><li>2. Loss Causation Model</li><li>3. Multiple Causal Model</li><li>4. Accident consequences</li></ol></li></ul>	5 minutes	
69			
70			
71			
72			
73			
74			

75	<ul style="list-style-type: none"> <li>Explain the responsibilities of management towards safety</li> </ul>	1 minute	
76	<ul style="list-style-type: none"> <li>Divide participants into groups</li> </ul>	1 minute	
77			
78	<ul style="list-style-type: none"> <li>Look at these 4 slides</li> </ul>		
79	<ul style="list-style-type: none"> <li>Identify the causal factors for the accidents</li> </ul>	12 minutes	
80	<ul style="list-style-type: none"> <li>Each slide 4 minutes</li> </ul>		
81	<ul style="list-style-type: none"> <li>Give overview on the topic</li> </ul>	3 minutes	
82	<ul style="list-style-type: none"> <li>Explain illustration on which stage to identify hazards</li> </ul>		
83	<ul style="list-style-type: none"> <li>Describe safety hazards</li> </ul>	2 minutes	
84	<ul style="list-style-type: none"> <li>Describe health hazards</li> </ul>	2 minutes	
85	<ul style="list-style-type: none"> <li>Explain hazards which can cause harm</li> </ul>	3 minutes	

	86	<ul style="list-style-type: none"> <li>State classification of hazards</li> </ul>	1 minute	
	87	<ul style="list-style-type: none"> <li>Explain the slide</li> </ul>	2 minutes	
	88	<ul style="list-style-type: none"> <li>Describe hazardous activity</li> </ul>	2 minutes	
	89	<ul style="list-style-type: none"> <li>Describe hazardous personal condition</li> </ul>	2 minutes	
	90	<ul style="list-style-type: none"> <li>Describe hazardous system condition</li> </ul>	2 minutes	
	91	<ul style="list-style-type: none"> <li>Describe hazardous personal state</li> </ul>	2 minutes	
	92	<ul style="list-style-type: none"> <li>Explain physical hazards</li> </ul>	2 minutes	
	93	<ul style="list-style-type: none"> <li>State the hazards of slip, trip and fall</li> </ul>	1 minute	
	94	<ul style="list-style-type: none"> <li>Describe categories of chemical hazards</li> </ul>	1 minute	

	95	<ul style="list-style-type: none"> <li>Explain examples of chemical hazards</li> </ul>	2 minutes	
	96	<ul style="list-style-type: none"> <li>Explain biological hazards</li> </ul>	2 minutes	
	97	<ul style="list-style-type: none"> <li>Explain psycho-social hazards</li> <li>Give relevant examples</li> </ul>	3 minutes	
	98			
	99	<ul style="list-style-type: none"> <li>Explain ergonomic hazards</li> </ul>	1 minute	
	100	<ul style="list-style-type: none"> <li>Discuss methods of identifying hazards by document review and inspection</li> </ul>	5 minutes	
	101			
	102			
	103	<ul style="list-style-type: none"> <li>Explain exposure monitoring</li> </ul>	2 minutes	
	104	<ul style="list-style-type: none"> <li>Explain when biological and medical surveillance should be conducted</li> </ul>	2 minutes	
	105	<ul style="list-style-type: none"> <li>Explain whom should undergo biological and medical surveillance</li> </ul>	2 minutes	

106	<ul style="list-style-type: none"> <li>Discuss methods of identifying hazards by document review and inspection</li> </ul>	2 minutes	
107			
108	<ul style="list-style-type: none"> <li>Discuss example 1 HAZOP</li> </ul>		
109	<ul style="list-style-type: none"> <li>Explain Hazop 1 and Hazop 2</li> </ul>	4 minutes	
110			
111	<ul style="list-style-type: none"> <li>Discuss example 2 ; FMEA</li> </ul>	4 minutes	
112			
113			
114	<ul style="list-style-type: none"> <li>Discuss US 2015 ‘Top 10 Violation’</li> </ul>		
115	<ul style="list-style-type: none"> <li>Identify top 16 hazards in the illustration provided</li> </ul>	10 minutes	
116			
<b>LUNCH for 1 hour and 30 minutes (12.30 pm – 2.00 pm)</b>			

2.00 pm – 5.00 pm	117	<ul style="list-style-type: none"> <li>• Give overview on the subtopic to be discussed</li> </ul>	1 minute	
	118	<ul style="list-style-type: none"> <li>• Explain hierarchy of control examples</li> <li>• Identify hazards in spray paintings</li> </ul>	2 minutes	
	119	<ul style="list-style-type: none"> <li>• Explain illustration, ‘where do hazards of spray paintings will be in the chart’</li> </ul>	2 minutes	
	120			
	121	<ul style="list-style-type: none"> <li>• Explain elimination method for the hazards</li> </ul>	2 minutes	
	122	<ul style="list-style-type: none"> <li>• Explain substitution method for the hazards</li> </ul>	2 minutes	
	123	<ul style="list-style-type: none"> <li>• Explain illustration of isolation methods for the hazards</li> </ul>	2 minutes	
	124	<ul style="list-style-type: none"> <li>• Explain engineering control method for the hazards</li> </ul>	2 minutes	
	125	<ul style="list-style-type: none"> <li>• Show the graph of hazards once we imply hierarchy of control (HOC)</li> </ul>	4 minutes	
	126			
	127	<ul style="list-style-type: none"> <li>• Explain administrative control method for the hazards</li> </ul>	2 minutes	
	128	<ul style="list-style-type: none"> <li>• Show and explain both illustration</li> <li>• Discuss the benefit of implementation of hierarchy of control</li> </ul>	3 minutes	
	129			
	130	<ul style="list-style-type: none"> <li>• Explain the level of effectiveness of HOC for spray painting</li> </ul>	2 minutes	

	131	<ul style="list-style-type: none"> <li>• Explain the graph of ALARP with relevant examples</li> <li>• Make the explanation simple yet comprehensive</li> </ul>	4 minutes	
	132	<ul style="list-style-type: none"> <li>• Describe the example form for risk assessment for design review</li> </ul>	2 minutes	
	133	<ul style="list-style-type: none"> <li>• Ask participants to download QR code for HIRARC document</li> </ul>	2 minutes	
	134	<ul style="list-style-type: none"> <li>• Explain the table of HIRARC</li> </ul>	5 minutes	
	135	<ul style="list-style-type: none"> <li>• Explain risk matrix table and action rating</li> </ul>		
	136	<ul style="list-style-type: none"> <li>• Describe ALARP</li> </ul>	2 minutes	
	137	<ul style="list-style-type: none"> <li>• Give overview on the subtopic</li> </ul>	1 minute	
	138	<ul style="list-style-type: none"> <li>• Explain PtD process</li> </ul>	4 minutes	
	139	<ul style="list-style-type: none"> <li>• Describe general principles of prevention</li> </ul>	2 minutes	
	140	<ul style="list-style-type: none"> <li>• Explain what designers should do</li> </ul>	3 minutes	



141	<ul style="list-style-type: none"> <li>Describe illustration of OSHCIM 2017</li> </ul>	2 minutes	
142	<ul style="list-style-type: none"> <li>Describe illustration of appointing PD and PC in the traditional method</li> </ul>	2 minutes	
143	<ul style="list-style-type: none"> <li>Describe illustration of appointing PD and PC using OSHCIM method</li> </ul>	2 minutes	
144	<ul style="list-style-type: none"> <li>Explain illustration the principles of risk management in OSHCIM</li> </ul>	7 minutes	
145			
146	<ul style="list-style-type: none"> <li>Describe illustration of design review process in the traditional method</li> </ul>	2 minutes	
147	<ul style="list-style-type: none"> <li>Describe illustration of design review process using OSHCIM method</li> </ul>	2 minutes	
148	<ul style="list-style-type: none"> <li>Explain the correlation between each point in the slide</li> </ul>	2 minutes	
149	<ul style="list-style-type: none"> <li>Explain design review objectives in term of RULE 1,2,3</li> </ul>	3 minutes	

150	<ul style="list-style-type: none"> <li>Give introduction on DRRULE</li> </ul>	4 minutes	
151			
152	<ul style="list-style-type: none"> <li>Describe what DRRULE stand for</li> </ul>	3 minutes	
153			
154	<ul style="list-style-type: none"> <li>Explain Flow Diagram</li> </ul>	2 minutes	
155	<ul style="list-style-type: none"> <li>Describe the graph of design risk review process</li> </ul>	2 minutes	
156	<ul style="list-style-type: none"> <li>Explain design risk key focus</li> </ul>	9 minutes	
157			
158			
159	<ul style="list-style-type: none"> <li>Show the form and describe it</li> </ul>	2 minutes	
160	<ul style="list-style-type: none"> <li>Download QR code and explain about the document</li> </ul>	2 minutes	
161	<ul style="list-style-type: none"> <li>Show the form and describe the form</li> </ul>	2 minutes	
162	<ul style="list-style-type: none"> <li>Download QR code and explain the document</li> </ul>	2 minutes	
163	<ul style="list-style-type: none"> <li>Explain rating in HIRARC</li> </ul>	2 minutes	

164	<ul style="list-style-type: none"> <li>Explain risk matrix table in the slide and action rating</li> </ul>	2 minutes	
165	<ul style="list-style-type: none"> <li>Describe ALARP</li> </ul>	1 minutes	
166	<ul style="list-style-type: none"> <li>Give overview of the sub-topic</li> </ul>	1 minutes	
167	<ul style="list-style-type: none"> <li>Explain risk control principles</li> </ul>	2 minutes	
168	<ul style="list-style-type: none"> <li>Explain residual risk</li> </ul>	2 minutes	
169	<ul style="list-style-type: none"> <li>Explain the figures in detail</li> </ul>	15 minutes	
170			
171			
172			
173	<ul style="list-style-type: none"> <li>Give overview on the slide DRRULE 1</li> </ul>	1 minutes	
174	<ul style="list-style-type: none"> <li>Explain the flowchart regarding stages of design review for DRRULE 1</li> </ul>	4 minutes	
175	<ul style="list-style-type: none"> <li>Describe purpose of DRRULE 1</li> </ul>	2 minutes	
176	<ul style="list-style-type: none"> <li>Explain the pictures of safety risk impact</li> </ul>	3 minutes	

177	<ul style="list-style-type: none"> <li>Clarify what DRRULE 1 should look like</li> </ul>	1 minute	
178	<ul style="list-style-type: none"> <li>Show examples of DRRULE 1</li> <li>There are 6 slides which showing examples of DRRULE 1</li> <li>Ensure to give each slides 3 minutes time to discuss and explain</li> </ul>	18 minutes	
179			
180			
181			
182			
183			
184	<ul style="list-style-type: none"> <li>Give instruction for the workshop to participants</li> </ul>	2 minutes	
185	<ul style="list-style-type: none"> <li>Get participants to work in group for DRRULE 1</li> </ul>	30	<ul style="list-style-type: none"> <li>Give each group A3 of workshop questions</li> <li>Mahjong paper</li> <li>Marker pens: blue, red, black</li> <li>Sellotape</li> </ul>

DAY 2				
9.00 am – 10.30 am	186	<ul style="list-style-type: none"> <li>Day 2</li> </ul>	1 minute	** Bring the handouts given in Day 1
	187	<ul style="list-style-type: none"> <li>Tell topic to be discussed in Day 2</li> </ul>		
	188	<ul style="list-style-type: none"> <li>Give overview on the slide</li> </ul>		
	189	<ul style="list-style-type: none"> <li>Explain slide with relevant example</li> <li>Relate each point</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	
	190	<ul style="list-style-type: none"> <li>Specify the types of safety and health information needed for communication</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	
	191	<ul style="list-style-type: none"> <li>Outline all types of safety and health information needed for communication</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	
	192	<ul style="list-style-type: none"> <li>Clarify means of communication to stakeholders</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	

193	<ul style="list-style-type: none"> <li>Continue from previous slide (Clarify means of communication to stakeholders)</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	
194	<ul style="list-style-type: none"> <li>Explain the importance of coordinate flow of information to stakeholders</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	
195	<ul style="list-style-type: none"> <li>Clarify slide with relevant example</li> <li>Make the explanation simple yet comprehensive</li> </ul>	3 minutes	
196	<ul style="list-style-type: none"> <li>Give overview on the slide</li> </ul>	1 minute	
197	<ul style="list-style-type: none"> <li>Explain briefly safety and health file (SHF)</li> <li>What is the file really about</li> </ul>	3 minutes	
198	<ul style="list-style-type: none"> <li>Explain briefly safety and health file</li> <li>The importance of SHF</li> </ul>	3 minutes	
199	<ul style="list-style-type: none"> <li>Clarify items needed to be put inside the SHF</li> </ul>	3 minutes	
200	<ul style="list-style-type: none"> <li>Continue previous slide</li> <li>Clarify items needed to be put inside the SHF</li> </ul>	3 minutes	

201	<ul style="list-style-type: none"> <li>Describe 'How to maintain the records' in SHF</li> </ul>	2 minutes	
202	<ul style="list-style-type: none"> <li>Discuss a case scenario for SHF</li> </ul>	4 minutes	
203	<ul style="list-style-type: none"> <li>Describe practical tips on documentation</li> </ul>	3 minutes	
204	<ul style="list-style-type: none"> <li>Continue from previous slide</li> <li>Describe practical tips on documentation</li> </ul>	3 minutes	
205	<ul style="list-style-type: none"> <li>Specify how to properly documented SHF</li> </ul>	3 minutes	
206	<ul style="list-style-type: none"> <li>Detail the monitoring and reviewing of SHF</li> <li>Importance of vigilant monitoring</li> </ul>	3 minutes	
207	<ul style="list-style-type: none"> <li>Simplify the monitoring process of SHF</li> </ul>	3 minutes	
208	<ul style="list-style-type: none"> <li>State the importance of on-going review</li> </ul>	3 minutes	
209	<ul style="list-style-type: none"> <li>Discuss residual risk</li> </ul>	6 minutes	
210	<ul style="list-style-type: none"> <li>Relate the image with real life cases</li> <li>Discuss with participants and get ideas on what should be done</li> </ul>	6 minutes	

	211	<ul style="list-style-type: none"> <li>• Explain in detail the slide</li> <li>• List out all identified significant risks on CDM Visual Risk Analysis</li> </ul>	7 minutes	
	212	<ul style="list-style-type: none"> <li>• Download QR Code and explain briefly what the document is all about</li> </ul>	7 minutes	
	213	<ul style="list-style-type: none"> <li>• Discuss the image</li> </ul>	7 minutes	
Coffee Break (10.30 am – 11.00 am)				

11.00 am – 12.30 pm	214	<ul style="list-style-type: none"> <li>• Give overview on the slide</li> </ul>	1 minute	
	215	<ul style="list-style-type: none"> <li>• State the purpose of this workshop</li> </ul>	1 minute	
	216	<ul style="list-style-type: none"> <li>• Give instruction and let participants get into group</li> </ul>	1 minute	



	217	<ul style="list-style-type: none"> <li>Show the image and let participants discuss</li> </ul>	20 minutes	<ul style="list-style-type: none"> <li>Give each group A3 of workshop questions</li> <li>Mahjong paper</li> <li>Marker pens: blue, red, black</li> <li>Sellotape</li> </ul>
	218	<ul style="list-style-type: none"> <li>Ask group of participants to present their discussion</li> </ul>	18 minutes	
	219	<ul style="list-style-type: none"> <li>State the topic DRRULE 2</li> </ul>	4 minutes	
	220	<ul style="list-style-type: none"> <li>Describe DRRULE 2 Process Flow Diagram</li> </ul>		
	221	<ul style="list-style-type: none"> <li>Explain stages of design reviews with appropriate examples</li> </ul>	6 minutes	
	222			
	223	<ul style="list-style-type: none"> <li>Clarify things needed to be considered in design reviews</li> </ul>	3 minutes	
	224	<ul style="list-style-type: none"> <li>Stated what should be done during review process</li> </ul>	3 minutes	
	225	<ul style="list-style-type: none"> <li>Discuss the examples point by point for maintenance corridor on external facades</li> </ul>	3 minutes	


226	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for construction methods</li></ul>	3 minutes	
227	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for safe installation and maintenance access for air condition unites</li></ul>	3 minutes	
228	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for safe maintenance access</li></ul>	3 minutes	
229	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for Layout of the structure affecting flow of human traffic</li></ul>	3 minutes	
230	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for detailed architectural design</li></ul>	3 minutes	
231	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for installation and maintenance of fixtures</li></ul>	3 minutes	
232	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for accessibility for maintenance</li></ul>	3 minutes	
233	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for maintenance methods</li></ul>	3 minutes	

	234	<ul style="list-style-type: none"><li>• Explain example DRRULE 2 for maintenance</li></ul>	6 minutes	
	235			
<div>LUNCH</div> <div>12.30 pm – 2.00 pm (1h 30m)</div>				

2.00 pm – 3.30 pm	236	<ul style="list-style-type: none"> <li>Give overview on the title</li> </ul>	1 minute	
	237	<ul style="list-style-type: none"> <li>Show the scenario and let participants discuss</li> </ul>	30 minutes	<ul style="list-style-type: none"> <li>Give each group A3 of workshop questions</li> <li>Mahjong paper</li> <li>Marker pens: blue, red, black</li> <li>Sellotape</li> </ul>
	238	<ul style="list-style-type: none"> <li>Ask each group to present their discussion</li> </ul>	20 minutes	
	239	<ul style="list-style-type: none"> <li>State the topic DRRULE 3</li> </ul>	4 minutes	
	240	<ul style="list-style-type: none"> <li>Describe DRRULE 3 Process Flow Diagram</li> </ul>		

	241	<ul style="list-style-type: none"><li>• Explain what is DRRULE 3</li></ul>	3 minutes	
	242	<ul style="list-style-type: none"><li>• State the purpose of DRRULE 3</li></ul>	3 minutes	
	243	<ul style="list-style-type: none"><li>• Describe DRRULE 3 Pre-Construction Review</li></ul>	3 minutes	
	244	<ul style="list-style-type: none"><li>• Explain example DRRULE 3 for temporary works</li></ul>	3 minutes	
	245	<ul style="list-style-type: none"><li>• Explain example DRRULE 3 for work by specialist contractor</li></ul>	3 minutes	
	246	<ul style="list-style-type: none"><li>• Continue to explain example DRRULE 3 for</li></ul>	3 minutes	
	247	<ul style="list-style-type: none"><li>• Explain example DRRULE 3 for construction stage hazards</li></ul>	6 minutes	
	248			
	249	<ul style="list-style-type: none"><li>• Discuss the real case scenario</li></ul>	3 minutes	
	<b>Rest for 5 minutes</b>			

250	<ul style="list-style-type: none"> <li>Give overview on the title</li> </ul>	1 minutes	
251	<ul style="list-style-type: none"> <li>Show the scenario and let participants discuss</li> </ul>	15 minutes	<ul style="list-style-type: none"> <li>Give each group A3 of workshop questions</li> </ul>
252	<ul style="list-style-type: none"> <li>Ask each group to present their discussion</li> </ul>	20 minutes	<ul style="list-style-type: none"> <li>Mahjong paper</li> <li>Marker pens: blue, red, black</li> <li>Sellotape</li> </ul>
253	<ul style="list-style-type: none"> <li>Download QR codes</li> <li>Describe briefly the documents in a simple yet comprehensive</li> </ul>	2 minutes	
254	<ul style="list-style-type: none"> <li>Describe briefly the documents in a simple yet comprehensive</li> </ul>	2 minutes	
255	<ul style="list-style-type: none"> <li>Describe briefly the documents in a simple yet comprehensive</li> </ul>	2 minutes	
256	<ul style="list-style-type: none"> <li>Give instruction for the test</li> <li>Let participants take the test</li> </ul>	32 minutes	
257	<ul style="list-style-type: none"> <li>Give instruction to be send within 1-week time</li> </ul>	3 minutes	
258	<ul style="list-style-type: none"> <li>Question and answer session</li> </ul>	13 minutes	



# **TRAIN THE TRAINERS (TTT) GUIDANCE NOTES**



# ***OCCUPATIONAL SAFETY & HEALTH IN CONSTRUCTION INDUSTRY (MANAGEMENT)***

**PRINCIPAL DESIGNER & DESIGNER(S)  
DESIGN RISK MANAGEMENT (02D)**

- This is a competency course
- 2 days (compulsory)
- Additional workshop (Day 3) is optional – more to hands on and discussion in group
- Principal designer – DESIGNER who plans, manages and monitors the pre-construction phase and co-ordinates matters relating to health and safety
- Designer(s) – prepares or modifies designs (or) instructs/ arranges for others to do so)

## DISCLAIMER

- *The information contained in program has been developed in good faith and is believed to present occupational safety & health safety principles. The training provider and all other participating organization make no representations or warranties as to the completeness or accuracy thereof. Persons using this information must make their own determination as to its suitability for the purposes in support of their own safety program. The training provider and all other participating organizations are in no way responsible for damages of any nature resulting from the use of this information;*
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2 days training only covers

- A basic knowledge
- Further knowledge you have to explore to expand/ maintain your knowledge
- Self-learning with – more exposure, accident cases at site, new technologies and approach, new tools from internets or research paper and journals



## HOUSE RULES

1. Punctuality
2. No Disturbances
3. Respect Others
4. Participation
5. Agree to Disagree
6. Ask Questions
7. Give your honest feedback



- 1- please on time so that you did not missed any information
- 2- don't disturb others
- 3- respect each other so that everything will going smoothly
- 4- you are most welcome to participate in every part of this course
- 5- you have right to agree or disagree but in proper manners
- 6- please participate in discussion with related and good questions
- 7-your honest feedback is really needed and most appreciated

## COURSE CONTENTS DAY 01

### 1. Overview of OSHCI(M) 2017 Guidelines

- Client Overall Duty of Care
- PD & D(s) Duty of Care
- Other Duty Holders Liabilities

### 2. Overview of OSH Legal Framework

- Legal Structure of Secondary Legislations
- PD & D DRRULE Guidelines
- Review Aide Memoirs

### 3. Accident Prevention Principles

- Accident Causal Factors & Risk Assessment
- Hierarchy of Control
- Construction Hazards & Risk

### 4. Risk Management Approach for OSHCI(M)

- Design Review Process Flow
- DRRULE 1,2,3 (Objectives)
- DDRULE 1 - Concept Design Review

### 5. WORKSHOP - DRRULE 1 - Concept Design Review

- 4. WORKSHOP - DRRULE 1 - Concept Design Review

1- Overall view of OSHCI(M) 2017 on duty care which covers rules, responsibility and liability

2- for now, no specific regulation on OSCHI(M) but we target and expected by year 2020 for the regulation on OSHCI(M)

3- Current practice is control the accident (during the construction) but OSHCI(M) approach. We want to prevent and eliminate accident through design)

4 – OSHCI(M) highlight 3 Rules

Rules 1 – Concept

Rules 2 – Detail

Rules 3 – Construction based plan review

5 – workshop – teamwork / hands on / discussion

## COURSE CONTENTS DAY 02

1. **Review of Day 01**
2. **Communication of Safety & Health Information**
  - Types of Information
  - Means of Communication
  - Coordination Flow
3. **Managing and Update Safety & Health File**
  - Design Review Outcome (Risk Control)
  - Distributing & Verifying Advisory Notes
4. **WORKSHOP : Discussion & Practice**
  - DRRULE -1 Hazard Considerations
  - Presentation
5. **WORKSHOP : Discussion & Practice**
  - DRRULE -2 Hazard Considerations
  - Presentation
6. **WORKSHOP : Discussion & Practice**
  - DRRULE -3 Hazard Considerations
  - Presentation
7. **Recap. Q & A**
8. **Written Assessment**

1-Reflect on Day 1

2- how to communicate information and the coordination flow

3- manage and update the risk control and manage the safety health file

NEXT

More to workshop

- Explanation and hands on

Then Q&A followed by Written Assessment

## OBJECTIVES

At the end of this program, delegates will be able to describe the:-

**1. OSHCI(M) Guideline**

- Duty Holders Duties;
- Client Duties And Due Diligence;
- Design Risk Management Principles;

**2. OSH Legislation**

- Legal Structure of Secondary Legislations
- PD & D DRRULE 1 2 3
- Review Aide Memoirs

**3. Manage and Update OSHCI(M)**

- Documentations
- Design Review Process
- Distributing & Verifying Advisory Notes

**4. Upon qualifying for the Written Assessment & Report Assignment Assessment delegates will be able to commence their journey as a Principal Designer under OSHCI(M)**

By the end of this course, delegates able to

-describe DRRULElines on Duties and design principles

- Relate the OSH legislation
- Able to manage and update OSHCI(M)
- Written assessment and workplace assignment for the course completeness
- If want to be a competent person, the next step is to attend interview

## GLOSSORY

- **OSHCI(M)**
  - Occupational Safety & Health Construction Industry (Management) Guidelines 2017;
- **PtD – Prevention through Design Terminologies**
  - **DfS** - Design for Safety
  - **PtD** – Safety by Design
  - **CDM** – Construction Design Management
- **OSHCI(M) Duty Holders**
  - **CL – Client** (Developers)
  - **PD – Principal Designer** (The lead designer and/or designer appointed by the Client, who has control of the project during the Pre Construction Phase)
  - **PC – Principal Contractor** (Is the Contractor appointed by the Client when there is more then one contractor, and shall be responsible for the OSH management of a construction site during construction phase)

### ANIMATE AND DESCRIBE

1. Occupational Safety & Health Construction Industry (Management) Guidelines 2017
2. **Prevention through Design Terminologies**
  - Design for Safety
  - Safety by Design
  - Construction Design Management
3. **-CL – Client** (Developers)
  - **PD – Principal Designer** (The lead designer and/or designer appointed by the Client, who has control of the project during the Pre Construction Phase)
  - **PC – Principal Contractor** (Is the Contractor appointed by the Client when there is more then one contractor, and shall be responsible for the OSH management of a construction site during construction phase)

- **SDRM - Safety Design Risk Management**

- The process of identifying safety hazards and risk during the Pre Construction Phase;

- **DRRULE - Design Risk Rule**

- The SDRM Guide for OSHCI(M) Duty Holders to perform Pre Construction Phase risk management covering:-
  - DRRULE1 – Concept Design Review
  - DRRULE2 – Detail Design Review
  - DRRULE3 – Pre Construction Review

- **CLB – Client Brief**

- **PCI – Pre Construction Information**

- **SHF – Safety & Health File**

- **CPP – Construction Phase Plan**

#### **ANIMATE AND DESCRIBE**

4. **Safety Design Risk Management** - The process of identifying safety hazards and risk during the Pre Construction Phase

5. **Design Risk Rule** -The SDRM Guide for OSHCI(M) Duty Holders to perform Pre Construction Phase risk management covering:-

**DRRULE1 – Concept Design Review**

**DRRULE2 – Detail Design Review**

**DRRULE3 – Pre Construction Review**

- **OYK** – Orang yang kompeten (Competent Persons)
- **OYB** – Orang yang bertanggungjawab (Designated Persons)
- **SHO** – Safety & Health Officer
- **SSS** – Site Safety Supervisor
- **PBT** – Pihak Berkuasa Tempatan (Local Authority)
- **AEC** - Architecture, engineering and construction
- **IPTA** - Institut Pengajian Tinggi Awam i.e. Public Higher Education Institution.
- **IPTS** - Institut Pengajian Tinggi Swasta (Private colleges and universities)

#### ANIMATE AND DESCRIBE

- Competent person
- Designated person
- Safety & Health Officer
- Site Safety Supervisor
- Pihak Berkuasa Tempatan (Local Authority)
- Architecture, engineering and construction
- Institut Pengajian Tinggi Awam i.e. Public Higher Education Institution.
- Institut Pengajian Tinggi Swasta (Private colleges and universities)



# 1. OVERVIEW OF OSHCI(M) GUIDELINES

- Client Overall Duty of Care
- PD & D(s) Duty of Care
- Other Duty Holders Liabilities

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Start part 1 of our course

- We focus on overall view of DRRULEline and Duties

1. Client overall duty of care

2. PD & D(s) duty of care

3. Others Duty



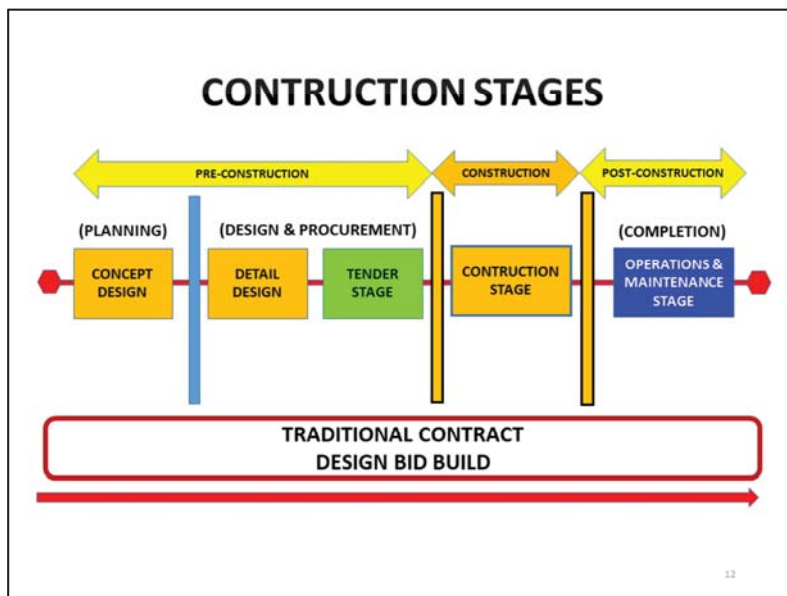
## OBJECTIVES OF OSHCI(M) DRRULELINES 2017

- These DRRULE's provide practical guidance to the client, designer and contractor on the management of safety, health and welfare when carrying out **construction projects of a structure**;
- This guidance is for people with legal duties under the Occupational Safety and Health Act and the Factories and Machinery Act.
  - **These include client, designer and contractor.**
- It explains what they **must or should do** to comply with the law and **recommends duties to them in order to manage their projects**

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DRRULEline – guide client, designer, and contractor on safety management, welfare, and carry out construction projects

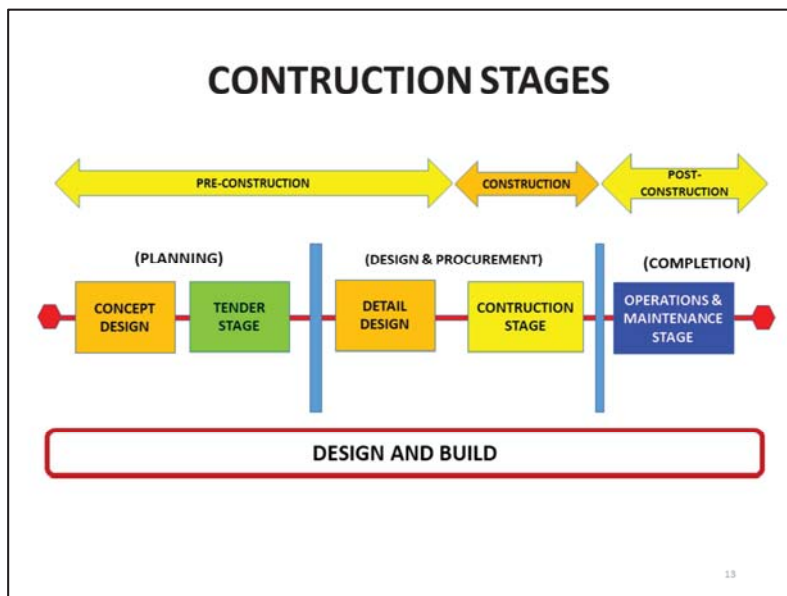
- Guide client, designer, and contractor with legal duties under OSHA
- Explains what MUST or SHOULD DO to comply laws



Construction (traditional or design and build)

-we normally focus on construction phase (BOWEC regulation)

- OSHCI(M) focus on pre-construction phase means that start prevent from design (early stage)
- Post-construction phase (OSHA and FMA)
- For traditional- Client, designer and contractor are from different party



- For Design and Build – client, designer and contractor usually come from their own group (same party)
- For example: Sunway Group (they are the main con and only sub-tender to other party)
- Between these two contracts, Design and Build is more preferable

## DEFINITIONS

- **Project means** a project which includes or is intended to include construction works and include **all planning, design, management or other works involved in a project until the end of the construction phase.**
- **Structures are defined** as any permanent or temporary structures, which also include any part of the structure and any product, or mechanical or electrical system intended for the structure.

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Permanent structures – building designed, planned or constructed so as to remain at one location

Temporary structures

-used to facilitate the construction of building, bridges, tunnels and other above and below ground facilities

- Either dismantled or removed when permanent work become self-supporting or completed

## OSHCI(M) DRRULELINES– KEY ELEMENTS

- 1) **Managing the risks** by applying the risk management approach and the **general principles of prevention**;
- 2) **Appointing the right people and organisations at the right time**;
- 3) Making sure everyone has **the information, instruction, training and supervision** they need to carry out their jobs in a way that secures safety and health;
- 4) **Dutyholders cooperating and communicating** with each other and **coordinating their work**; and
- 5) **Consulting workers and engaging** with them to promote and develop effective measures to secure safety, health and welfare

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1- Refer in OSHCI(M) appendix 1 page 60

2- refer page 3. basically based on past record, attitude, knowledge, exposure to current practice and skills

3- based on ISO requirements (must follow) –refer page 4

4- client, designer and contractor must communicate, cooperate and work together – refer page 4

5- consult workers for their experience feedback since they experienced all the construction works at the construction sites. This is very useful to develop the project design – refer page 4

## GENERAL PRINCIPLES OF PREVENTION

1. Avoid risks
2. Evaluate risks which cannot be avoided
3. Combat the risks at source
4. Adapt the work to the individual
5. Adapt to technical progress
6. Replace dangerous by non-dangerous or less dangerous
7. Develop a coherent overall prevention policy
8. Give collective protective measures priority over individual protective measures
9. Give appropriate instructions to employees

16

Describe each principles.

1- avoid the risk during very early stage of SITE SELECTION

- You need to foresee HAZARDS that can cause OSH Risks

- Perform Hazard Identification throughout the CONSTRUCTION LIFE CYCLE

2.- investigate all the possible risks

3- control risk at source

4- distribute the works to individual

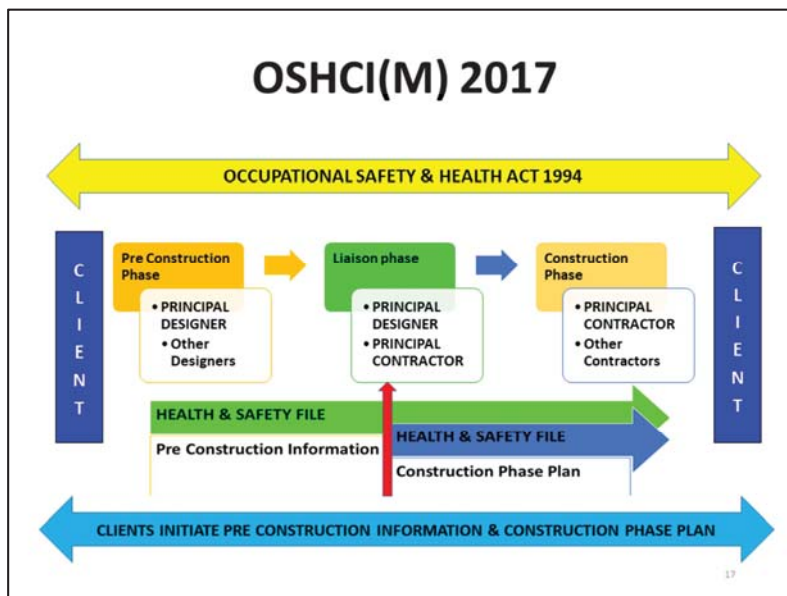
5- alert with technical issues

6- do something to replace the dangerous

7- policy towards sustainable development or mission and vision of the company

8- Collective (teamwork) preventive measure is the most important

9- the instruction must based on SOP



- model under OSHA
- pre-construction phase involved mainly designer
- Liaison phase involved designer + contractor (how to build)
- Construction phase involved main contractor coordinate to sub-contractor
- When client create project, some of them come and go but OSHCI(M) , the client will be client forever
- Throughout the life cycle, PCI and CPP must maintain to be compiled in Health and Safety File
- Health and Safety file will transfer to the client – designer – contractor and then pass back to owner.

## DUTY HOLDERS ROLE & DUTIES

- CLIENT
- PRINCIPAL DESIGNERS & DESIGNERS
- PRINCIPAL CONTRACTORS & CONTRACTORS
- WORKERS

### INDIRECT SIGNIFICANT STAKEHOLDERS

- *Enforcement Authorities*
- *AEC Professional Bodies (NGO's)*
- *Education Institutions (IPTA & IPTS)*
- *Competent Persons (SHO;SSS;CSS;OYK)*
- *Designated Person (DP;PE;OYB)*



18

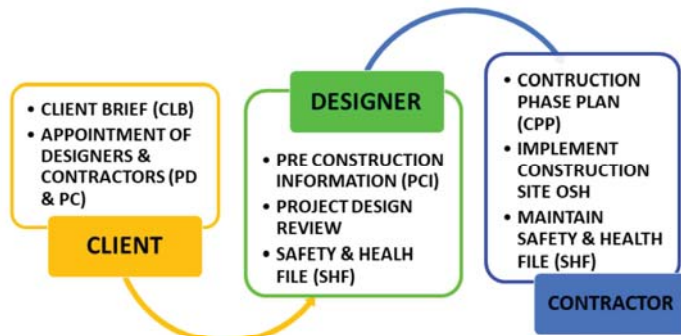
ANIMATE AND DESCRIBE

Refer OSHCI(M) for more information on

- page 6 (client)
- page 16 (PD)
- page 30 (PC & C)

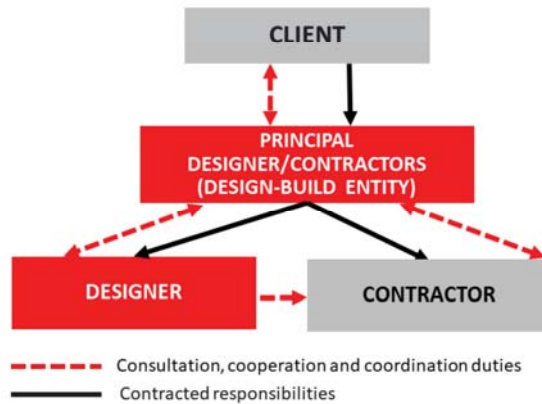


## KEY DUTY HOLDERS ROLE

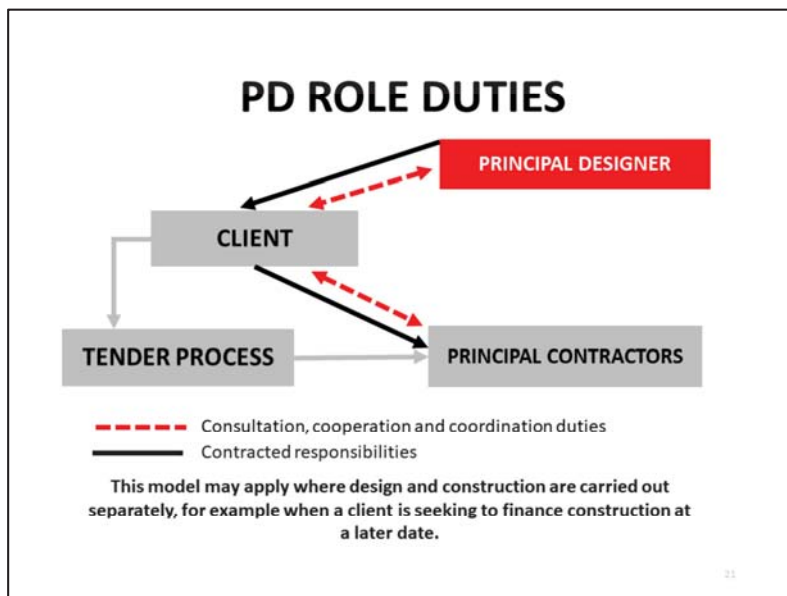


- the role shows the connection between client, designer and contractor
- brief for client is very important to give idea about the project before the appointment of PD and PC (more information on page 46 and 51)
- more information on designer on page 47 and 51
- More information on contractor on page 48 and 53

## PD ROLE DUTIES

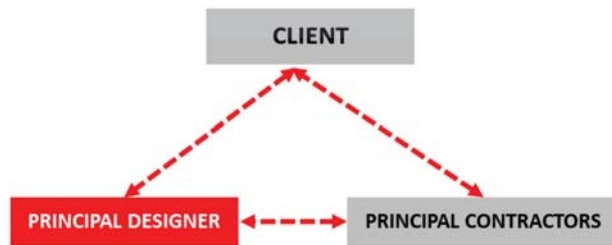


The linkage focus on consultation and contracted responsibilities  
-client mostly will perform their duties with only PC and PD



For separate design and construction, this model may applied where client cooperate and consult with all duty holders in tender process

## PD ROLE DUTIES



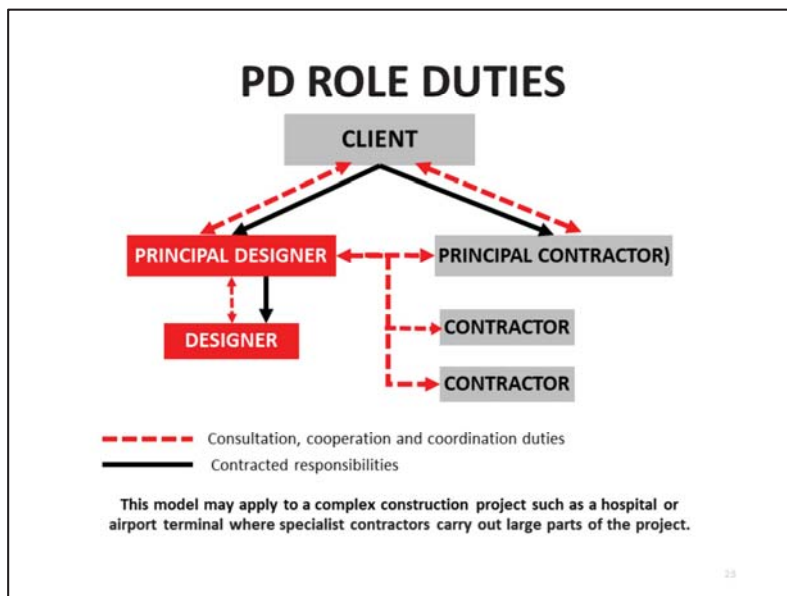
----- Consultation, cooperation and coordination duties

This model may apply where design and construction activities are integrated such as a domestic residence or apartment complex.

22

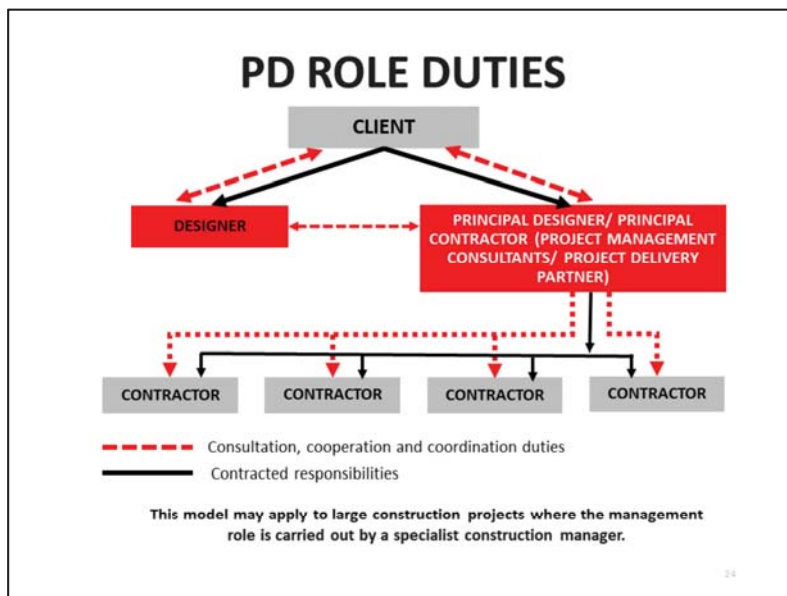
For integrated design and construction activities, this model was applied

- client consult with both PD and PC
- PC and PD will coordinate their their duties



In complex construction project it involved many dutyholders

- Client – PD – PC
- PD – D
- PC – C -- C



Large construction project

-management role carried out by specialist construction manager

-PC or PD will sub the project to other sub contractor

## DUTY HOLDER PROCESS MAP



### START OF PROJECT

- Client to check what documents are already in their possession that will be relevant to the project,
- Provide **RESOURCES (BUDGET & PEOPLE)** and **INFORMATION** to produce **Client brief**; **Pre Construction Information**; **Safety & Health File**;
- **Appoint** other DH **TIMELY** (Principal Designer & Principal Contractor);
- Ensure DH perform their duties **EFFECTIVELY**;
- Ensure are in place; **MANAGEMENT ARRANGEMENT & ENSURING PC provide Construction Phase Plan**
- Ensure all DH are **SKILL KNOWLEDGABLE EXPERIENCE AND TRAINED (SKET-CAPABLE**

25

### ANIMATE AND DESCRIBE

- Refer page 64 (appendix 3)
- Allocate resources to produce client brief (PCI, SHF)
- Other duty holder are appointed
- PC and PD carry out their duties

## DUTY HOLDER PROCESS MAP



- PD obtain and review **Client brief+Pre Construction Information; Safety & Health File; update data accordingly;**
- Ensure Client understood his duties;
- Designers ensure they are **SKET to Design out Hazards and Risk & Perform Design Risk Management Reviews**
- PD ensure DH document, communicate, and **implement Risk Controls and update any Residual Risk into SHF; Specify them into the tendering documents;**
- Cooperate, communicate and collaborate with other DH;
- PD ensure Client aware of **updated SHF upon handing over to Principal Contractor**

25

### ANIMATE AND DESCRIBE

Refer page 64 (appendix 3)

- Prepare and provide relevant information and ensure client understood their duties
- Identifying, eliminate and controlling foreseeable risk
- Obtain PD and review the client brief + PCI
- Communicate and collaborate with other DH



## DUTY HOLDER PROCESS MAP



- Ensure during tendering process, Contractor are aware of his duties;
- **Review tendering documents;**
- **Obtain SHF & PCI from Clients/PD;** ensure DH have perform their duties;
- PD assist the PC to **draw up the Construction Phase Plan;**
- **PC Plan, monitor and manage** Construction Phase;
- **Review Design changes with PD;**
- **Collaborate with other DH and update** Safety & Health File

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### ANIMATE AND DESCRIBE

- handle tendering process and review the tendering documents
- cooperate with other dutyholders
- manage and monitoring PH phase and PC Plan
- obtain SHF and PCI from clients



## **2. OVERVIEW OF OSH LEGAL FRAMEWORK**

**1. Legal Structure of Secondary Legislations**

**2. PD & D DRRULE's**

**3. Review Aide Memoirs**

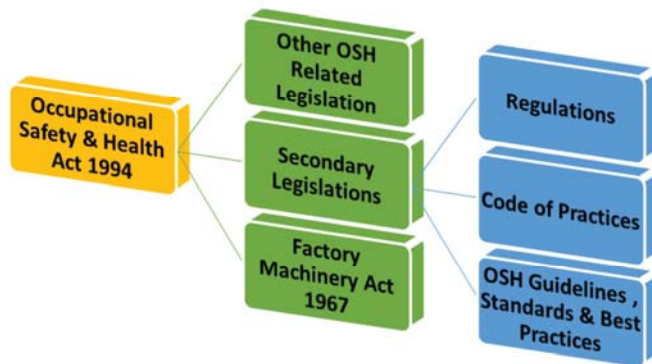
28

Secondary legislation - can be used to set the date for when provisions of an Act will come into effect as law, or to amend existing laws

The objectives are

- Secure safety, health, welfare and protect person at work
- Promote occupational environment
- Enabling act based on regulation and industrial code of practices in combination with provision act

## OSH LEGISLATION STRUCTURE



The structure start from OSH Act – Regulation – Order – Practices – Guidelines

- Regulations, code of practices and DRRULElines & best practices are all under secondary legislation

## F&M ACT 1967 LEGAL STRUCTURE



### FMA 1967

- Industrial safety and hygiene
- Safe work practices
- PIC

There are many section

- safety, health and welfare
- PIC and cert of competency
- Notification of accident
- Notice of occupation of factory

## FMA'67 ENFORCEMENT & PROSECUTIONS



31

-revised on 1974 and enforced by Factory and Machinery Department

Objectives are

- Control factories operations with respect to safety, health and welfare of persons
- Registration and inspection of machinery

## IMPLEMENTATION OF OSHA 1994



32

- Act 514 (enforced by DOSH)
- self-regulation
- Responsibilities to employer and employees
- Consultation

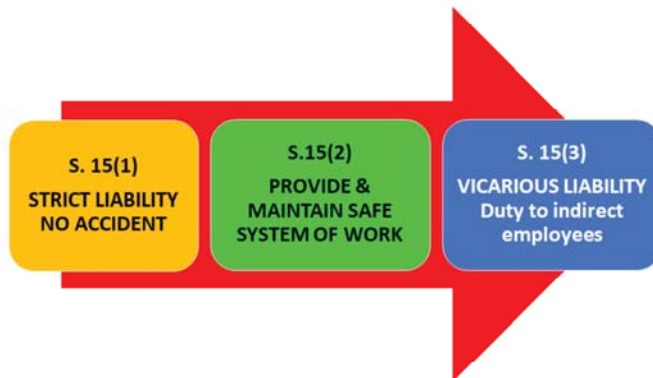
## OSH ACT 1994 - GUIDING PRINCIPLES



33

Responsibilities to ensure safety and health at workplace lies on those who create the RISK and those who work with RISK

## EMPLOYERS DUTY OF CARE (SELF REGULATION)



- 1- ensure the safety, health and welfare at work of all his employees
  - 2- provision and maintenance of plant and system of work. Absence of risk in connection with use or operation, storage and transport of plant and substances
- employee: include independent contractor engaged and the duties under subsections (1) and (2)



## GENERAL DUTY OF CARE

### Employer General Duties

- **15 Ensure Safety**
  - 15(1) Risk Assessment
  - 15(2) Risk Controls (ALARP=SSOW)
  - 15(3) Contractor Control
- **16 OSH Policy**
- **17 Safety of Other persons not at work**
- **18 Occupier liability (Occupants)**

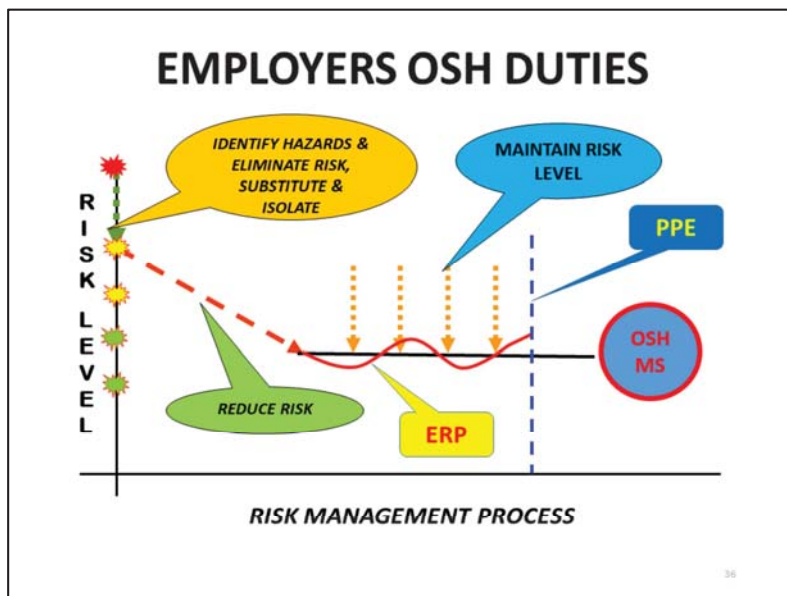
### Employees Duties

- **24 Not take risk**
- **25 Not to interfere with OSH arrangements**

35

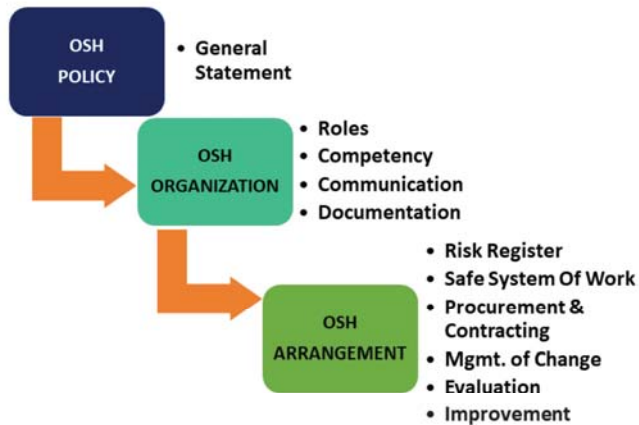
General duty of care means every person is bound without contract to abstain from injuring the person or workplace upon any another person's right

Duty of care : Responsibilities one person has to be reasonably careful



- monitor health and condition of employees, workplace under that management and control and the conform to applicable OSHA standard
- Provide workplace free from serious recognized hazardous, comply with standards, rules and regulation issued by OSH act
- The equipment, material and protective devices as prescribed are provided

## S.16 OSH POLICY



Except in such cases as may be prescribed, it be the duty of every employer and every self-employed person to prepare and as often as may be appropriate revise a written statement of his general policy with respect to the safety and health at work of his employees and the organisation and arrangements for the time being in force for carrying out that policy, and to bring the statement and any revision of it to the notice of all of his employees

## OSH ACT'94 S 58. SAFEGUARDS AGAINST FURTHER PERSONAL LIABILITY.

- Subject to the provisions of this Act and any regulation made there under, no person shall incur any personal liability for any loss or damage caused by any act or omission by him in carrying out the duties under this Act or any regulation made there under,

- ***unless the loss or damage was occasioned intentionally or through recklessness or gross negligence.***

- **(Reckless Endangerment)**

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Refer OSH Act' 94 section 58

-no person shall incur any personal liability for any loss or damage caused by any act

-carry out the duties under this Act

## OSH ACT'94 S 55. DEFENCE

- It shall be a defence in any proceedings against a person for an offence under this Act or any regulation made thereunder to satisfy the court that the offence was committed
  - **without his consent or connivance** and
  - that he exercised all such **DUE DILIGENCE** to prevent the commission of the offence as he ought to have exercised,
  - having regard to the **nature of his functions** in that capacity and to all the circumstances

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Describe S.55 OSH Act 1994

Emphasize:

1. Without Consent meaning: To provide proof the provision of Safe System of Work exists, applicable and reliable;
2. Define Connivance: ill intent.

Explain due diligence in OSH;

Refer to DOSH OSH Act 1994 DRRULEline 2006 S.55 Defence Page 63

“ Under this section the person charged needs to satisfy the court that the offence was committed without his consent. On his part the person charged must be able to show that he exercised all due diligence to prevent the offence being committed.

The essence of defence for due diligence is that

- the defendant took such reasonable and practicable measures to avoid committing the offence and
- the court could conclude that the defendant was not negligent or

otherwise at fault.

- It must be shown that the defendants mind was concentrated upon the likely risk; general precautions are “unlikely to be enough.

## TERM OF REFERENCE OF OSH LEGAL OBLIGATION FUNDAMENTALS



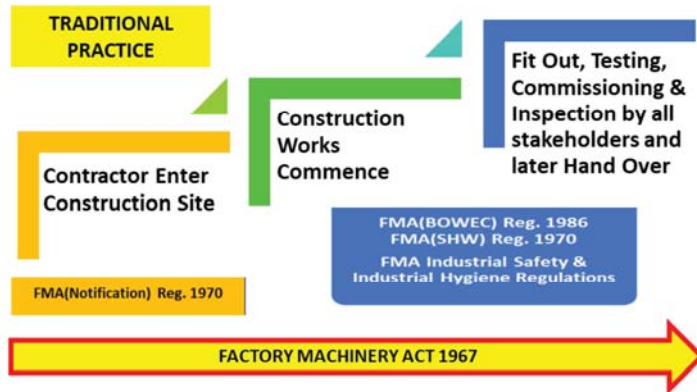
Self regulation of duty means the system of work

The blue labelled is on the NATIONAL level while

The green labelled is on organizational level

- Based on standard, instruction must be produced to explain how to do it/ procedure/ for record
- Then SOP was applied for the management
- Policies serve as a way for management to communicate expectations to employees

## CONSTRUCTION INDUSTRY DUTY HOLDERS OSH LIABILITIES



Based on FMA 1967

This is the flow process for registration to JKKP

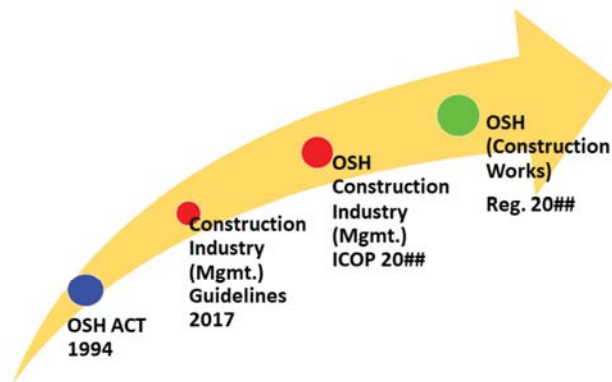
- First, notify DOSH follow the procedure in BOWEC
- After that, contractor enter the construction site and construction works commence
- Then fit out, testing, commissioning and inspection

While FMA Act 1967, It is subjected to

- FMA (BOWEC) Regulation 1970
- FMA (SHW) Regulation 1970
- FMA Industrial Safety & Hygiene



## EXPECTED LEGISLATIVE DEVELOPMENT



Now we are at 2<sup>nd</sup> stage. ICOP has been drafted by UTM and final stage projected on 2020.

- The adoption of an adequate institutional and legislative framework at national and regional level is the first priority
- basis of an efficient criminal justice response to the illicit manufacturing of and trafficking in firearms, their parts and components and ammunition.
- the first pillar of integrated approach to address the above-mentioned phenomena.

## KEY CHANGES (OSH BEYOND THE CONSTRUCTION SITE)

BOWEC(S) 1986	OSHCIM Guidelines 2017
- Prescribed control measures (how to achieve the standard)	- Set the standard/ objective to achieve, but not how
- Applies to principal/main contractor in a construction site, maintenance and demolition	- Applies to design phase, construction, maintenance and demolition (full cycle)
- Focus on design and management of construction work	- Focus on planning, design and management of construction project
- Main responsibility to principal/ main contractor and singularly responsible for OSH	- Main responsibility to the client/developer, principal designer and principal contractor

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### DESCRIBE THE ANIMATION TOPIC BY TOPIC

The several key changes from BOWEC to OSHCIM

- Set the standard to achieve the objectives
- Applies on full cycle
- Focus on early stage of construction project
- Focus on responsibilities of all duty holders

### DESCRIBE EACH PROVISIONS (Line by line on the click of mouse)



The booklet of Guidelines on OSHCIM 2017

## **OSHCI(M) DRRULELINES– KEY ELEMENTS**

- 1) Managing the risks by applying the risk management approach and the general principles of prevention;
- 2) Appointing the right people and organisations at the right time;
- 3) Making sure everyone has the information, instruction, training and supervision they need to carry out their jobs in a way that secures safety and health;
- 4) Dutyholders cooperating and communicating with each other and coordinating their work; and
- 5) Consulting workers and engaging with them to promote and develop effective measures to secure safety, health and welfare

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Refer page 2 – 4 for more elaboration

1) The general principles of prevention are set out in full in Appendix 1, but in summary they are to:

- (a) avoid risks where possible;
- (b) evaluate those risks that cannot be avoided; and
- (c) put in place proportionate measures that control them at source.

2. Appointing the right organisations and individuals to complete a particular project is fundamental to its success, including safety and health performance

- Designers and contractors

3. The level of supervision, instructions and information required will depend on the risks involved in the project and the level of skills, knowledge, training and experience of the workforce.

4. Duty holders should cooperate with each other and coordinate their work to ensure safety and health

5. Consultation about safety and health is two-way. It involves giving information to workers, listening to them and taking

account of what they say before decisions are made by the duty holder

## LR UK ENFORCEMENT PROSECUTION CDM 2015 2016/17

- **Total Enforcement Notices**
  - 3,155 enforcement notices
- **Improvement notices 1,362**
- **Prohibition notices 1,793**
- **Breaches – the notices identified 7,993 potential breaches of acts or regulations.**



**HSE** Health and Safety  
Executive  
Construction, Design & Management Regs. (CDM)

OSHCOM

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- The Regulations give effect without modifications to proposals submitted to the Secretary of State by the Health and Safety Executive ("the Executive") under section 11(3) of the 1974 Act(b).

- The goal is to prevent workplace death, injury or ill health
- It was achieved by working with dutyholders to help them understand the risks they create and how to manage them.
- Prosecution of a company or an individual is recorded as a case.  
The case may involve more than one breach of health and safety law

## Enforcement Prosecution (HSE UK)

- **2016 ~ 2017**

- **Of the 1,669 potential breaches of CDM 2015,**
  - **Principal Contractor (489);**
  - **Contractor duties (278)** were by far the most frequent.
  - **Client duties (99)** potential breaches;
  - **Principal Designer duties (5)** potential breaches ;
  - **Designer duties (2)** potential breaches;



OSH/CIM

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- Records of prosecutions of organisations are published on this register for 1 year before being transferred to the prosecution history register, where they are published for a further 9 years.
- enforcement action to ensure dutyholders:
  - i) deal immediately with serious risks (so they prevent harm)
  - ii) comply with the law
  - iii) are held to account if they fail in their responsibilities
- enforcement options include:
  - i) providing information and advice face-to-face or in writing
  - ii) serving notices on dutyholders
  - iii) withdrawing approvals
  - iv) varying licenses, conditions or exemptions
  - v) issuing simple cautions
  - vi) prosecution

## CDM failing costs Crest Nicholson £800k 29 Sep 2016

- Crest Nicholson Operations, the **PRINCIPAL CONTRACTOR** of a large housing development project in Surrey, has been fined after a worker was run over by a heavy goods vehicle (HGV).
- Crest Nicholson pleaded guilty to breaching Reg. 36(1) of the **CDM Reg 2007**,
  - *which states that pedestrians and vehicles must be able to move around a construction site without risks to safety.*
  - **It was fined £800,000 plus £10,984 costs.**

<https://www.ioshmagazine.com/article/cdm-failing-costs-crest-nicholson-ps800k>

OSHCOM

48

David Cole, who was contracted to Harlequin Brickwork, was working as a foreman on the construction site in Wokingham. Work started in 2013 and is due to be completed next April.

**On 7 December 2014 he walked along the nearside of the HGV, which had reversed into a T junction. The vehicle suddenly pulled forward and turned towards the pavement, hitting him.**

He was pulled underneath the vehicle and sustained life-threatening injuries; his skin was removed from his left arm and leg and he needed pinning surgery to repair a fractured hip. His left leg is now 2 cm shorter than his right.

Reading Crown Court was told that Crest Nicholson had failed to effectively plan and manage the workplace transport. The safety and health Executive (HSE) said the accident could have been avoided had the company ensured workers stayed behind the pedestrian barriers and did not walk on the road, and prevented HGVs reversing hundreds of metres at once.

**Crest Nicholson pleaded guilty to breaching Reg 36(1) of the Construction (Design and Management) Regulations 2007, which states that pedestrians and vehicles must be able to move around a construction site without risks to safety. It was fined £800,000 plus £10,984 costs.**

HSE inspector John Berezansky said: "David Cole suffered life-changing injuries because Crest Nicholson did not properly manage and monitor the workplace transport of their construction site."



## Developer lands £200k fine for CDM breaches **12 Sep 2017**

- The owner of a block of flats has **been fined £200,000 after allowing work on an unsafe site to restart** after a HSE inspector had served him **enforcement notices.**
- Selliah Sivguru Sivanewaran, pleaded guilty to breaching **Reg 13(1) and 4(1) of the CDM Reg. 2015**



Demolition was carried out by hand with workers climbing on to the unguarded roof.  
Image: HSE

<https://www.ioshmagazine.com/article/update-developer-lands-ps200k-fine-cdm-breaches>

OSHCIM

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Verrall-Withers said the worker supervising had now been engaged as a contractor. “Sivanewaran hadn’t appointed anyone in writing,” he said. “I had already written to him and said that the worker supervising, who I’d met in October, had no safety and health training, had been working dangerously on the roof and should not be left to supervise the work”.

The inspector added that Sivanewaran had not appointed a principal contractor. He had also failed to engage a site manager and provided none of the required site documentation. He served a prohibition notice, closing the site down until a suitable contractor was appointed.

Selliah Sivguru Sivanewaran, of Harlyn Drive, Pinner, pleaded guilty to breaching reg 13(1) and 4(1) of the Construction (Design and Management) Regulations 2015 at an earlier hearing at Westminster Magistrates’ Court on 25 July but the judge delayed the sentencing to 30 August, so he could consider the case and to give Sivanewaran time to provide financial records.

## CDM 2015 FIRE RISK PD and PC failed to comply with CDM May 24 2018

- **safety and health breaches including:**
  - Risk; Management; Fire
- **The CDM Principal Contractor; Coast & Country Construction Limited**
  - was required to control how the work was carried out and to ensure that the work would be completed safely.
  - **fined £150,000 and ordered to pay costs of £6,039.**
- **The CDM Principal Designer; Paul Humphries Architects Ltd**
  - failed during the pre-construction phase to consider the risk of fire spread to the vulnerable nearby residents.
  - **Fined £20,000 and ordered to pay costs of £6,039.**

OSHCOM

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### 1. Background of Breach

- **PC & PD put Dementia patients living at a care home in Exmouth were put at risk of death** because a building firm and architect company ignored safety and health rules.

### 2. Breaches

- **Risk** – uncontrolled high-risk activities putting workers at risk of death, serious injuries or ill health including falls from height, fire, slips and trips and poorly controlled wood dust.

- **Management** – a “total disregard” for **safety and health and site management**; and

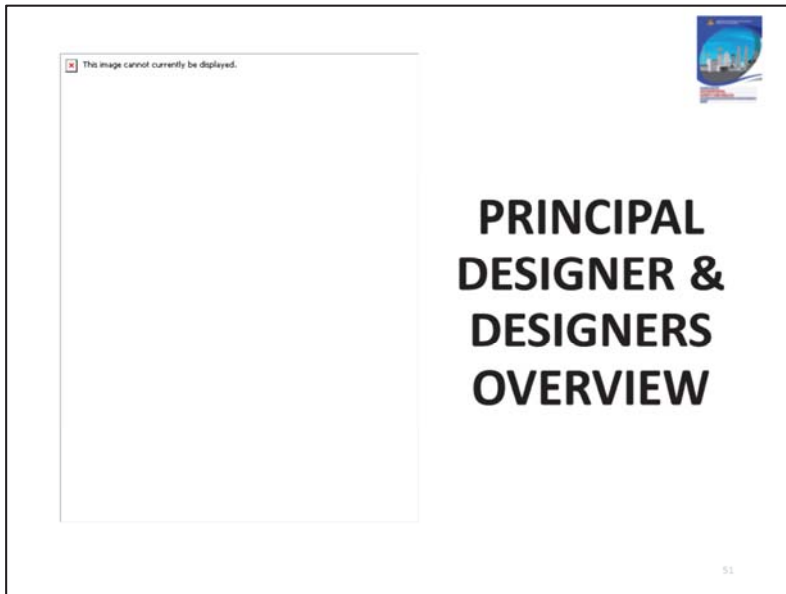
- **Fire** – risk of fire spread associated with the construction of a timber frame extension adjoining an existing building where physically and/or mentally impaired residents of the home were put at risk of injury or death due to the possibility of fire spreading into the home.

### 3. PC & PD Charged and pleaded guilty

- **PC Coast & Country Construction Limited** – of Concord Road, Exmouth did not attend court but were found guilty in their absence to breaching Section 2 (1) and 3 (1) of the

safety and health at Work etc. Act 1974, and have been fined £150,000 and ordered to pay costs of £6,039.

- **PD Paul Humphries Architects Ltd** – of Salterton Road, Exmouth pleaded guilty to breaching Regulation 11 (1) and 11 (3) of the Construction (Design and Management) Regulations 2015, and have been fined £20,000 and ordered to pay costs of £6,039.



PD- refer page 21 – 24

D – refer 16- 19 for detail information

## WHO IS THE DESIGNERS

- **A designer is an organisation or individual**, who in the course or furtherance of a business:
  - **prepares or modifies a design** for a construction project (including the design of temporary works); or
  - **arranges for, or instructs someone else** under their control to do so,
- **The term 'design' includes:-**
  - drawings, design details, specifications, bills of quantity and calculations prepared for the purpose of a design.
- **Designers includes:-**
  - architects, architectural technologists, consulting engineers, quantity surveyors, interior designers, temporary work engineers, chartered surveyors, technicians or anyone who specifies or alters a design

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- A designer has a strong influence during the concept and feasibility stage of a project. The earliest decisions can fundamentally affect the safety and health of those who will construct, maintain, repair, clean, refurbish and eventually demolish a building.

- **A designer should address safety and health issues from the very start.**

Where issues are not addressed early on, projects can be delayed and it can become significantly harder for contractors to devise safe ways of working once they are on site

## WHY DESIGNERS HAVE A KEY ROLE IN SAFETY & HEALTH

1. **Designers have a key role to play in OSHCIM 2017 as they are in a unique position to reduce the risks that arise during construction work.**
  - The earlier that decisions are made by them, **the greater will be the affect on construction health and safety and the influence of later design choices.**
  - It is vital to consider health and safety in the design process from the outset.
2. **Designers often consider health and safety in their designs by utilising the 'Hierarchy of Risk Control' during the design process.**
  - This process allows them **to eliminate or mitigate risks** to health and safety within their designs.
  - Where it is not possible to eliminate particular risks, information about them must be passed to the **Principal Contractor for inclusion in the Construction Phase Plan.**

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This is a series of steps to be followed when designing to eliminate and reduce [risk](#) by their design decisions, as follows:

- i) Consider whether it is possible to eliminate or control the hazard and the resulting risk by designing it out, i.e. design the roof with permanent safety rails.
- ii) Next consider whether the risk can be combated in the design i.e. change design of items to be lifted to incorporate attachment points for lifting.
- iii) Next consider measures to control [risk](#) to all the workers i.e. design a one way system for vehicles visiting the site.
- iv) Only as a last resort should it be necessary to control risk by means of personal protection.

### **Hierarchy of Risk Control**

from the most effective to least effective

1. Elimination (physically remove the hazards)
2. Substitution (replace the hazard)
3. Engineering controls (isolate people from hazard)
4. Administrative controls (change the way people work)
5. PPE (protect the worker with PPE)

## WHY DESIGNERS HAVE A KEY ROLE IN SAFETY & HEALTH

3. In arriving at design decisions concerning risk, the designer can take account of the costs of eliminating, or including, a design feature.
  - These costs can be counted not just in financial terms but, for instance, in aesthetics, buildability, fitness for purpose, and environmental impact.
4. Designers' responsibilities extend beyond the design phase.
  - They need to consider the safety of those people who maintain, clean, repair and eventually demolish their structures.



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Refer page 26 and 27 on example 6. there are some design options to control risks in various stages of the lifecycles.

- Design for safe construction
- Design to facilitate safe use
- Design for safe maintenance
- Modification
- Demolition and dismantling

## DUTIES OF DESIGNERS - CHECKLIST

**The designers' duties on all construction projects are to:**

1. Ensure that the client is **aware of the client's duties** prior to commencing any design work.
2. Ensure that personnel allocated to their design team from internal resources are **competent and adequately resourced**.
3. Ensure that any **designers or contractors** that are engaged on the project are **competent and adequately resourced**.
4. **Ensure that the design and the designers' duties are complied with by any designers engaged by them, including any designers who are based outside Malaysia**

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### 1. ENSURE THAT THE CLIENT IS AWARE OF THE CLIENT'S DUTIES

The designer has an absolute duty under OSHCIM 2017 to ensure that the client is aware of the client's duties prior to commencing any design work.

- This should be first thing that a designer does on first contact with the client and must be performed for all construction work.

- **Whether the project is notifiable and the additional duties** that this would cause the client to perform, would usefully be discussed at this time.

### 2 & 3. COMPETENCE AND RESOURCES

Any design organisation has an absolute duty to ensure that personnel allocated to their design team from internal resources are competent and adequately resourced. - This would apply to both employees and agency personnel employed on the project.

- Designers who **sub-contract design or arrange design work** on the project to a designer who is based outside MALAYSIA has an absolute duty to ensure that the design and the designers' duties are performed in with OSHCIM 2017 .

- If the designer who sub-contracts or arranges design work outside MALAYSIA is themselves not located within MALAYSIA, the client must verify compliance.



## DUTIES OF DESIGNERS - CHECKLIST

**The designers' duties on all construction projects are to:**

- 5. Eliminate or reduce safety and health risks** to constructors, users, maintainers, repairers, commissioners, testers, cleaners, demolishers, etc. **when preparing the design.**
- 6. Co-operate and communicate** with other designers, including temporary works designers, to ensure adequate co-ordination of the design.
- 7. Provide information about the risks which cannot be satisfactorily addressed by their designs to the client, other designers and contractors.**

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### 5. ELIMINATE OR REDUCE RISKS BY DESIGN

So far as is reasonably practicable, the designer should eliminate or reduce safety and health risks to constructors, users, maintainers, repairers, commissioners, testers, cleaners, demolishers, etc. when preparing their design.

- Designers will be required to **establish ground rules** for determining that which will be regarded as reasonably practicable.
- What frequency of personnel access to the edge of the roof or pier on a bridge for maintenance purposes would constitute the need for permanent edge protection?
- Would it be sufficient to make provision for the simple attachment of guard-rails for such work or even fixings for safety harnesses?
- Considerable guidance has been provided by DOSH and such bodies as the CIDB and other organization locally and/or internationally, showing various options for designers when attempting to eliminate and reduce risk by design.
- The designers' considerations for the reduction of risk by design do not relieve the constructor, maintainer, repairer, cleaner, etc. of their obligations to perform risk assessments and provide a safe and healthy workplace and system of work.
- The designers' knowledge of the construction, use, maintenance, repair, testing, commissioning, cleaning and demolition/dismantling processes and of the S&H legislation will provide an understanding of the risks that will be encountered.
  - This information will be supplemented by guidance as and when applicable..
- The designer will also require some knowledge as to the types and frequency of

maintenance, testing, repair and redecoration activities.

- This will allow decisions to be taken about the resources necessary to overcome risks and make judgements on whether it is "reasonably practicable" to incorporate a particular facility into the design.

It is essential that designers have a sound knowledge of health and safety issues, as required by the regulations, to ensure compliance with their duties.

**Designers may wish to produce a hazard inventory associated with the design elements for both construction and post-construction work such as maintenance, cleaning, etc.**

## **7. Provide information**

Significant risks are not necessarily those that involve the greatest risks, but those, including health risks that are:

- a) not likely to be obvious to a competent contractor or other designers;**
- b) unusual; or**
- c) likely to be difficult to manage effectively.**

Information provided by the designer should be brief, clear, precise, and in a form suitable for the users.

**This can be achieved using:**

- a) notes on drawings**
  - This is preferred, since the notes will then be immediately available to those carrying out the work.
  - They can refer to other documents if more detail is needed, and be annotated to keep them up to date;
- b) written information provided with the design**
  - This should be project specific, and should only contain information which will be useful to those constructing or maintaining the structure;
- c) suggested construction sequences**
  - Showing how the design could be erected safely, where this is not obvious, for example suggested sequences for putting up pre-cast panel concrete structures.
  - Contractors may then adopt this method or develop their own approach.

**The information should be provided by the designer to whomever needs it, including the client, other designers and contractors.**

## DUTIES OF DESIGNERS - CHECKLIST

On projects requiring LEGAL NOTIFICATION the designers' additional duties are to:

- a) **Verify that the project has been notified** and that the **Principal Designer has been appointed** as soon as possible after commencement of initial or preliminary design.
- b) **Co-operate with the Principal Designer** for the verification of design and designer compliance and the co-ordination of the design.
- c) **Provide any information requested by the Principal Designer for the health and safety file.**

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1. after commencement of initial / preliminary design – the designers has to notify the project and APPOINT PD
2. D and PD must cooperate to verify the design / coordination of design
3. Provide info requested by PD for HSE file

## WHO IS THE PRINCIPAL DESIGNER

- **A PD is the designer with control over the pre-construction phase of the project.**
  - This is the very earliest stage of a project **from concept design through to planning the delivery of the construction work.**
- The PD shall be **appointed in writing** by the client to carry out their duties.



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The following can also be provided via the pre-construction process.

- Procurement plan
- Execution plan
- Project scope
- Engineering
- Evaluations as specified by client
- Basis of design
- Integrated Project Schedule
- Risk analysis
- Utility requirements
- Cash curve
- Constructability review
- Equipment list

Principal designers must:

- plan, manage, monitor and coordinate health and safety in the pre-construction phase.
- carried out both before and after the construction phase has started help and advise the client in bringing together pre-construction information, and provide the information [designers](#) and [contractors](#) need to carry out their duties
- work with any other designers on the project to **eliminate** foreseeable health and safety risks to anyone affected by the work and, where that is not possible, take steps to **reduce or control** those risks
- ensure that everyone involved in the pre-construction phase communicates and cooperates, coordinating their work wherever required
- liaise with the [principal contractor](#), keeping them informed of any risks that need to be controlled during the construction phase

## WHO IS THE PRINCIPAL DESIGNER

- The PD is an organisation (or on a smaller project they can be an individual) that has:
  - The **technical knowledge** of the construction industry relevant to the project;
  - The **understanding and skills** to manage and coordinate the preconstruction phase, including any design work carried out after construction begins.
- Where the **PD is an organisation** they should have the organisational capability to carry out the role as well as the **necessary skills, knowledge and experience that individual designers** must have.

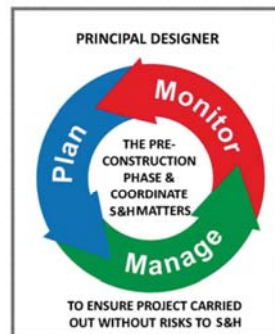
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The principal designer can be an organisation or an individual that has:  
(a) the technical knowledge of the construction industry relevant to the project;  
(b) the skills, knowledge and experience to understand, manage and coordinate the pre-construction phase, including any design work carried out after construction Begins

- Principal designers may have separate duties as designers

## WHO IS THE PRINCIPAL DESIGNER

- The PD must have knowledge and skills to apply the **principles of Design Risk Management**, and
- have knowledge of **OSHCI(M) Guideline 2017** and relevant OSH Construction legislations , Code of Practices & Guidelines;



- Risk management is the process of formulating and implementing a course of action to mitigate the hazards determined in the risk-assessment process to be important

- To be effective, risk management must have two elements: a specific occupational health and safety plan and an appropriate safety culture and working environment.

# PRINCIPAL DESIGNERS DUTIES

1. Planning, managing, monitoring and coordinating
2. Identifying, eliminating or controlling foreseeable risks
3. Ensuring coordination and cooperation
4. Providing pre-construction information
5. Liaising with the principal contractor



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## 1. PLANNING, MANAGING, MONITORING AND COORDINATING

In carrying out the duty to plan, manage, monitor and coordinate the preconstruction phase, principal designers must take account of:

- a) the general principles of prevention and, where relevant, the content of:
- b) any construction phase plan.

- This will be relevant when the plan has implications for any design work that is carried out after the construction phase has started e.g. ground contamination discovered affecting the choice of piling method; and

- c) any existing health and safety file.

- In cases where a health and safety file has been prepared as part of previous construction work on the building, the file should have information which will help the planning, management and coordination of the pre-construction phase.

This information should be taken into account, in particular, when decisions are being taken about design, technical and organisational issues in order to plan which items or stages of work can take place at the same time or in sequence; and when estimating the time needed to complete certain items or stages of work.

The principal designer's work should focus on ensuring the design work in the pre-construction phase contributes to the delivery of positive health and safety outcomes.

Bringing together designers as early as possible in the project, and then on a regular basis, to ensure everyone carries out their duties will help to achieve this. This can be done as part of the normal design process. Regular design meetings chaired by the principal designer are an effective way to:

- a) discuss the risks that should be addressed during the pre-construction phase;**
- b) decide on the control measures to be adopted; and**
- c) agree the information that will help in preparing the construction phase plan.**

When appointing any designers, the principal designer must check that these designers have sufficient skills, knowledge, experience and (if they are an organisation) the organisational capability to carry out the work. These checks should be carried out before appointment takes place.

The principal designer's role continues into the construction phase when design work is carried out and when gathering and preparing information for the health and safety file.

## **2. IDENTIFYING, ELIMINATING OR CONTROLLING FORESEEABLE RISKS**

Principal designers must ensure, as far as is reasonably practicable, that foreseeable risks to health and safety are identified. In practice, this will involve the principal designer working with other designers involved with the project. The risks that should be identified are those that are significant and are likely to arise:

- a) while carrying out construction work; or**
- b) during maintenance, cleaning or the use of the building as a workplace once it is built.**

Once the risks have been identified, principal designers must follow the approach to managing them set out in the general principles of prevention. The principal designer must, as far as reasonably practicable, ensure that the design team:

- a) Eliminate the risks associated with design elements.**

- If this is not possible (for instance because of competing design considerations such as planning restrictions, specifications, disproportionate costs or aesthetics):

- b) Reduce any remaining risks; or**

- c) Control them, to an acceptable level.**

- This relies on exercising professional judgement in considering how the risks can be managed. The focus should be on those design elements where there is a significant risk of injury or ill-health.

## **3. ENSURING COORDINATION AND COOPERATION**

Principal designers must ensure that:

- a) Everyone involved in working on the pre-construction phase cooperates with each other.**

- They must establish that effective communication is occurring and that information is shared within the project team.

- This could involve holding meetings with others in the design team.



- Progress meetings with the client and the principal contractor also provide a way of ensuring work on the project is properly coordinated;
- b) Designers comply with their duties (see designer duties).
- Appropriate checks should be made to ensure that designers are dealing with design risks appropriately.
- This can be done as part of the design process and through regular progress meetings;
- c) Designers are providing information about elements of the design which present significant risks that cannot be eliminated.**
- This should include information about unusual or complex risks that are more likely to be missed or misunderstood by contractors or others on the project rather than risks that are well-known and understood.

#### **4. PROVIDING PRE-CONSTRUCTION INFORMATION**

Pre-construction information is defined as information that is already in the client's possession or which is reasonably obtainable. It must be relevant, have an appropriate level of detail and be proportionate given the nature of risks to health or safety involved in the project.

The client has the main responsibility for pre-construction information. However, the principal designer must help and advise the client. The principal designer should help the client bring the information the client already holds (such as any existing health and safety file or asbestos survey) together. The principal designer should then:

- a) assess the adequacy of existing information to identify any gaps in the information which it is necessary to fill; and**
- b) provide advice to the client on how the gaps can be filled and help them in gathering the necessary additional information.**
- b) provide, as far as they are able to, the necessary information promptly and in a convenient form to help designers and contractors who:**
  - are being considered for appointment; or**
  - *have already been appointed, to carry out their duties.***
  - *Further guidance on the requirements relating to the preconstruction information.***

#### **5. LIAISING WITH THE PRINCIPAL CONTRACTOR**

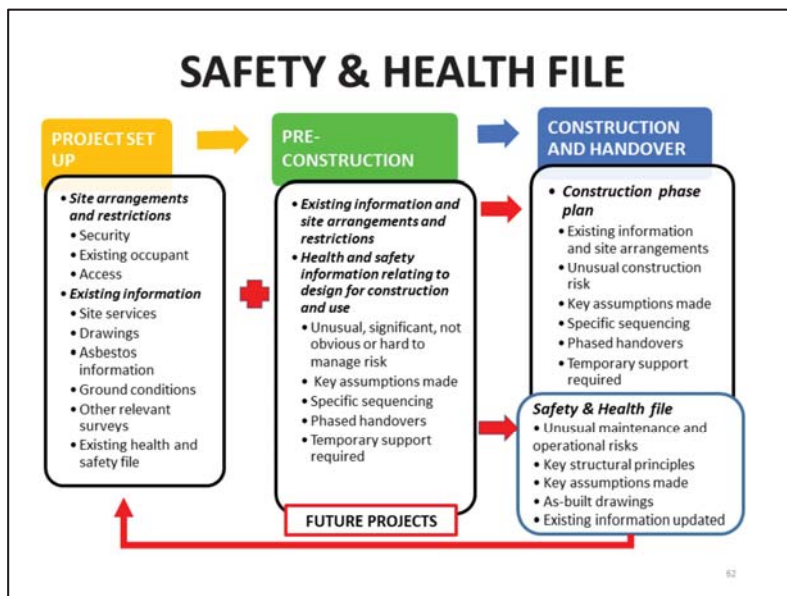
The principal designer must liaise with the principal contractor for the duration of their appointment. During the pre-construction phase this must cover sharing information that may affect the planning, management, monitoring and coordination of the construction phase - in particular, the information needed by the principal contractor to prepare the construction phase plan. Liaison should also extend into the construction phase to deal with on-going design and obtaining information for the health and safety file. This could be done by holding regular progress meetings with the principal contractor.

**If the principal designer's appointment finishes before the end of the project,** the principal designer must ensure that the principal contractor has all the necessary information so that they:

- a) are aware of the risks which have not been eliminated in the designs;**

- b) understand the means employed to reduce or control those risks; and
- c) understand the implications for implementing the design work during the remainder of the project.

The principal designer should also **arrange for a handover of the health and safety file to the principal contractor** and make them aware of any issues that may need to be taken into account in reviewing, updating and completing it.



Process flow of a project

- starts from project set up
- pre-construction proceed after the existing of health and safety file
- The construction begin after existing information and site arrangement
- SHF will pass back to client after the construction
- Refer page 54



## 3. ACCIDENT PREVENTION PRINCIPLES

1. Accident Causal Factors & Risk Assessment
2. Hierarchy of Control
3. Construction Hazards & Risk

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### 1. Accident causal factors

- Equipment
- Environment
- People
- Management

### 2. Hierarchy of control

- Elimination – substitution – engineering controls – admin control – PPE

### 3.

-Hazard - *A Hazard is a potential source of harm or adverse health effect on a person or persons'.*

- Risk – *'risk is the likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard.'*

## RISK MANAGEMENT PRINCIPLES



- Risk Assessment is where the severity of the Hazard and its potential outcomes are considered in conjunction with other factors including the level of exposure and the numbers of persons exposed and the risk of that hazard being realised. There are a number of different formulae used to calculate the overall risk from basic calculations using high, medium and low categories to complicated algorithms to calculate risks at Nuclear power stations and other high risk work locations.

- Risk Management Practices
  - i) Involve stakeholders
  - ii) Tone from the top
  - iii) Communication
  - iv) Clear risk management policies
  - v) Continuous monitoring

## TYPE OF RISK

- **PURE RISK**
  - HAZARDS
- **SPECULATIVE RISK**
  - BUSINESS
- **SENSIBLE RISK**
  - SURVIVABILITY



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- risk involves a hazard combined with volition or will. Different types of building contract will allocate risk in different quarters
- Pure (particular) risk – damage to person and property
- Speculative - something which can be apportioned in advance as decided by the parties to the contract. This may include losses in time and money, which result from unexpected ground conditions, exceptionally adverse weather, unforeseeable shortages of labour or materials, and other similar matters beyond the control of the contractor.
- Other basic risks are – technical / external / organisational / project management risks



- about taking practical steps to protect people from real harm and suffering - not bureaucratic back covering
- Monitoring
- Assessing
- Alleviating

Sensible approach to risk management is about:

- ensuring that workers and the public are properly protected
- enabling innovation and learning not stifling them
- ensuring that those who create risks manage them responsibly and understand that failure to manage significant risks responsibly is likely to lead to robust action
- providing overall benefit to society by balancing benefits and risks, with a focus on reducing significant risks - both those which arise more often and those with serious consequences
- enabling individuals to understand that as well as the right to protection, they also have to exercise responsibility



# ACCIDENT CAUSATION THEORIES CONSEQUENCES

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For this part, we will look into some theories

- i) Accident causal theory
- ii) Dominos theory

And some model

- i) Loss causation model
- ii) Multiple causal model

And the accident consequences



# ACCIDENT CAUSAL THEORY

- **Role of Herbert W. Heinrich (1930's),**
  - Developed **Domino Theory** and promoted control of workers behaviour.
- **Problem;**
  - *Focused on worker behaviour and not management*
  - *Caused people to think that safety is about policing worker*

68

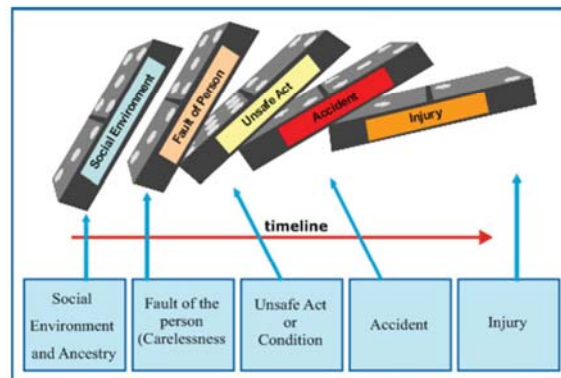
## Herbert W. Heinrich

- was an [American](#) industrial safety pioneer from the 1930s.
- He was an Assistant Superintendent of the Engineering and Inspection Division of Travelers Insurance Company
- he published his book *Industrial Accident Prevention, A Scientific Approach* in 1931
- One empirical finding from his 1931 book became known as Heinrich's Law: that in a workplace, for every accident that causes a major injury, there are 29 accidents that cause minor injuries and 300 accidents that cause no injuries
- Because many accidents share common root causes, addressing more commonplace accidents that cause no injuries can prevent accidents that cause injuries.
- Heinrich's work is claimed as the basis for the theory of [Behavior-based safety](#) by some experts of this field, which holds that as many as 95 percent of all workplace accidents are caused by unsafe acts.
- He came to this conclusion after reviewing thousands of accident reports completed by supervisors, who generally blamed workers for causing accidents without conducting detailed investigations into the root causes.
- Heinrich's figure that 88 percent of all workplace accidents and injuries/illnesses are caused by "man-failure" is perhaps his most oft-cited conclusion, his book actually encouraged employers to control hazards, not merely focus on worker behaviors.
- "No matter how strongly the statistical records emphasize personal faults or how imperatively the need for educational activity is shown, no safety procedure is

complete or satisfactory that does not provide for the . . . correction or elimination of . . . physical hazards," Heinrich wrote in his book.

- Emphasizing this aspect of workplace safety, Heinrich devoted 100 pages of his work to the subject of machine guarding.<sup>[2]</sup> Heinrich did safety work across many industries, with published data, which gives guidelines of how to scale up from incidents and near misses to a good estimate of the probability of real accidents.

## DOMINO THEORY



According to **Heinrich**, an "accident" is one factor in a sequence that may lead to an injury. • The factors can be visualized as a series of dominoes standing on edge; when one falls, the linkage required for a chain reaction is completed.

## ACCIDENT CAUSAL THEORY

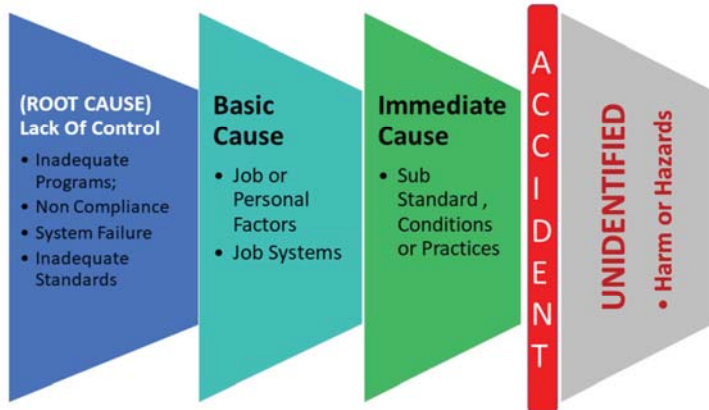
- Frank Bird (1970) developed *Loss Control Theory*.
  - Suggested that underlying cause of accidents are lack of management controls and poor management decisions.
- Problem:
  - Not so popular: blames management (responsibility and control).

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Around 1970, Frank E. Bird, a researcher with the International Loss Control Institute, revised Heinrich's domino theory (Bird and O'Shell 1973). Bird's model was a simple revision, but it was an important insight, because it introduced the thought of managerial error into the accident causation sequence.

**Frank Bird** (1970) developed *Loss Control Theory*. Suggested that underlying cause of accidents are lack of management controls and poor management decisions. Problem: not so popular & blames management (responsibility and control).

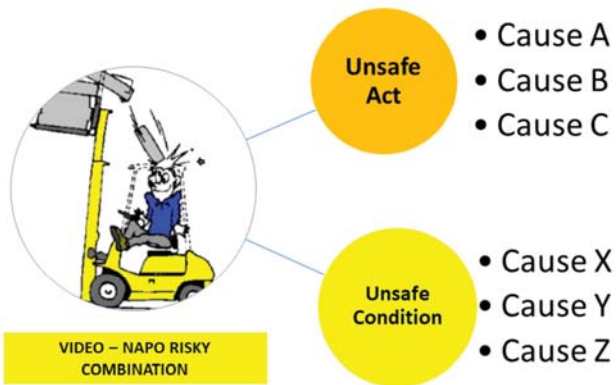
## LOSS CAUSATION MODEL



It is adapted from International Loss Control Institute Loss Causation Model (modified from Bird and Germaine 1985)

-They recognised the need for management to prevent and control accidents in what were fast becoming highly complex situations due to the advances in technology. They developed an updated domino model which they considered reflected the direct management relationship with the causes and effects of accident loss and incorporated arrows to show the multi-linear interactions of the cause and effect sequence

## MULTIPLE CAUSAL MODEL



For example

Accident (trip)

-Cause A (poor lighting)

-Cause B (not look where going)

-Cause C (wood in walkaway)

This is compatible with loss causation theory

# ACCIDENT CONSEQUENCES



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Accidents can **lead** to many negative consequences, including serious **injuries** and the expensive costs along that come with them. When innocent victims have to suffer from these consequences, it is in their best interests to pursue compensation from the person or company that caused the accident.

## THREE MAJOR RESPONSIBILITIES OF THE MANAGEMENT OF AN ORGANIZATION:

### 1. MORAL

- towards the worker

### 2. LEGAL

- non compliance is a crime

### 3. FINANCIAL

- towards the shareholders and stakeholders



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1 – give moral support to the workers and team

2 – check the legal requirement to make sure it is compliance with the act and legislation

3 – provide and manage the financial to the stakeholders and shareholders





# GROUP EXERCISE IDENTIFY THE INCIDENT CAUSAL FACTORS

SUGGEST REMEDY

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## **Break into 4 Groups**

1. Identify Cause Factors
2. Determine the ROOT CAUSES
3. Suggest Corrective & Preventive Actions

**Q. Can this be prevented during Pre Construction**  
**If so HOW**

## IDENTIFY THE CAUSAL FACTORS



<https://www.malaymail.com/s/698757/major-road-access-to-bukit-bintang-cut-off-by-10m-deep-sinkhole>

76

The major thoroughfare serving the city's bustling Golden Triangle was cut off this morning after a **burst water pipe caused a section of it to collapse**.

The mid-morning incident happened along a 19-metre stretch at the busy Jalan Pudu-Jalan Imbi-Jalan Hang Tuah intersection, **ending with a 10-metre deep sinkhole just 20 metres from the elevated KL Monorail track near the Imbi station**.

### READ ALOUD

In an immediate response to the incident, MRT Corporation Sdn Bhd (MRT Corp) stressed that the road collapse had nothing to do with the project as the alignment of the MRT Sungai Buloh-Kajang line does not pass the location.

"MRT Corp wishes to state unequivocally that the incident is not related in any way to the MRT project," the company said in a brief statement posted on its official Facebook page.

### DISCUSS:

1. Do you agree with this statement?
2. Is there a possibility to foresee this incident? If yes HOW?

## IDENTIFY THE CAUSAL FACTORS



<http://www.theborneopost.com/2016/12/11/incompetent-crane-handlers-a-factor-in-frequent-accidents/>

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**File photo shows construction workers lifting the piling machine that crashed a car killing a couple on Nov 5 in Klang. — Bernama photo**

KUALA LUMPUR: Incompetent crane handler is among factors seen as contributing to the frequent occurrence of accidents at construction sites.

A senior lecturer in Building Technology, School of Housing, Building and Planning, Universiti Sains Malaysia, **Dr Mohd Zailan Sulieman said there are crane handlers who did not attend the safety and health Induction Course** which is required for construction workers as stipulated by the authorities.

**“This issue is often discussed at seminars and forums because many of the findings of the investigations pertaining to accidents at construction sites involving cranes showed they were due to negligence by incompetent handlers,” he said when contacted by Bernama here.**

### DISCUSS

**Q1. Can TRAINING ALONE prevent this incident from happening?**

**Q2. At what stage of construction this hazard could be foreseen**

## IDENTIFY THE CAUSAL FACTORS



<https://www.net.com.my/opinion/columnists/2017/10/293650/special-task-force-needed-check-safety-level-all-construction>

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**Landslide tragedy which happened at a construction site in Lengkok Lembah Permai, Tanjung Bungah, George Town, Penang which resulted in the death of three workers and a total number of 11 workers buried alive.**

### DISCUSS

**Q1. Do you agree with the HEADLINE... SPECIAL TASK FORCE.**

**Q2. Who is responsible to foresee this hazard and risk?**

## IDENTIFY THE CAUSAL FACTORS

malaymail  
online



<https://www.malaymail.com/s/1550055/one-hurt-in-kajang-construction-scaffolding-mishap>

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**A view of the construction site in Kajang where the scaffolding collapsed, injuring one worker. — Picture courtesy of Selangor Fire and Rescue Department**

**KUALA LUMPUR, Jan 10** — An Indonesian construction worker was injured while seven others escaped unscathed after a scaffolding collapsed at a construction site in Kajang yesterday. A dozen rescue personnel from the Kajang Fire and Rescue Department were dispatched to a sewerage construction site near the Grand Saga Highway after authorities were alerted at 5.28pm.

Selangor Fire and Rescue Department operations management chief Alimaddia Bukri said a 33-year-old labourer and seven others were working on the ground floor when the scaffolding toppled onto them from the second floor of the unfinished building. He said rescue personnel saved the injured worker who was not able to move away from the debris field in time.

### DISCUSS

**Q1. Ask the delegates to list of CAUSAL FACTORS;**

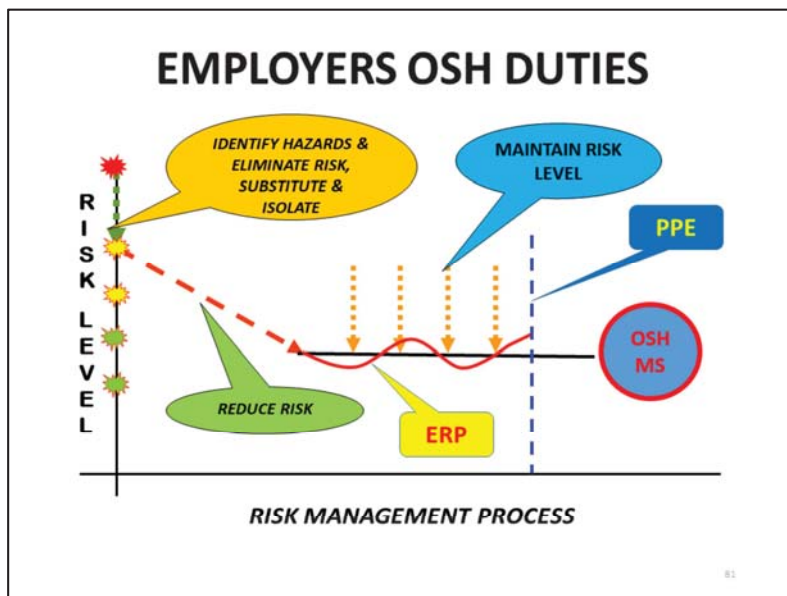
**Q2. Can Design Risk on of the factors?**

**Q3. Can the Risk be Design Out before work is started?**



# **HAZARD IDENTIFICATION**

**HAZARD CLASSIFICATION  
USE OF RESOURCES FOR IDENTIFYING  
HAZARDS**

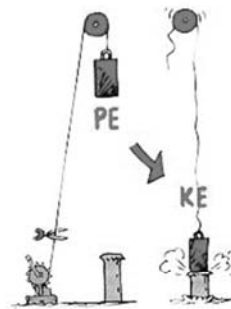


- monitor health and condition of employees, workplace under that management and control and the conform to applicable OSHA standard
- Provide workplace free from serious recognized hazardous, comply with standards, rules and regulation issued by OSH act
- The equipment, material and protective devices as prescribed are provided

## SAFETY HAZARDS

- A safety hazard is **any force strong enough** to cause injury, or damage to property. An injury caused by a safety hazard is usually obvious.

- For example, a worker may be badly cut. Safety hazards cause harm when workplace controls are not adequate



- . Some examples of safety hazards include, but are not limited to
  - slipping/tripping hazards (such as wires run across floors);
  - fire hazards (from flammable materials);
  - moving parts of machinery, tools and equipment (such as pinch and nip points);
  - work at height (such as work done on scaffolds);
  - ejection of material (such as from molding);
  - pressure systems (such as steam boilers and pipes);
  - vehicles (such as forklifts and trucks);
  - lifting and other manual handling operations; and
  - working alone.



## HEALTH HAZARDS

- An occupational health hazard is **any agent that can cause illness** to an individual.
  - A health hazard may produce serious and immediate (acute) affects, or may cause long-term (**chronic**) problems.
  - All or part of the body may be affected.
    - *Someone with an occupational illness may not recognize the symptoms immediately.*



For example, noise-induced hearing loss is often difficult for the affected individual to detect until it is well advanced. Health hazards include chemicals (such as battery acid and solvents), biological hazards (such as bacteria, viruses, dusts and molds), physical agents (energy sources strong enough to harm the body, such as electric currents, heat, light, vibration, noise and radiation) and work design (ergonomic) hazards.

# HAZARDS



- Hazards are things or conditions that can cause HARM

Examples of Hazards and Their Effects		
Workplace Hazard	Example of Hazard	Example of Harm Caused
Thing	Knife	Cut
Substance	Benzene	Leukemia
Material	Asbestos	Mesothelioma
Source of Energy	Electricity	Shock, electrocution
Condition	Wet floor	Slips, falls
Process	Welding	Metal fume fever
Practice	Hard rock mining	Silicosis

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Hazard consequences in

- workplace as the source
- Hazards as agent (knife, benzene, asbestos and etc)
- Effect of hazard will be on safety and health such as cut, leukemia, shocks, slips, metal fume fever, silicosis

## CLASSIFICATION OF HAZARDS

- Physical (Mechanical)
- Electrical
- Biological
- Chemical
- Psychosocial
- Ergonomic



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### 1. Physical

- Excessive effort, poor posture and repetition can all lead to muscular pain, tendon damage and deterioration to bones and related structures
- wet floor
- Loose electrical cables Objects protruding in walkways or doorways

### 2. Electrical

- dangerous condition where a worker could make electrical contact with energized equipment or a conductor, and from which the person may sustain an injury from **shock**; and/or, there is potential for the worker to receive an arc flash burn, thermal burn, or **blast injury**.

### 3. Biological

- Hepatitis B
- New strain influenza

### 3. Chemical

- Effects on central nervous system, lungs, digestive system, circulatory system, skin, reproductive system. Short term (acute) effects such as burns, rashes, irritation, feeling unwell, coma and death
- Alkaline solvents

### 5. Psychosocial

- Loud sounds
- Bright lights

### 6. Ergonomics

- Lifting heavy object stretching the body
- Twisting the body
- Poor desk seating

## CONTEXTUAL CLASSIFICATION OF HAZARDS

### 1. Hazardous substance or Object

- A **specific object** that increases risk to health in its immediate spatial or temporal vicinity
- A **hazardous chemical or biological agent**;
- An **object on a path** that could be tripped over;
- An **unguarded machine blade**;
- A **vehicle moving at significant speed**;
- A **poorly designed hand tool**.

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Hazard may come from object or substances as the agent.

- Substances – hazardous chemical / biological agents
- Objects – any object that increases risk to safety or health

## 2. HAZARDOUS ACTIVITY

- **A work task or activity** that is inherently a potential source of risk, so that workers are exposed to one or more of the following:
  - **Biomechanical hazards** ... e.g. heavy lifting, highly repetitive movements, prolonged static postures
  - **Psychosocial hazards** ... e.g. work that is likely to cause psychological stress (link), due to factors such as:
    - extended periods of external pacing at a high rate with short cycle times;
    - personal interactions with aggressive or abusive clients, etc

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Somehow, some activities also can cause hazard

Listed below are just a few of the main hazards that are encountered on a typical construction site:

### **Working at Height**

The construction of buildings – or indeed, demolition works – frequently requires tradesmen to work at height. Fatalities and injuries involving height relating factors account for many accidents each year.

### **- Moving Objects**

### **- Slips, Trips, & Falls**

When you consider the diverse range of activities going on at a construction site at any one time it seems hardly surprising slips, trips, and falls happen on an almost daily basis.

### **- Noise**

Noise is a major hazard within the construction industry. Repetitive, excessive noise causes long term hearing problems and can be a dangerous distraction, the cause of accidents.

**- Hand Arm Vibration Syndrome**

Hand arm vibration syndrome, or 'blue finger' as it is commonly referred to, is a painful and debilitating industrial disease of the blood vessels, nerves and joints, triggered by the prolonged use of vibratory power tools and ground working equipment.

**- Material & Manual Handling**

Materials and equipment is being constantly lifted and moved around on a construction site, whether manually or by the use of lifting equipment. Different trades will involve greater demands, but all may involve some degree of risk.

**- Collapse**

Not exactly a hazard, more a risk – an accident in waiting.

**- Asbestos**

Today there is a new generation of construction workers, including; joiners, electricians and plumbers for whom asbestos is seen as a historical problem, something from the past that's now long

**- Airborne Fibres & Materials – Respiratory Diseases**

often invisible, fine, toxic mixture of hazardous materials and fibres that can damage the lungs, leading to diseases such as chronic obstructive pulmonary, asthma and silicosis

**- Electricity**

### 3. HAZARDOUS PERSONAL CONDITION

- **Ongoing, sub-optimal conditions** of workers that increase their **personal vulnerability** to hazardous activities and conditions;
  - **Pre-existing injuries;**
  - **States of chronic fatigue or stress due to factors such as inadequate sleep, poor work-life balance;**
  - **Sub-standard competence in performing normal work tasks.**

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Vulnerable to Hazard-specific: – a characteristic which makes the element concerned susceptible to the force/s or impact of a hazard. The geo-physical and locational attributes of the element/s concerned are considered in this category. Based on the present-knowledge of the distribution and frequency of hazards, a community or country may be threatened by specific hazards.



## 4. HAZARDOUS SYSTEM CONDITION

- A condition of any component of the system (equipment, workstation, work procedures and organisation, job design, management system, physical and psychosocial environments) that increases risk
  - **Very cold environment;**
  - **Inadequate staffing level;**
  - **Absent or inadequate resources (e.g. lifting aids, information, equipment, emotional support);**
  - **Inadequate time to complete required work;**
  - **Piece-rated payment system;**
  - **Very long working hours;**
  - **Badly designed shift rotation system;**
  - **Management system that results in workers having inadequate levels of: control or decision latitude, performance feedback, recognition/reward of effort and good performance.**

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Systems include

- i) Equipment provided and used
- ii) Environment of workstation
- iii) Safe work procedure
- iv) Proper organization
- v) Particular job design and management system
- vi) Physical and psychosocial environment

## 5. HAZARDOUS PERSONAL STATE

- A more transient personal state, **typically chronic stress or fatigue**, that results from one or more of the above factors and increases risk – directly to that individual
  - Due to physiological effects of the stress response, or
  - Overloading/overexertion of specific body tissues; or
  - Indirectly due to performance degradation and a consequent increase in errors that increase injury risk

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Some of these categories conform to the common understanding of a hazard as a 'thing;' others, particularly those listed by Macdonald as psychosocial hazards and hazards relating to ongoing conditions of 'the system' are referred to as 'hazardous.' Some OHS professionals would consider Macdonald's "hazardous personal condition," "hazardous system condition" and "hazardous personal state" categories to be risk factors rather than hazards. Moreover, some examples provided for the hazardous personal and system conditions, such as substandard competence or lack of equipment, would be perceived by OHS professionals as failures in controls. Indeed, several of Macdonald's categories correlate with Reason's (1997) "latent failures" or "unsafe conditions." Consequently, it can be argued that this is an

example of a classification system that goes beyond 'hazard.'

## PHYSICAL HAZARDS

- Noise
- Heat
- Radiation
- Vibration
- Pressure
- Electricity
- Machinery



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- factors within the environment that can harm the body without necessarily touching it.
- Physical Hazards include:
  - i) Radiation: including ionizing, nonionizing (EMF's, microwaves, radiowaves, etc.)
  - ii) High exposure to sunlight/ultraviolet rays
  - iii) Temperature extremes – hot and cold
  - iv) Constant loud noise

## SLIP, TRIP & FALL



**Hazard:** Each year, falls consistently account for the greatest number of fatalities in the construction industry. A number of factors are often involved in falls, including unstable working surfaces, misuse or failure to use fall protection equipment and human error. Studies have shown that using guardrails, fall arrest systems, safety nets, covers and restraint systems can prevent many deaths and injuries from falls.

**Solutions:**

Consider using aerial lifts or elevated platforms to provide safer elevated working surfaces;

Erect guardrail systems with toeboards and warning lines or install control line systems to protect workers near the edges of floors and roofs;

Cover floor holes; and/or

Use safety net systems or personal fall arrest systems (body harnesses).

## CHEMICAL HAZARDS

- **Physical**

- Fire & Explosions

- **Health**

- Illness, burns, fatality

- **Environmental**

- Pollution



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Are present when a worker is exposed to any chemical preparation in the workplace in any form (solid, liquid or gas). Some are safer than others, but to some workers who are more sensitive to chemicals, even common solutions can cause illness, skin irritation, or breathing problems.

## CHEMICAL HAZARDS

- Arsenic- skin / lungs /cancer
- Lead- anemic (hemoglobin )
- Mercury - nervous system
- Silica - cancer
- Solvents - liver / nerve
- **Asbestos - lung cancer**



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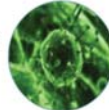
Most chemical agent of chemical hazard give more effect to health

Most risky are cancer (any type or any stage) , attack the nervous system, lungs, HB and so on

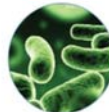
# BIOLOGICAL HAZARDS

- **Legionella pneumophila**
  - Bacteria ( aircon system water supply ) pneumonia
- **Bloodborne pathogens**
  - HIV / HCV
- **Organic dust / fungi (mold)**
  - Asthma / dermatitis
- **Flour & grain dust**
  - Asthma
- **Rhinovirus**
  - Common cold
- **Enzyme alcalase**
  - Laundry detergent [allergic - asthma]

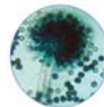
VIRUSES



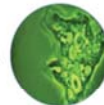
BACTERIA



FUNGI



PARASITES



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- Associated with working with animals, people, or infectious plant materials
- Biological also affect on health – contribute to many types of disease and illness
- Types of things you may be exposed to include:
  - i) Blood and other body fluids
  - ii) Fungi/mold
  - iii) Bacteria and viruses
  - iv) Plants
  - v) Insect bites
  - vi) Animal and bird droppings



## PSYCHO-SOCIAL HAZARDS

- Social problems;
- Fear of failure;
- Retrenchment/VSS...
- Demotivation or lack of confidence;
- Sexual Harassment;
- **STRESS**



## PSYCHO-SOCIAL HAZARDS

- **Working Alone**
  - Security Personnel
- **Workplace Violence**
  - Cash handling
- **Bullying**
  - New employee



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- most related with organization hazard
- Examples of work organization hazards include:
  - i) Workload demands
  - ii) Workplace violence
  - iii) Intensity and/or pace
  - iv) Respect (or lack of)
  - v) Flexibility
  - vi) Control or say about things
  - vii) Social support/relations
  - viii) Sexual harassment

## ERGONOMIC HAZARDS

- Workplace design
- Lay-out of workstation
- Design of tools
- Repetitive movements
- **Excessive manual handling**



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- Occur when the type of work, body positions and working conditions put strain on your body. They are the hardest to spot since you don't always immediately notice the strain on your body or the harm that these hazards pose. Short term exposure may result in "sore muscles" the next day or in the days following exposure, but long-term exposure can result in serious long-term illnesses.
- Ergonomic Hazards include:
  - i) Improperly adjusted workstations and chairs
  - ii) Frequent lifting
  - iii) Poor posture
  - iv) Awkward movements, especially if they are repetitive
  - v) Repeating the same movements over and over
  - vi) Having to use too much force, especially if you have to do it frequently
  - vii) Vibration

## METHODS OF IDENTIFYING HAZARDS

- **Hazards are identified in three ways:**
  - **Inspection and observation** at the workplace and review of documents and publications
  - **Measurement of the atmosphere**, monitoring the environment or medical surveillance of workers
  - **Analysis and brainstorming**

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- hazard identification and risk assessment are processes by which designers and the principal designer will interrogate the design work as it progresses
- The purpose of hazard identification is to highlight the critical operations of tasks, that is, those tasks posing significant risks to the health and safety of employees as well as highlighting those hazards pertaining to certain equipment due to energy sources, working conditions or activities performed

## IDENTIFYING HAZARDS BY DOCUMENT REVIEW

- 1. Reports** of accidents, accident investigation and audits
- 2. Information** from publications
  - Regulations and Codes of Practice
  - Statistics
  - Handbooks etc.
  - SDS (MSDS)

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The hazard identification and assessment methodology shall include:

- Steps and time frame for identifying and assessing the hazards. (i.e. who is responsible for the identification; an individual or a committee; time frame for the completion of the identification)
- The keeping of a record of the hazards.
- A time frame for reviewing and, if necessary, revising the methodology (i.e. the review of the identification method will be carried out every three years)

# IDENTIFYING HAZARDS BY INSPECTIONS

## • TO IDENTIFY HAZARDS

- Checklist and inspection worksheet (standard approach and record)
- Involve supervisors, managers and employees



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Inspections are important as they allow you to:

- listen to the concerns of workers and supervisors
- gain further understanding of jobs and tasks
- identify existing and potential hazards
- determine underlying causes of hazards
- recommend corrective action
- monitor steps taken to eliminate hazards or control the risk (e.g., engineering controls, administrative controls, policies, procedures, personal protective equipment)

## EXPOSURE MONITORING

### • Information Required

- Excessive noise
- Excessive heat
- Inadequate ventilation
- Radiation exposure
- Excessive air contaminants
- Ergonomic hazards



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- Monitoring means measuring workers' exposures to named substances. Exposure may be by inhalation, by skin contact, or by swallowing
- Monitoring is required:
  - i) to help select the right controls
  - ii) where substances present a serious health risk
  - iii) to check that exposure limits are not exceeded and your control measures work well enough
  - iv) to help choose the right amount of respiratory protection
  - v) to identify any need for health surveillance
  - vi) when an inspector has issued an enforcement notice that requires you to monitor exposure.

## **BIOLOGICAL & MEDICAL SURVEILLANCE -WHEN**

- **Health Surveillance is Warranted if:**

- Substance is used in workplace
- Substance is hazardous
- Evidence or reason to suspect injury
- Atmospheric monitoring insufficient
- Techniques available
- Will benefit those at risk

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- Health surveillance is a means of detecting any harmful changes to someone's health, and importantly at an early stage to help identify if further corrective action is needed. This page gives an overview of what you must do, when and how.
- Health surveillance checks that the health risk management system is correctly working. It is a statutory risk based system of ongoing health checks when exposing workers to substances or activities that may cause them harm. It allows you to identify any ill health symptoms early and highlights the controls you need to improve.



## **BIOLOGICAL & MEDICAL SURVEILLANCE - WHO**

### **• Employees Requiring Health Surveillance**

- Exposed to hazard for which there is:
- Identifiable health effect/disease
- Likelihood that it could occur
- Valid techniques for detecting effect
- Valid biological monitoring method and reason to believe values might be exceeded

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- Health surveillance allows for early identification of ill health and helps identify any corrective action needed. Health surveillance may be required by law if your employees are exposed to noise or vibration, solvents, fumes, dusts, biological agents and other substances hazardous to health, or work in compressed air.

Where some risk remains and there is likely to be harm caused to your employees, you will need to take further steps. Consider health surveillance if your employees are at risk from:

noise or vibration

solvents, dusts, fumes, biological agents and other substances hazardous to health

asbestos, lead or work in compressed air

ionising radiation

## HAZARDS BY ANALYSIS AND BRAIN STORMING

- **Used in new plant design specially in process plants:**
  - Hazards and Operability Studies ([HAZOP](#))
  - Failure Mode and Effect Analysis (FMEA)
  - Fault Tree Analysis
  - Hazards Analysis (HAZAN)
  - Quantitative Risk Assessment
  - etc.

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It involves the following broad steps:

- Identify reasonably foreseeable hazards associated with the design,
- Assess the risks arising from the hazards,
- Eliminate or minimise the risk by designing control measures,
- Re-assess the risk with the identified control measures implemented,
- Monitor and review the control measures.

## EXAMPLE 1. HAZOP

- To identify and evaluate safety hazard in the process plant
- To identify operability problems
- New design or process
- Multidisciplinary brainstorming
- What if?
- Focus on fire, explosion, toxic release etc.

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- Hazard and Operability Analysis (HAZOP) is a structured and systematic technique for system examination and risk management
- often used as a technique for identifying potential hazards in a system and identifying operability problems likely to lead to nonconforming products
- based on a theory that assumes risk events are caused by deviations from design or operating intention
- Identification of such deviations is facilitated by using sets of “guide words” as a systematic list of deviation perspectives
- This approach is a unique feature of the HAZOP methodology that helps stimulate the imagination of team members when exploring potential deviations
- HAZOP is often described as:
  - i) brainstorming technique
  - ii) qualitative risk assessment tool
  - iii) inductive risk assessment tool, meaning that it is a “bottom-up” risk identification approach, where success relies on the ability of subject matter experts (SMEs) to predict deviations based on past experiences and general subject matter expertise

#### Hazard and Operability Study (HAZOP) Template<sup>1</sup>

Project:				Node:		Page:		
Node Description:						Date:		
						Drg No:		
Team leader:		Team Members:			Minutes By:		Pages:	
Guideword	Possible Cause(s)	Consequence	Safeguard (existing)	Rec#	Recommendations	Accountability	Action	Action Ref#

<sup>1</sup> Adapted from ICI Australia Engineering Hazard Study Course Notes

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This is template of HAZOP form

-The HAZOP guide word concept can be used to stimulate brainstorming of potential risks within other risk assessment tools as well

-The documentation of HAZOP analyses is often facilitated by utilizing a template recording form as detailed in IEC Standard 61882. Risk assessment teams may modify the template as necessary based on factors such as:

- i) Regulatory requirements
- ii) Need for more explicit risk rating or prioritization (ex: rating deviation probabilities, severities, and/or detection)
- iii) Company documentation policies
- iv) Needs for traceability or audit readiness
- v) Other factors

# HAZOP-1

Figure 1.1 The HAZOP process

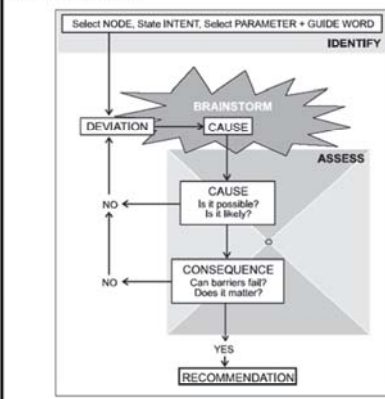


Figure 1.2 Parameter guide word combinations

	GUIDE WORDS					
	NO	MORE	LESS	AS WELL AS	PART OF	REVERSE
PARAMETERS						
FLOW*	✓	✓	✓	✓	✓	✓
PRESSURE*		✓	✓			✓
TEMPERATURE*		✓	✓			✓
LEVEL	✓	✓	✓			✓
PHASE	✓	✓	✓			✓
COMPOSITION (SPECIFIC COMPONENT)	✓	✓	✓			✓
OPERATION	✓	✓	✓	✓	✓	✓

\* - NORMAL PARAMETERS

NOT USED ☐

USUAL ☒

POSSIBLE ☒

The Preparation Phase typically includes the following activities:

- Identifying and locating supporting data and information
- Identification of the audience and users of the study outputs
- Project management preparations (ex: scheduling meetings, transcribing proceedings, etc.)
- Consensus on template format for recording study outputs
- Consensus on HAZOP guide words to be used during the study

# HAZOP-2

Figure 4.2 - Typical Completed HAZOP Worksheet

HAZOP Worksheet		Project Title		Company Name				
Meeting Date: 01-January-1994		Leader: A.N. Other C. Eng		Project Contract No.				
Node Details: Condensate Processing - Off spec condensate storage tank 29-TA-301		Node:		PEFS: PH-A00-PE-106-01 (D11), 105-05 (D11), 105-03 (D12)				
<p>PARAMETER : FLOW</p> <p>INTENTION : Tank 29-TA-301 is used as a hold-up facility for off-spec condensate and also as a receptacle for hydrocarbon liquids collected in the knock-out pots and maintenance flare</p>								
G. WORD	DEVIATION	CAUSES	CONSEQUENCES	PROTECTION	RECOMMENDATIONS	BY	P	No:
No	Flow	High level trip in tank 29-TA-301 shutting inlet due to excessive off spec production or operator failure to drain tank and recycle liquid	Possibly unable to blowdown plant as liquids cannot be removed from flare knock-out drum via route to 29-TA-301.	The may be adequate volume in the flare knock-out drum negating the requirement to transfer liquids to the off-spec tank during blowdown.	Determine if there is adequate liquid volume in the knock-out drum for the blowdown scenarios. If not consider ways of providing adequate liquid storage capacity during blowdown.	PE	1	1

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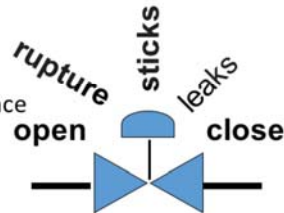
This is the example of completed HAZOP worksheet

- HAZOP is a powerful communication tool
- The output of the tool should always be presented at a level of detail appropriate for the various stakeholders
- This is important not just for presenting results, but also for obtaining early buy-in on the approach
- the approach should be documented in a Standard Operating Procedure
- It may not be necessary to include detailed scoring steps or algorithms in the procedure, but they should be documented in a controlled report
- Updates to the portfolio should also be controlled

## Example 2. FMEA (Failure Mode & Effects Analysis)

- Component level

- Possible failures and their effects
- To eliminate or control failures
- Include information in maintenance manuals.



System	Component	Failure Mode	Failure Effect
Scrubber	Water pump	Inadequate water flow	Increased environmental pollution

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Failure modes and effects analysis (**FMEA**) is a step-by-step approach Developed in the 1950s, FMEA was one of the earliest structured reliability improvement methods. Today it is still a highly effective method of lowering the possibility of failure.

- identifying all possible failures in a design
- a manufacturing or assembly process, or a product or service
- “Failure modes” means the ways, or modes, in which something might fail
- methodology aimed at allowing organizations to anticipate failure during the design stage by identifying all of the possible failures in a design or manufacturing process.

Failure Modes and Effects Analysis (FMEA) Template<sup>3</sup>

Project No:		Component:		Page:		
Component Description:				Date:		
Team Leader:		Team Members:		Drg No:		
				Minutes by:		
				Pages:		
No	Failure Mode	Detection Method	Equipment Affected		Safety Systems Response	Comments
			Identification	Effects		

<sup>3</sup> Adapted from ICI Australia Engineering Hazard Study Course Notes

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Design FMEA (DFMEA) explores the possibility of product malfunctions, reduced product life, and safety and regulatory concerns derived from:

- i) Material Properties
- ii) Geometry
- iii) Tolerances
- iv) Interfaces with other components and/or systems
- v) Engineering Noise: environments, user profile, degradation, systems interactions





# **HAZARD IDENTIFICATION WORKSHOP**

## **USE HAZID CARD**

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### Checklist of Preliminary Hazard Analysis

- qualitative technique for the early identification of potential hazards and threats effecting people, the environment, assets or reputation
- The major benefit of a HAZID study is to provide essential input to project development decisions
- It is a means of identifying and describing HSE hazards and threats at the earliest practicable stage of a development or venture.

## US 2015 10 TOP VIOLATIONS



Can refer this link <http://www.hazmatstudent.com/osha-training/osha-top-10-violations/>

## US 2015 10 TOP VIOLATIONS



Can refer this link <http://www.hazmatstudent.com/osha-training/osha-top-10-violations/>



### Describe the construction hazards,

- Some of the hazards can be eliminated and reduce during design stage

- i) Fire
- ii) Unguarded machinery
- iii) Unsafe Access
- iv) Working at height
- v) Unsafe lifting operations
- vi) Struck by foreign body
- vii) Open shaft and edges
- viii) Unsafe working platforms
- ix) Unstable structural membranes
- x) Overloaded vehicles and forklifts
- xi) Unsafe cantilever loading platforms
- xii) Unsafe scaffolds
- xiii) Falling objects
- xiv) Unsafe electrical equipment
- xv) Unstable mobile crane
- xvi) Unsafe excavation



# IDEAL HIERARCHY OF CONTROL EXAMPLE

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Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective control solutions. Controls must protect workers from any new hazards that are created

- i) Elimination
- ii) Substitution
- iii) Engineering controls
- iv) Administrative control
- v) Personal protective equipment

# AUTOMOBILE SPRAY PAINTING

## IDENTIFY THE HAZARDS

- **Safety hazards**

- Fire & Explosions

- **Health hazards**

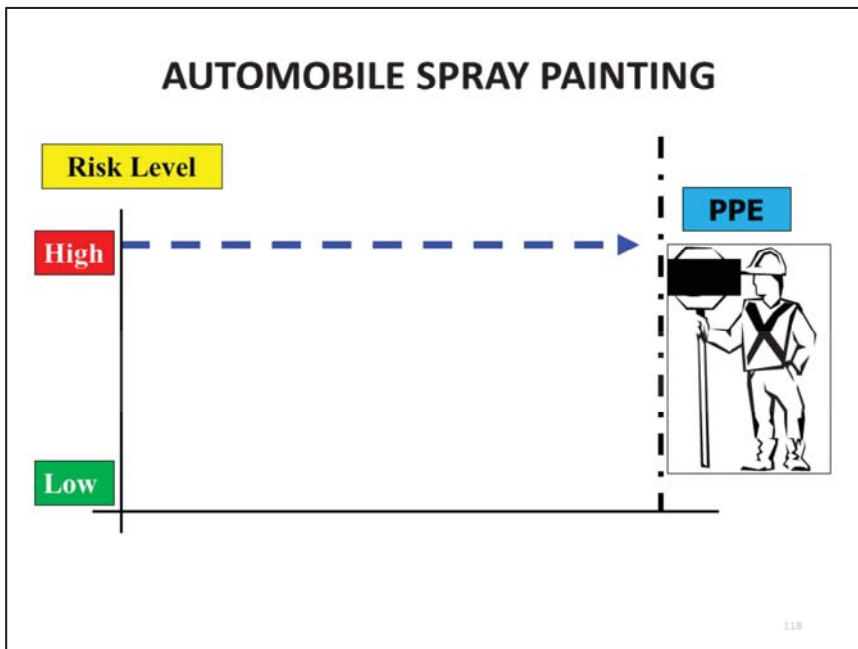
- Asphyxiation
- Toxic
- Illness



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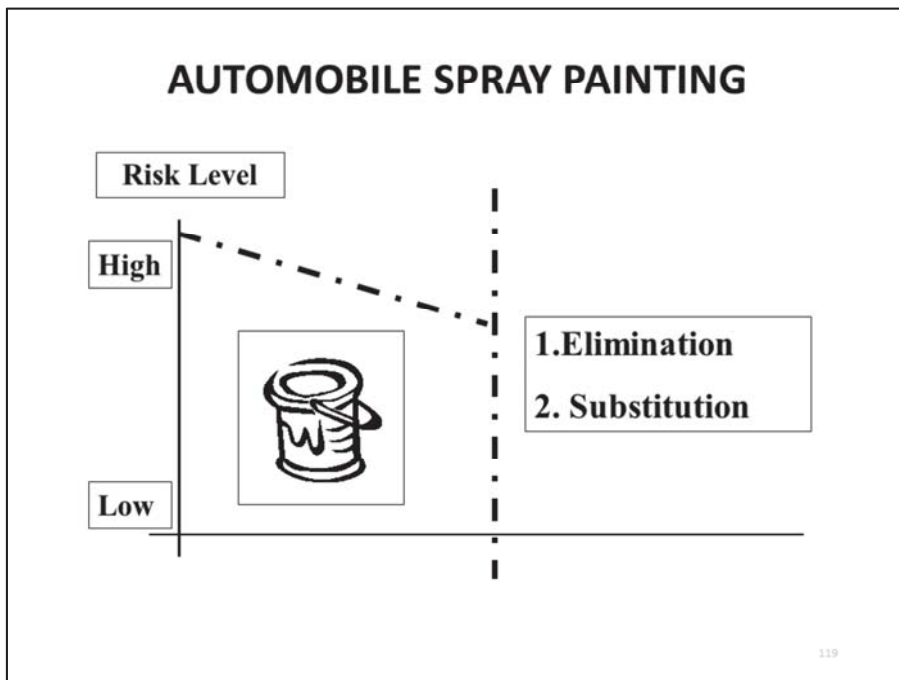
Open for discussion

- Identify the safety and health hazard
- What is the consequences



Discuss the risk reduction based on hierarchy of control

- Designer(s) shall integrate risk identification, assessment and control into the design process. Designers must demonstrate as far as reasonably practicable to implement risk reduction strategy based on the hierarchy of control



For high risk level, the suitable control method are

- **Elimination** (Getting rid of a hazardous job, tool, process, machine or substance is perhaps the best way of protecting workers. For example, when designing, a designer should consider the risks people may be exposed to through the course of both constructing a building and using it once it is constructed)
- **Substitution** (Sometimes doing the same work in a less hazardous way is possible)



## ELIMINATION

- **Remove fire hazards**
- **Use pneumatic or hydraulic system instead of electrical**
- **Outsource work**
- **Use mechanical lifting device instead of manual**

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Designing is a process that often continues throughout the project and the following questions should be considered when design is carried out:

- i) Can I get rid of the problem (or hazard) altogether? For example, can air- conditioning plant on a roof be moved to ground level, so work at height is not required for either installation or maintenance?
- ii) If not, how can I reduce or control the risks, so that harm is unlikely or the potential consequences less serious? For example, can I place the plant within a building on the roof, or provide a barrier around the roof?

# SUBSTITUTION

- **CAN WE**

- physical forms of toxic substance
- concentration

- **HANDLING PROCEDURES**

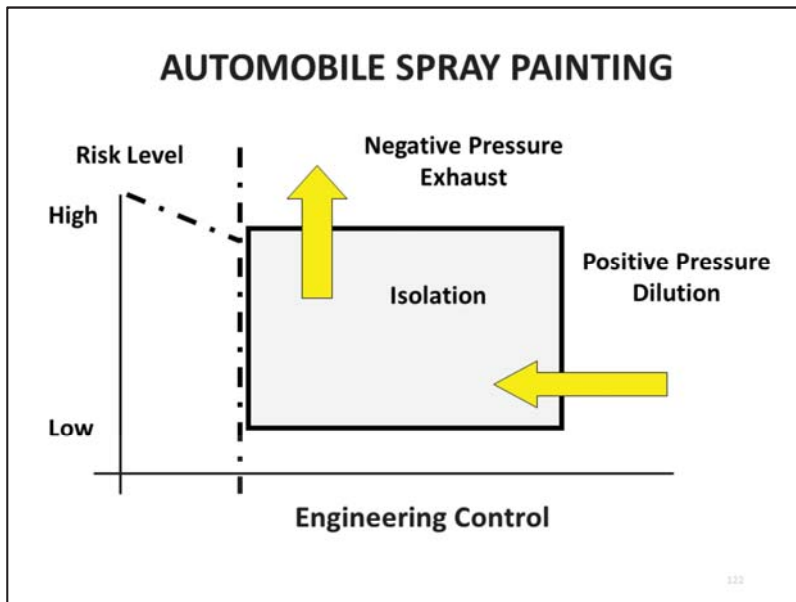
- volume
- location
- process



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For example, if hazards cannot be eliminated, a designer can:

- provide a less risky option, for example, switch to using paving lighter in weight, to reduce musculoskeletal disorders such as back problems;
- make provisions so the work can be organised to reduce exposure to hazards, for example, make provision for traffic routes so barriers can be provided between pedestrians and traffic;
- ensure that those responsible for planning and managing the work are given the information they will need to manage remaining risks, for example, tell them about loads that will be particularly heavy or elements of the building that could become unstable. This can be achieved through providing key information on drawings or within models, for example, by using Building Information Modelling (BIM).



If elimination or substitution cannot be applied, engineering control is one of the control measure to reduce the risk.

**Isolation** - If a hazard cannot be eliminated or replaced, it can sometimes be isolated, contained or otherwise kept away from workers. For example, an insulated and air-conditioned control room can protect operators from a toxic chemical.

## ENGINEERING CONTROL

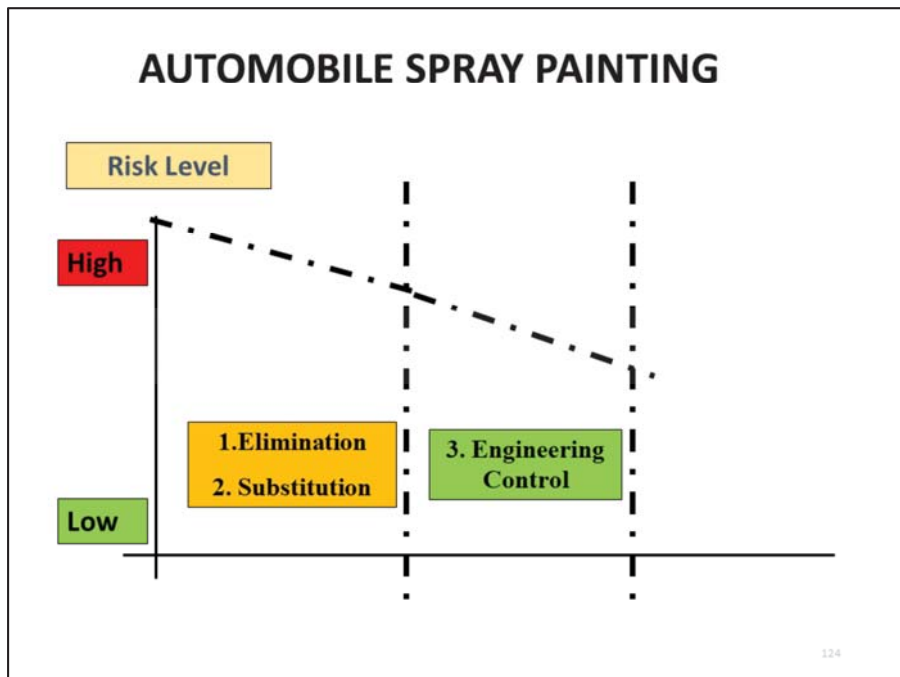
- **Isolation**
  - welding screen
- **Enclosure**
  - noise insulation
- **Containment**
  - LEV
- **Limitation**
  - PRV/ELCB/OVERFLOW SWITCH



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Engineering control will include but may not be limited to:

- i) Redesign - Jobs and processes can be reworked to make them safer. For example, containers can be made easier to hold and lift
- ii) Isolation - If a hazard cannot be eliminated or replaced, it can sometimes be isolated, contained or otherwise kept away from workers. For example, an insulated and air-conditioned control room can protect operators from a toxic chemical
- iii) Automation - Dangerous processes can be automated or mechanized. For example, computer-controlled robots can handle spot welding operations. However, care must be taken to protect workers from robotic hazards
- iv) Barriers - A hazard can be blocked before it reaches workers. For example, special curtains can prevent eye injuries from welding arc radiation. Proper equipment guarding will protect workers from contacting moving parts
- v) Absorption - Baffles can block or absorb noise. Lockout systems can isolate energy sources during repair and maintenance. Usually, the further a control keeps a hazard away from workers, the more effective it is
- vi) Dilution - Some hazards can be diluted or dissipated. For example, ventilation systems can dilute toxic gasses before they reach operators.



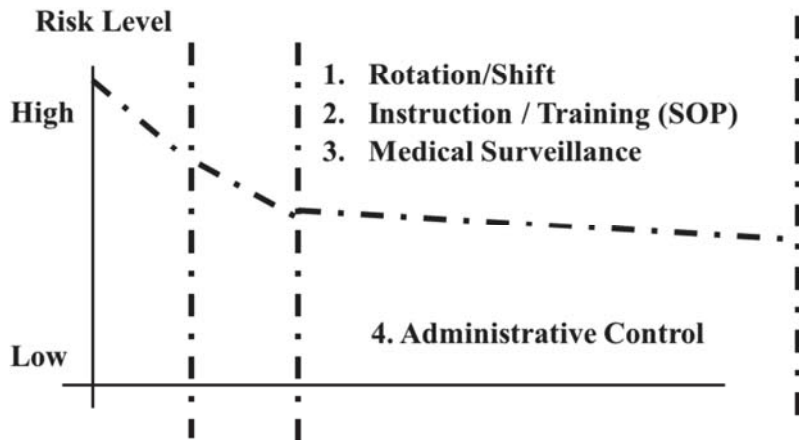
For high risk level

- elimination
- Substitution

For remaining can use

- Engineerig control and other risk control

## AUTOMOBILE SPRAY PAINTING



### Administrative controls

- i) Job rotations and other procedures can reduce the time that workers are exposed to a hazard. For example, workers can be rotated through jobs requiring repetitive tendon and muscle movements to prevent cumulative trauma injuries. Noisy processes can be scheduled when no one is in the workplace

# ADMINISTRATIVE CONTROLS

- **Polices & Procedures**

- **Preventive maintenance**
- **Monitoring systems**
  - Safety inspections
- **Safe System of Work**
  - Permit to work
- **Work placement**
  - Rotation

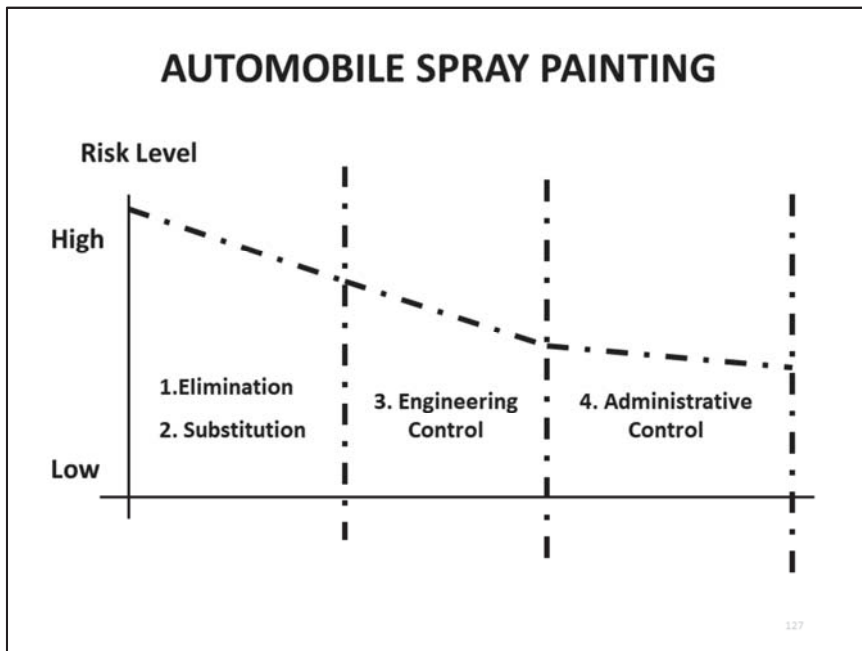


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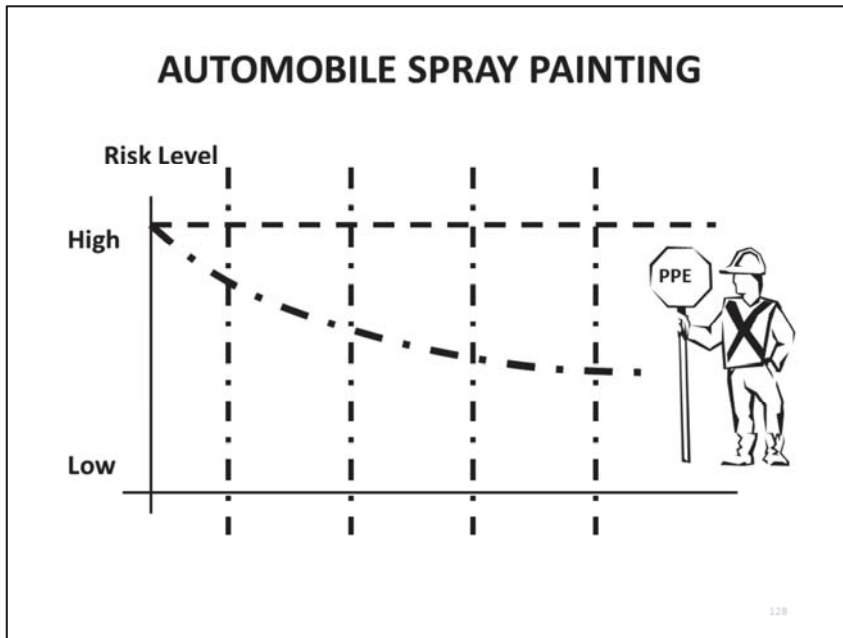
- i) Safe work procedures - Workers can be required to use standardized safety practices. The employer is expected to ensure that workers follow these practices. Work procedures must be periodically reviewed with workers and updated
- ii) Housekeeping, repair and maintenance programs - Housekeeping includes cleaning, waste disposal and spill clean-up. Tools, equipment and machinery are less likely to cause injury if they are kept clean and well maintained
- iii) Hygiene - Hygiene practices can reduce the risk of toxic materials being absorbed by workers or carried home to their families. Street clothing should be kept in separate lockers to avoid being contaminated by work clothing. Eating areas must be segregated from toxic hazards. Eating should be forbidden in toxic work areas. Where applicable, workers should be required to shower and change clothes at the end of the shift

- iv) Supervision and training – Initial training on safe work procedures and refresher training should be offered. Appropriate supervision to assist workers in identifying possible hazards and evaluating work procedures





Lower risk level (remaining hazard)  
- Can cater using administrative control

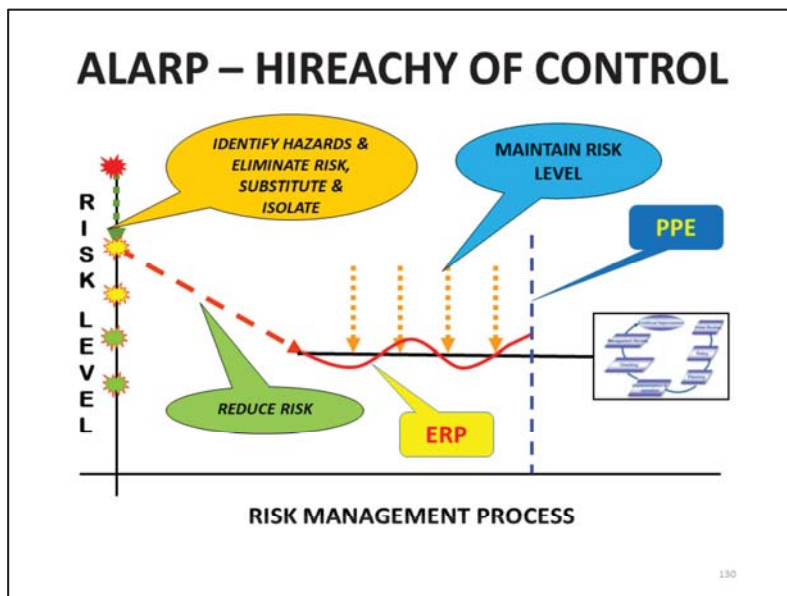


**Personal protective equipment** - Personal protective equipment (PPE) and clothing is used when other controls measures are not feasible and where additional protection is needed. Workers must be trained to use and maintain equipment properly. The employer and workers must understand the limitations of the personal protective equipment. The employer is expected to require workers to use their equipment whenever it is needed. Care must be taken to ensure that equipment is working properly. Otherwise, PPE may endanger a worker's health by providing an illusion of protection.

# HIERARCHY OF CONTROL

- **Most Effective**
  - Elimination - remove the hazard
- **Fairly Effective**
  - Substitution - use less hazardous one
  - Isolation- Barriers etc.
  - Engineering - Guarding
- **Least Effective**
  - Administrative (safe work practices, limit exposure, etc.
- **Last resort**
  - PPE

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Step 1 - Identify foreseeable hazards, and particular and significant risks affecting health and safety

step 2 - Evaluate the level of risk based on likelihood and consequences to prioritize the control measures

Step 3 - Eliminate hazards

Step 4 - Minimise remaining identified risks by design

Step 5 - Consider pre-fabrication to minimise hazardous work [e.g. pre-fabricated and pre-stressed concrete bridge beams

Step 6 - Design in features to reduce risks (i.e. from working at height, deep excavation etc.)

Step 7 - Ensure that designs are suitable and compatible with any interacting or interrelating designs

Step 8 - Provide information on significant risks associated with their design (example: information on drawings, suggested construction sequences)

Step 9 - Identify any future cleaning, maintenance, alteration and demolition hazards for the Safety and Health File

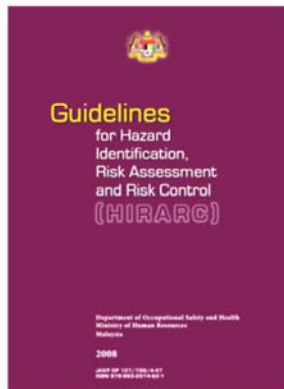
QUALITATIVE RISK ASSESSMENT EXAMPLE FOR DESIGN REVIEW							
Design Review Rule1/ Rule2/Rule3.							
Design Discipline:				Prepared By:		Checked By:	
* Persons at Risk: (1) Construction workers (2) Members of the Public (3) Maintenance workers							
** Action by: Principal Designer – include in the pre-construction health and safety plan / safety and health file							
Principal Contractor – manage risk during the construction phase							
Designer – take into consideration when preparing their designs							
Client – pass information to designers / planning supervisor							
Ref.	Activity	Hazard	Persons at Risk(s)	Design Measures taken, or being taken to eliminate or reduce the hazard	Information on the Residual Risk	Date Issue Raised	Action Required by:
MR1-1	Installation of equipment at height on existing / new structures	Possible injury through falling, overstretching, dropping of items.	(1) (2) (3)	Maximise pre assembly / installation of infrastructure prior to site installation to minimise any requirement to use a MEWP. Maximise pretesting of equipment to eliminate faults following installation (eg. soak testing). Provide appropriate means of edge protection to prevent falls from height. Maximise use of remote monitoring facilities to obviate the need for attendance at site during installation and commissioning phase of the works for fault diagnosis and rectification. The scheme designer is required to consider the access arrangements to all features to minimise / eliminate requirements in this regard.	Possible injury through falling, overstretching, dropping of items. The frequency and likelihood of occurrence will be reduced by the amount of pre-testing and preassembly that can be achieved prior to arrival at the site. This therefore needs to be maximised.	November 2018	PD, D, PC, C

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This is normal format of qualitative risk assessment

- Example for design review
- Design discipline
- Person at risk
- Action taken by PD, PC, D and C
- List of activity, hazards, person at risk, information on residual risk date and action required

## DOSH DRRULELINES FOR HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL (HIRARC) 2008



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Can go to this link to find this Guidelines HIRARC

<http://www.dosh.gov.my/index.php/ms/competent-person-form/occupational-health/guidelines/hirarc-2/1846-01-guidelines-for-hazard-identification-risk-assessment-and-risk-control-hirarc-2008/file>

LIKELIHOOD (LLH)	EXAMPLE	RATING
<b>Most likely</b>	The most likely result of the hazard / event being realized	<b>5</b>
<b>Possible</b>	Has a good chance of occurring and is not unusual	<b>4</b>
<b>Conceivable</b>	Might be occur at some time in future	<b>3</b>
<b>Remote</b>	Has not been known to occur after many years	<b>2</b>
<b>Inconceivable</b>	Is practically impossible and has never occurred	<b>1</b>

SEVERITY (SEV)	EXAMPLE	RATING
<b>Catastrophic</b>	Numerous fatalities, irrecoverable property damage and productivity	<b>5</b>
<b>Fatal</b>	Approximately one single fatality major property damage if hazard is realized	<b>4</b>
<b>Serious</b>	Non-fatal injury, permanent disability	<b>3</b>
<b>Minor</b>	Disabling but not permanent injury 2	<b>2</b>
<b>Negligible</b>	Minor abrasions, bruises, cuts, first aid type injury	<b>1</b>

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### Likelihood of an Occurrence;

This value is based on the likelihood of an event occurring. You may ask the question “How many times has this event happened in the past?” Assessing likelihood is based on worker experience, analysis or measurement. Likelihood levels range from “most likely” to “inconceivable.”

For example, a small spill of bleach from a container when filling a spray bottle is most likely to occur during every shift. Alternatively, a leak of diesel fuel from a secure holding tank may be less probable.

RISK MATRIX TABLE						
Likelihood (LLH)	Severity (SEV)					
	1	2	3	4	5	
5	5	10	15	20	25	
4	4	8	12	16	20	
3	3	6	9	12	15	
2	2	4	6	8	10	
1	1	2	3	4	5	

ACTION RATING		
RISK	DESCRIPTION	ACTION
15 - 25	HIGH	A HIGH risk requires immediate action to control the hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion.
5 - 12	MEDIUM	A MEDIUM risk requires a planned approach to controlling the hazard and applies temporary measure if required. Actions taken must be documented on the risk assessment form including date for completion.
1 - 4	LOW	A risk identified as LOW may be considered as acceptable and further reduction may not be necessary. However, if the risk can be resolved quickly and efficiently, control measures should be implemented and recorded.

Severity can be divided into five categories. Severity are based upon an increasing level of severity to an individual's health, the environment, or to property

Risk can be presented in variety of ways to communicate the results of analysis to make decision on risk control. For risk analysis that uses likelihood and severity in qualitative method, presenting result in a risk matrix is a very effective way of communicating the distribution of the risk throughout a plant and area in a workplace.

Risk can be calculated using the following formula:

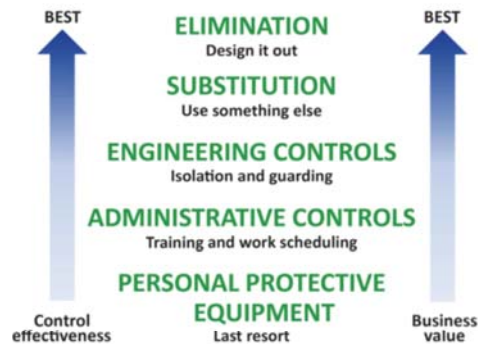
**$L \times S = \text{Relative Risk}$**

**$L = \text{Likelihood}$**

**$S = \text{Severity}$**



## RISK CONTROL (ALARP)



### Types of Control

At the source of the hazard

**Elimination** - Getting rid of a hazardous job, tool, process, machine or substance is perhaps the best way of protecting workers. For example, when designing, a designer should consider the risks people may be exposed to through the course of both constructing a building and using it once it is constructed

**Substitution** - Sometimes doing the same work in a less hazardous way is possible.

**Engineering control** – If elimination or substitution cannot be applied, engineering control is one of the control measure to reduce the risk

#### Administrative controls

Safe work procedures , supervision and training and job rotation

**Personal protective equipment** - Personal protective equipment (PPE) and clothing is used when other controls measures are not feasible and where additional protection is needed. Workers must be trained to use and maintain equipment properly.



## **4. RISK MANAGEMENT APPROACH FOR OSHCI(M)**

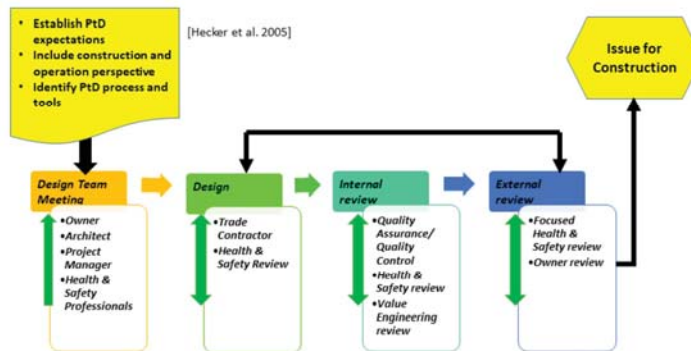
- **Design Review Process Flow**
- **DRRULE 1,2,3 (Objectives)**
- **DRRULE 1 - Concept Design Review**

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Design review process is a systematic approach that integrates the risk management process in the design phases and encourages collaboration between a client, designer, and constructor is recommended

The objective of design review is to identify significant risk, proportionately and lead to less unnecessary bureaucracy, better team working, and better project management encourages better quality and value for everyone.

## PtD Process



PtD is a process

- Address safety and health needs
- During the design stage
- Anticipates and prevents or minimize hazard and risk
- By designing out the risk

Overview of the Process

- plan
- Assess
- Design
- Review
- Verify
- Learn

## GENERAL PRINCIPLES OF PREVENTION

1. Avoid risks
2. Evaluate risks which cannot be avoided
3. Combat the risks at source
4. Adapt the work to the individual
5. Adapt to technical progress
6. Replace dangerous by non-dangerous or less dangerous
7. Develop a coherent overall prevention policy
8. Give collective protective measures priority over individual protective measures
9. Give appropriate instructions to employees

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The general principles of prevention provide a framework within which designers should consider their designs and any potential risks which may affect:

- i) workers or anyone else (for example, members of the public) who may be affected during construction;
- ii) those who may maintain or clean the building once it is built;
- iii) those who use the building as a workplace.

This means thinking about design solutions for reasonably foreseeable hazards that may occur as the structure is built, commissioned, used, maintained, repaired, refurbished or modified, decommissioned, demolished or dismantled and disposed or recycled

# WHAT SHOULD DESIGNER DO?

## 1. Preparing or modifying design

- Taking account of the general principles of prevention in design work
- Taking account of pre-construction information
- Eliminating, reducing or controlling foreseeable risks through design



## 2. Providing design information

### Provide info to:

- Principal designer;
- Other designer;
- Principal contractor;
- Contractors.

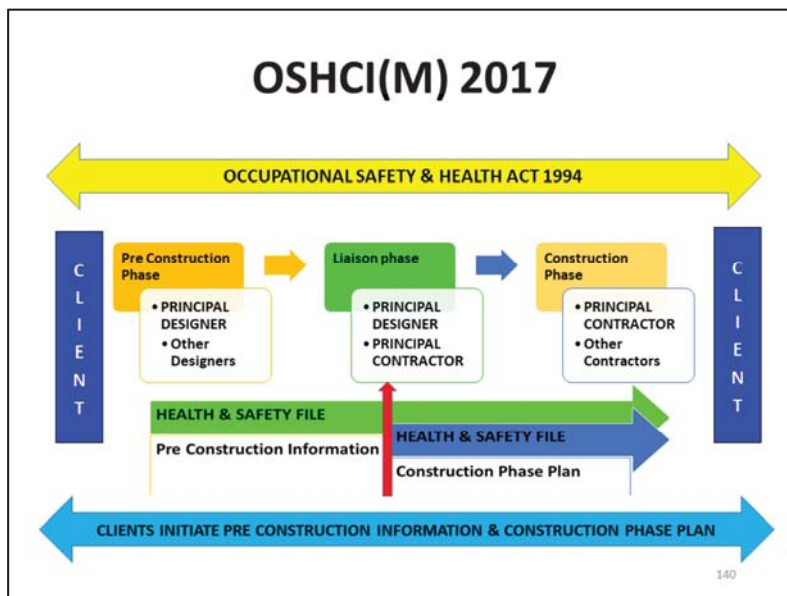
## 3. Making client aware of their duties

## 4. Cooperating with other duty holders

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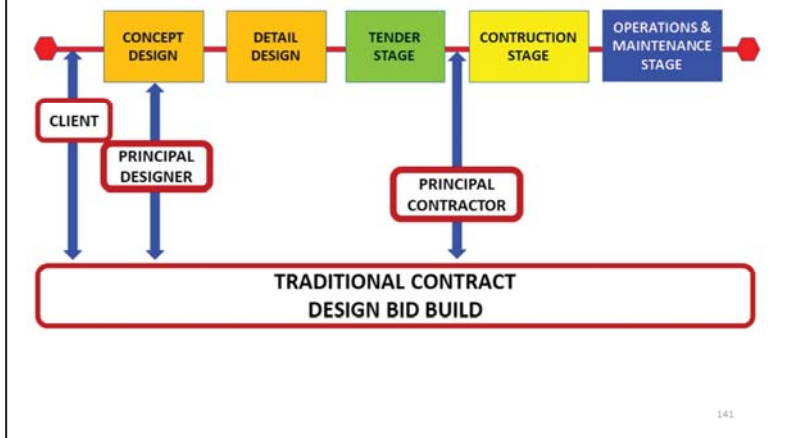
Designer(s) shall take into consideration of the systematic approach or an equivalent process that meets the objectives of the risk management principles

As the design progresses and details are developed to the next level, there are opportunities for reviewing and validating the decisions to confirm the effectiveness of controls adopted in the design solution. It is usually easier to correct or eliminate risks at the earliest possible time



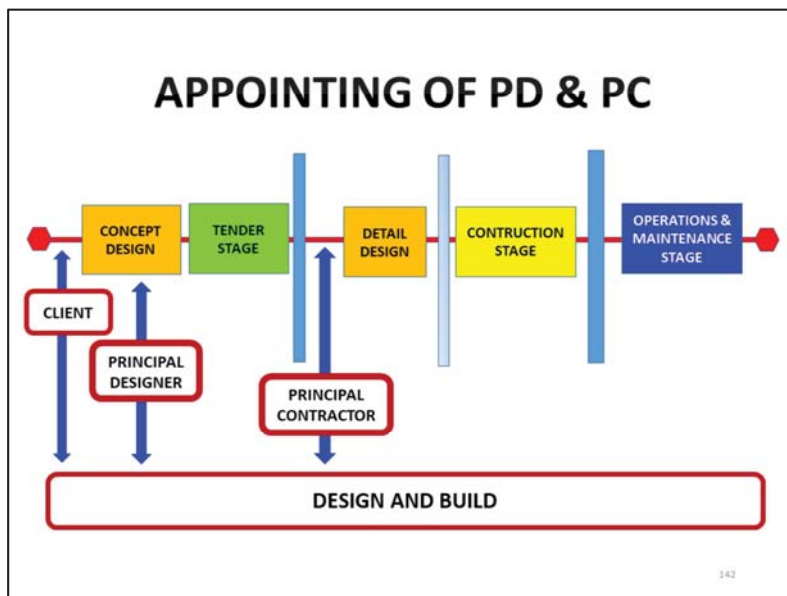
Managing occupational safety and health risks at the planning and design stage is often more effective, easier to sustain and cheaper to achieve than making changes later when the hazards become real risks in the workplace. **These guidelines provide practical guidance to the client, designer and contractor on the management of safety, health and welfare when carrying out construction projects<sup>1</sup> of a structure<sup>2</sup>.** This guidance is for people with legal duties under the *Occupational Safety and Health Act* and the *Factories and Machinery Act*. These include client, designer and contractor. **It explains what they must or should do to comply with the law and recommends duties to them in order to manage their projects.** Any actions taken should always be proportionate to the risks in the construction project

## APPOINTING OF PD & PC



Client making appointments is suggested to use the standard safety and health questions in Appendix 1 Example of OSH Capabilities Questionnaire in the Guideline on Contract Management or Publicly Available Specification 91:2013 Construction related procurement. These pre-qualification questionnaires are useful aids in selecting the suitable. Using these questions is one way of helping to assess organisational capability. Client should also check that the designer or contractor has enough experience and a good record in managing the risks involved in projects. The formal appointments of designers and contractors should be made in written.

Documentation of the pre-qualification checks and assessments will support the reasonable steps taken by client (or anyone appointed by client) to satisfy themselves that those who will carry out the work have the skills, knowledge, experience, and, where they are an organisation, the organisational capability to carry out the work in a way that secures safety and health.

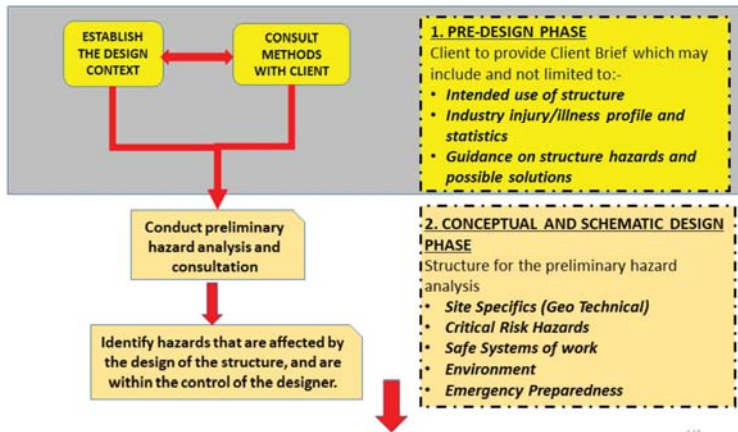


-same procedure of appointing the PD and PC

But at very earlier stage. After the facilities study PD will appointed by client . PD will do all duties. During tender stage, person/party that got the tender will be the PC



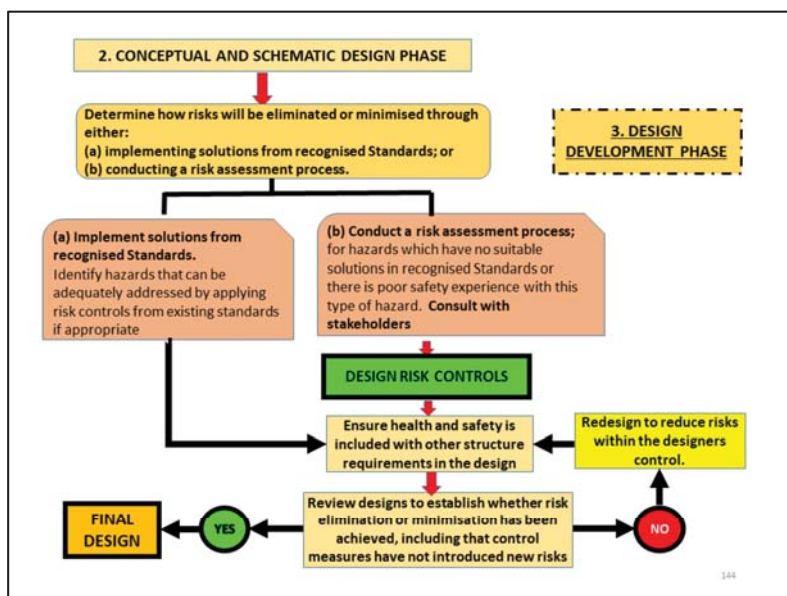
## RISK MANAGEMENT PRINCIPLES IN OSHCI(M)



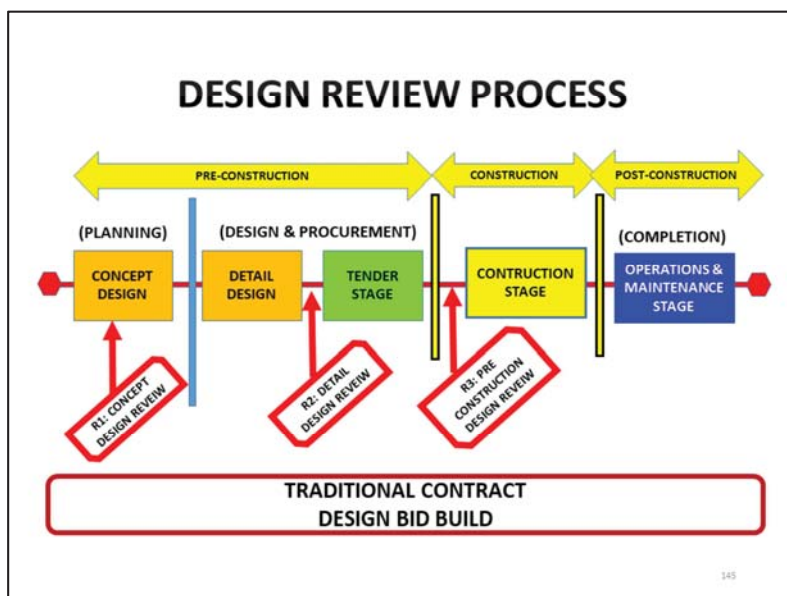
Design review process is a systematic approach that integrates the risk management process in the design phases and encourages collaboration between a client, designer, and constructor is recommended

The general principles of prevention are set out in full in Appendix 1, but in summary they are to:

- avoid risks where possible;
- evaluate those risks that cannot be avoided; and
- put in place proportionate measures that control them at source.

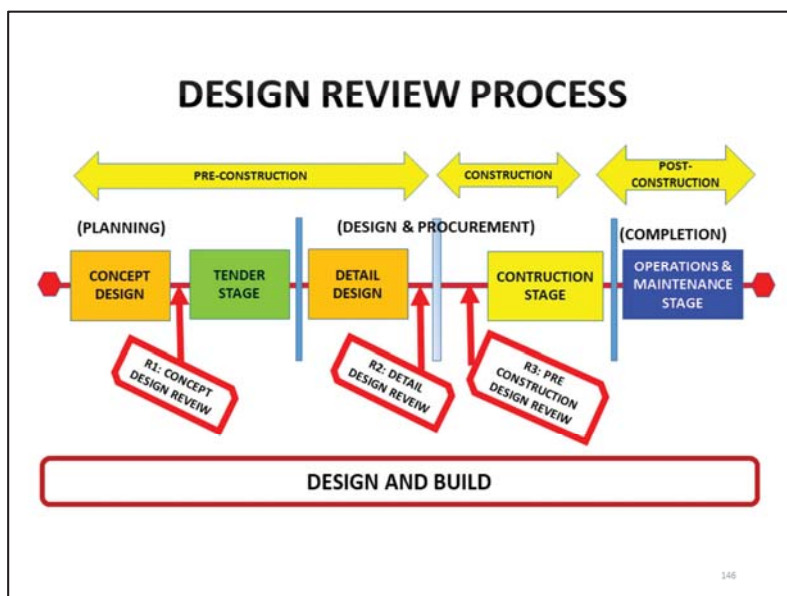


These guidelines recommend designers, principal designers, principal contractors and contractors to take account of the principles in carrying out their duties. Applying this principle at the planning and design stage will enable the client, designer and contractor to integrate control measures early in the design process to avoid or, if this is reasonably practicable, minimize risks to safety and health throughout the life of the structure being designed. Designing for safety of a structure should always be part of a wider set of design objectives, including practicability, aesthetics, cost and functionality. These sometimes competing objectives need to be balanced in a manner that does not compromise the safety and health of those who work on or use the structure over its life. General guidance on the risk management process is available in the *Guidelines for Hazard Identification, Risk Assessment and Risk Control (HIRARC)*.



The roles and responsibilities of clients will be inclusive of what they should do, and how is their work process. The work process includes the whole lifecycle of a project, consisting of pre-construction, during construction and post-construction. This section will outline the duties and responsibilities of clients based on project phase.

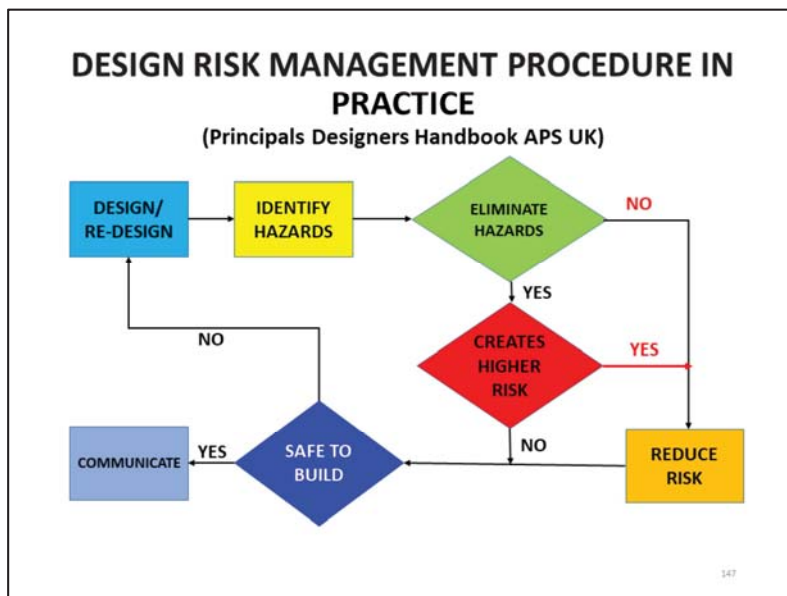
These guidance notes are based on Traditional Contract (which is also known as design bid build) as well as Design & Build Contracts. It is important to highlight that the duty to design for safety depends on the nature of contract as stated below.



During the pre-construction phase, the principal designer must;

- i) help bring the Pre-Construction Information together and provide it to the Designers and Contractors involved
- ii) assist the Client to assemble information, identify gaps and make reasonable enquiries about obtaining information about their premises [building and land] and local environment
- iii) When developing Pre-Construction Information, the Principal Designer should meet the Designers and discuss any issues that arise. They must ensure that Design Risk Management issues are discussed in design review meetings, team meetings, health and safety coordination meetings and workshops for specific issues and continuing communication
- iv) Invite the Principal Contractor to design team meetings to support the coordination between the designs undertaken during the pre-construction phase and those undertaken by other Designers during the construction phase
- v) Ensure that the Pre-Construction Information gathered during the Pre-Construction Phase should be incorporated into drawings, where possible. In addition to drawings, a document should be prepared, if required, to describe emergency procedures, the surrounding environment and the Client's management arrangements during

- construction. Significant risk information should be highlighted on drawings with symbols and a brief description
- vi) The Principal Designer should use a schedule to keep a record of required information as it is received. This should cover adequacy of information provided and Date of receipt and source of information
  - vii) When receiving information on significant remaining risk from Designers, Principal Designer should ensure that the information is clear, precise and in a form suitable for others to understand and justify whether the information should be on the drawing of the design. A log of responses from Designers is recommended to be kept because it is easy to lose track of returns.



Flowchart of design risk management procedure

- systematic way of making a construction project as safe as reasonably practicable and it shall also be used as part of the design process. It involves the following broad steps:

- i) Identify reasonably foreseeable hazards associated with the design,
- ii) Assess the risks arising from the hazards,
- iii) Eliminate or minimise the risk by designing control measures,
- iv) Re-assess the risk with the identified control measures implemented,
- v) Monitor and review the control measures.

## DESIGN REVIEW OBJECTIVES

### RULE 1: Concept Design Review

Concept design review shall look into the project overall perspective including but not limited to site location, public access traffic, and type of buildings in the surroundings, landscape and other general constraints.

### RULE 2: Detailed Design, Maintenance and Repair Review

Detailed design, operations, maintenance and repair review should look at a building's detailed architectural and structural design. The review should determine risks involved in the construction methods, access and egress, and whether the design will create confined space or other hazards. Risks related to maintenance and repair of a building, such as cleaning methods, should also be studied.

### RULE 3: Pre-Construction Design Review

Pre-construction design review should examine temporary works design and design by specialist contractors not covered during the concept and detailed design phases

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The objective of design review is to identify significant risk, proportionately and lead to less unnecessary bureaucracy, better team working, and better project management encourages better quality and value for everyone.

Design review includes analysing the relevant detail and working collaboratively with others to identify significant risks, mitigate their impact, record the significant findings and produce suitable information to communicate these measures proportionately

## DESIGN REVIEW PROCESS

- This section introduces the **Design Review Process called DRRULE**. Areas covered include:
  - **DRRULE Process**
    - DRRULE 1, 2, 3 and their scope
    - Examples of DRRULE 1, 2, 3.
  - **Other Safety and Health Considerations**
    - Hazards Identification Tools used in DRRULE
    - Checklist Method and Brainstorming
  - **Learning Activity 1 – includes a scenario for discussion which will help to gain a better understanding of Design Review Process.**
  - **Pointers on Facilitation of Design Review Process**

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Design review procedure covers respective duty holder's role and shall go through three stages:

Concept Design Review  
Detail Design Review  
Pre-construction Plan Review



## DESIGN REVIEW PROCESS - DRRULE

- To ensure the design is safe, a Design Review Process called DRRULE is introduced.
  - *Chaired and facilitated by the Principal Designer*
  - *Consist of major stakeholders such as client, design engineer, architect and contractor (if onboard already)*
  - *DRRULE led by the Principal Designer to identify and manage the hazards*

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**RULE 1: Concept Design Review**

**RULE 2: Detailed Design, Maintenance and Repair Review**

**RULE 3: Pre-Construction Review**

## DESIGN REVIEW PROCESS - DRRULE

1	<b>D</b>	<b>DESIGNATE</b> the Design Risk Management Team consisting of major stakeholders.
2	<b>R</b>	<b>REINFORCE RISK MANAGEMENT</b> is not an <b>OPTION BUT THE SOLUTION</b>
3	<b>R</b>	<b>RECOGNISED</b> the full <b>Context and Concept of Design</b> the hazards and risks that arise as a result of the design or construction method.
4	<b>U</b>	<b>UNDERSTAND</b> the <b>sources of hazards and risk</b>
5	<b>L</b>	<b>LEVERAGE</b> your design skills towards <b>risk mitigation</b>
6	<b>E</b>	<b>ENSURE</b> risk controls are formally <b>NOTIFIED</b> and residual risks information updates <b>in SHF and Advisory Notes</b>

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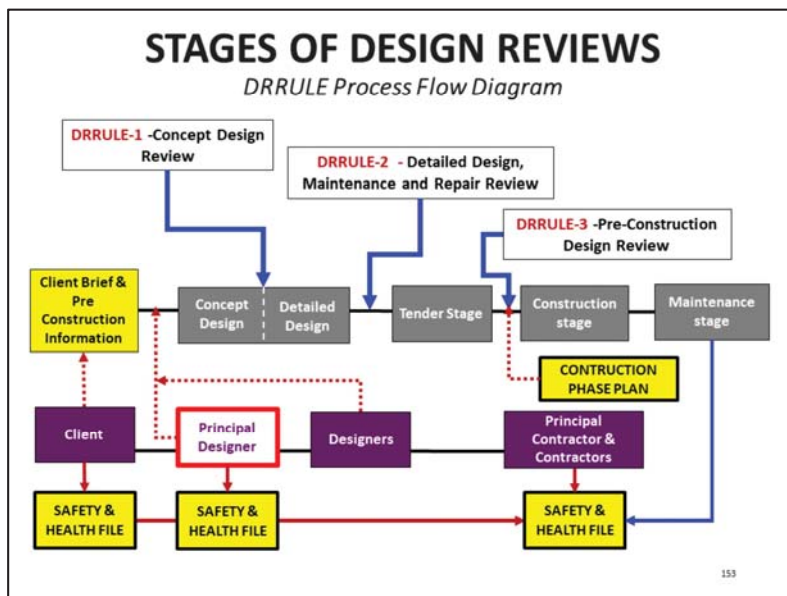
After hazards are identified from brainstorming these questions, significant hazards should then be assess using the:-  
 Appendix 4 Example of Qualitative & Semi Quantitative Risk Assessment Form;  
 A follow-up review should be done to ensure that the hazards are addressed and not merely filed away.

## DESIGN REVIEW PROCESS - DRRULE

- **Steps 3, 4 and 5 (Recognised, Understand & Leverage Design around the risk)**
  - **Should be repeated, and**
  - **until the review team is satisfied that the design can no longer be changed to totally eliminate all risks.**

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Unless results from applying RULE-1 at conceptual design stage indicate that a redesign or relocation of the project is required, risks identified under RULE-1 can usually be addressed during RULE-2 design stage. As such, RULE-1 is usually performed once. Design issues highlighted in RULE-1 should be addressed by the Designer when he or she is doing the detailed design. RULE-2 will hence be an exercise to identify risks and ensure that risks raised in RULE-1 are control through elimination or reduced;

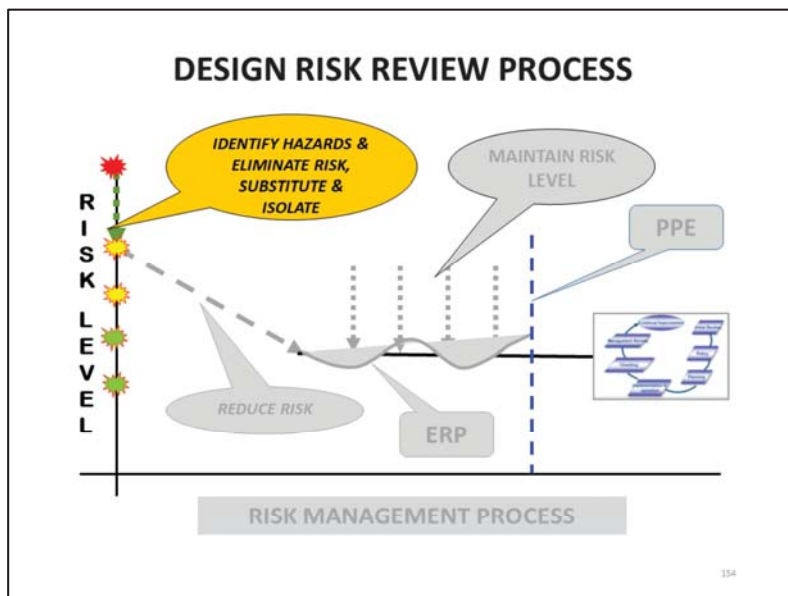


1. Pre-design stage – client to provide Client Brief
2. Conceptual and schematic design phase – structure for the preliminary hazard analysis

Design review procedure covers respective duty holder's role and shall go through three stages:

Concept Design Review  
 Detail Design Review  
 Pre-construction Plan Review

These stages shall require information and documentation for each duty holders to produce and distribute.



Determine how risk will be eliminated or minimized through ;

- i) Implement solution from recognized standard (hazard that can be addressed by risk control)
- ii) Conducting risk assessment process (consult with stakeholders)

## DESIGN RISK KEY FOCUS (HAZARDS)

Foreseeable risks of a project may come from broad groupings of hazards. The following list may be used to assist in identifying hazards and controlling foreseeable risks associated with the design of a structure throughout its lifecycle.

<b>Earthworks</b> <ul style="list-style-type: none"> <li>• Excavations (for example, risks from earth collapsing or engulfment)</li> <li>• Location of underground services</li> </ul>	<b>Structural safety</b> <ul style="list-style-type: none"> <li>• Erection of steelwork or concrete frameworks</li> <li>• Load bearing requirements</li> <li>• Stability and integrity of the structure</li> </ul>
<b>Movement of people and materials</b> <ul style="list-style-type: none"> <li>• Safe access and egress, including for people with disability</li> <li>• Traffic management <ul style="list-style-type: none"> <li>• Loading bays and ramps</li> <li>• Safe crossings</li> <li>• Exclusion zone</li> <li>• Site security</li> </ul> </li> </ul>	<b>Manual tasks</b> <ul style="list-style-type: none"> <li>• Methods of material handling</li> <li>• Accessibility of material handling</li> <li>• Loading docks and storage facilities</li> <li>• Workplace space and layout to prevent musculoskeletal disorders, including facilitating use of mechanical aids</li> <li>• Assembly and disassembly of pre-fabricated fixtures and fittings</li> </ul>

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- Ensure health and safety is included with other structure requirement in the design
- Review design to establish risk elimination or minimization has been achieved include the control measures have not introduced new risk

<b>Electrical safety</b> <ul style="list-style-type: none"> <li>• Earthing of electrical installations</li> <li>• Location of underground and overhead power cables</li> <li>• Protection of leads/cables</li> <li>• Number and location of power points</li> </ul>	<b>Noise exposure</b> <ul style="list-style-type: none"> <li>• Exposure to noise from plant or from surrounding area</li> </ul>
<b>Plant</b> <ul style="list-style-type: none"> <li>• Tower crane locations, loading and unloading</li> <li>• Mobile crane loads on slabs</li> <li>• Plant and machinery installed in a building or structure</li> <li>• Materials handling plant and equipment</li> <li>• Maintenance access to plant and equipment</li> <li>• The guarding of plant and machinery</li> <li>• Lift installations</li> </ul>	<b>Substances</b> <ul style="list-style-type: none"> <li>• Exposure to hazardous substances and materials including insulation and decorative materials</li> <li>• Exposure to volatile organic compounds and off gassing through the use of composite wood products or paints</li> <li>• Exposure to irritant/ toxic dust and fumes</li> <li>• Storage and use of hazardous chemicals, including cleaning products</li> </ul>

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Foreseeable risks of a project may come from broad groupings of hazards. The following list may be used to assist in identifying hazards and controlling foreseeable risks associated with the design of a structure throughout its lifecycle.

<b>Amenities and facilities</b> <ul style="list-style-type: none"> <li>• Access to various amenities and facilities such as storage, first aid rooms/sick rooms, rest rooms, meal and accommodation areas and drinking water</li> </ul>	<b>Specific risks</b> <ul style="list-style-type: none"> <li>• Exposure to radiation, for example, electromagnetic radiation</li> <li>• Exposure to biological hazards</li> <li>• Fatigue</li> <li>• Working alone</li> <li>• Use of explosives</li> <li>• Confined spaces</li> <li>• Over and under water work, including diving and work in caissons with compressed air supply</li> </ul>	
<b>Fire and emergencies</b> <ul style="list-style-type: none"> <li>• Fire risks</li> <li>• Fire detection and fire fighting</li> <li>• Emergency routes and exits</li> <li>• Access for and structural capacity to carry fire tenders</li> <li>• Other emergency facilities</li> </ul>	<b>Falls prevention</b> <ul style="list-style-type: none"> <li>• Guard rails</li> <li>• Window heights and cleaning</li> <li>• Anchorage points for building maintenance and cleaning</li> <li>• Access to working spaces for construction, cleaning, maintenance and repairs</li> <li>• Scaffolding</li> <li>• Temporary work platforms</li> <li>• Roofing materials and surface characteristics such as fragility, slip resistance and pitch</li> </ul>	<b>Working environment</b> <ul style="list-style-type: none"> <li>• Ventilation for thermal comfort and general air quality and specific ventilation requirements for the work to be performed on the premise</li> <li>• Temperature</li> <li>• Lighting including that of plant room</li> <li>• Acoustic properties and noise control, for example, noise isolation, insulation and absorption</li> <li>• Seating</li> <li>• Floor surfaces to prevent slips and trips</li> <li>• Space for occupants</li> </ul>

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Foreseeable risks of a project may come from broad groupings of hazards. The following list may be used to assist in identifying hazards and controlling foreseeable risks associated with the design of a structure throughout its lifecycle.



## PRELIMINARY HAZARD ANALYSIS (HK OSHEC & DEVB Guidance Notes 2010)

Significant Hazards and Designers' Action	Significant Hazards Identified During Design (If applicable)																KEY
	Construction	Fall From Height	Falling Objects	Site Plant Vehicles	Collapsing Structures	Excavated Trenches	Lifting Operations	Blocked / Overhead Services	Interaction With Others	Car / Loading Crane on Site	Vehicle and Machinery	Deep Excavations	Asbestos	Fire Means of Escape	Highway Traffic	Restricted Access	
Design Areas and Construction / Maintenance Activities																	<b>Comments/Qualification:</b> Information required to assist design and Guidance, summary of Principles of Prevention that MUST be applied to a significant risk when designing Avoidance (Design to avoid identified hazards but beware of introducing others) C&C-Control and Transfer (Design to provide acceptable safeguards or transfer the hazard with information)
Site Set Up Logistics																	
Access To Site																	
Site Offices and Compound																	
Site Surveys																	
Temp Services																	
Public / Highway Traffic Safety																	
Demolition and Dismantling																	
Design Areas and Associated																	
Construction Activities																	
Ground Excavation Works																	
Filling																	
Concrete Substructure																	
Slabs																	
Interfaces																	
Drainage and Utility Services																	
Superstructure Frame																	
Superstructure Flooring																	

*Notes: The activities and hazards are listed for reference, other related should be considered depends on actual condition*

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### Describe the Matrix

1. X Axis are Design areas and Maintenance Activities
2. Y Axis Significant Hazards and Designers Action

# DESIGN RISK MANAGEMENT REFERENCES

## DESIGNERS

### Design Risk Management

1. Blank Risk Assessment Form APS
2. Blank Qualitative Risk Assessment Form
3. Design Risk Assessment Sample
4. Hierarchy of Control RAG List
5. Example Semi Quantitative Risk Assessment



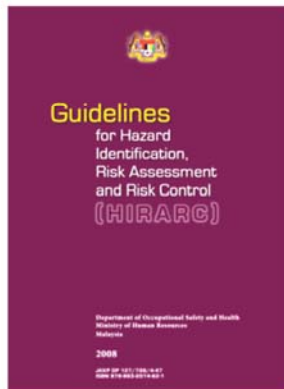
QUALITATIVE RISK ASSESSMENT EXAMPLE FOR DESIGN REVIEW							
Design Review Rule1/ Rule2/Rule3.							
Design Discipline:				Prepared By:		Checked By:	
* Persons at Risk: (1) Construction workers (2) Members of the Public (3) Maintenance workers							
** Action by: Principal Designer – include in the pre-construction health and safety plan / safety and health file							
Principal Contractor – manage risk during the construction phase							
Designer – take into consideration when preparing their designs							
Client – pass information to designers / planning supervisor							
Ref.	Activity	Hazard	Persons at Risk(s)	Design Measures taken, or being taken to eliminate or reduce the hazard	Information on the Residual Risk	Date Issue Raised	Action Required by:
MR1-1	Installation of equipment at height on existing / new structures	Possible injury through falling, overstretching, dropping of items.	(1) (2) (3)	Maximise pre assembly / installation of infrastructure prior to site installation to minimise any requirement to use a MEWP. Maximise pretesting of equipment to eliminate faults following installation (eg. soak testing). Provide appropriate means of edge protection to prevent falls from height. Maximise use of remote monitoring facilities to obviate the need for attendance at site during installation and commissioning phase of the works for fault diagnosis and rectification. The scheme designer is required to consider the access arrangements to all features to minimise / eliminate requirements in this regard.	Possible injury through falling, overstretching, dropping of items. The frequency and likelihood of occurrence will be reduced by the amount of pre-testing and preassembly that can be achieved prior to arrival at the site. This therefore needs to be maximised.	November 2018	PD, D, PC, C

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This is normal format of qualitative risk assessment

- Example for design review
- Design discipline
- Person at risk
- Action taken by PD, PC, D and C
- List of activity, hazards, person at risk, information on residual risk date and action required

## DOSH GUIDELINES FOR HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL (HIRARC) 2008



Can go to this link to find this Guidelines HIRARC

<http://www.dosh.gov.my/index.php/ms/competent-person-form/occupational-health/guidelines/hirarc-2/1846-01-guidelines-for-hazard-identification-risk-assessment-and-risk-control-hirarc-2008/file>

LIKELIHOOD (LLH)	EXAMPLE	RATING
<b>Most likely</b>	The most likely result of the hazard / event being realized	<b>5</b>
<b>Possible</b>	Has a good chance of occurring and is not unusual	<b>4</b>
<b>Conceivable</b>	Might be occur at some time in future	<b>3</b>
<b>Remote</b>	Has not been known to occur after many years	<b>2</b>
<b>Inconceivable</b>	Is practically impossible and has never occurred	<b>1</b>

SEVERITY (SEV)	EXAMPLE	RATING
<b>Catastrophic</b>	Numerous fatalities, irrecoverable property damage and productivity	<b>5</b>
<b>Fatal</b>	Approximately one single fatality major property damage if hazard is realized	<b>4</b>
<b>Serious</b>	Non-fatal injury, permanent disability	<b>3</b>
<b>Minor</b>	Disabling but not permanent injury 2	<b>2</b>
<b>Negligible</b>	Minor abrasions, bruises, cuts, first aid type injury	<b>1</b>

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### Likelihood of an Occurrence;

This value is based on the likelihood of an event occurring. You may ask the question “How many times has this event happened in the past?” Assessing likelihood is based worker experience, analysis or measurement. Likelihood levels range from “most likely” to “inconceivable.”

For example, a small spill of bleach from a container when filling a spray bottle is most likely to occur during every shift. Alternatively, a leak of diesel fuel from a secure holding tank may be less probable.

RISK MATRIX TABLE						
Likelihood (LLH)	Severity (SEV)					
	1	2	3	4	5	
5	5	10	15	20	25	ACTION RATING
4	4	8	12	16	20	
3	3	6	9	12	15	
2	2	4	6	8	10	
1	1	2	3	4	5	

RISK	DESCRIPTION	ACTION
15 - 25	HIGH	A HIGH risk requires immediate action to control the hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion
5 - 12	MEDIUM	A MEDIUM risk requires a planned approach to controlling the hazard and applies temporary measure if required. Actions taken must be documented on the risk assessment form including date for completion.
1 - 4	LOW	A risk identified as LOW may be considered as acceptable and further reduction may not be necessary. However, if the risk can be resolved quickly and efficiently, control measures should be implemented and recorded.

Severity can be divided into five categories. Severity are based upon an increasing level of severity to an individual's health, the environment, or to property

Risk can be presented in variety of ways to communicate the results of analysis to make decision on risk control. For risk analysis that uses likelihood and severity in qualitative method, presenting result in a risk matrix is a very effective way of communicating the distribution of the risk throughout a plant and area in a workplace.

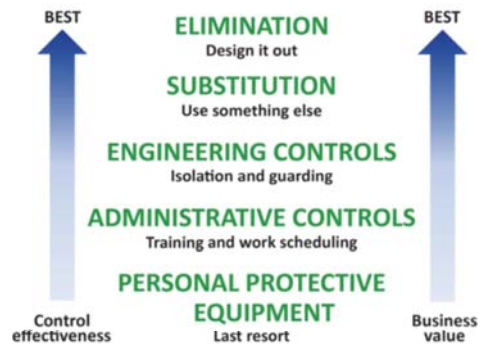
Risk can be calculated using the following formula:

**$L \times S = \text{Relative Risk}$**

**$L = \text{Likelihood}$**

**$S = \text{Severity}$**

## RISK CONTROL (ALARP)



### Types of Control

At the source of the hazard

**Elimination** - Getting rid of a hazardous job, tool, process, machine or substance is perhaps the best way of protecting workers. For example, when designing, a designer should consider the risks people may be exposed to through the course of both constructing a building and using it once it is constructed

**Substitution** - Sometimes doing the same work in a less hazardous way is possible.

**Engineering control** – If elimination or substitution cannot be applied, engineering control is one of the control measure to reduce the risk

#### Administrative controls

Safe work procedures , supervision and training and job rotation

**Personal protective equipment** - Personal protective equipment (PPE) and clothing is used when other controls measures are not feasible and where additional protection is needed. Workers must be trained to use and maintain equipment properly.



## POST REVIEW MEETINGS RISK CONTROL PRINCIPLES (ALARP)

Residual Risk Describe into  
drawings for Principal's  
Contractors and Facility Managers

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Ideally the design review risk control shall consider the above principles in determining the respective initiatives to **DESIGNING OUT THE RISK** and when not able to do so minimize the risk so far as reasonably practicable and the provide to the **CONTRACTORS** the information of the **RESIDUAL RISK in a formalize manner**;



## **RISK CONTROL PRINCIPLES (ALARP)**

### **Residual Risk (To PC & C(s) to address)**

- Upon the application of the proposed **RISK CONTROLS** the residual risk information shall be **NOTIFIED** to the affected persons.
  - **Affected persons are those who are affected by the building**
    - including those persons who construct, alter, demolish, occupy, or maintain the building, or persons who visit or are proximate to the building).
- **Different sets of affected persons exist at the different stages of a building development's life**
  - i.e. construction, use/ occupancy / maintenance/ alteration, and decommissioning and demolition), and each stage should be considered for Design Review's

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Upon the application of the proposed **RISK CONTROLS** the residual risk information shall be **NOTIFIED** to the **affected persons**.

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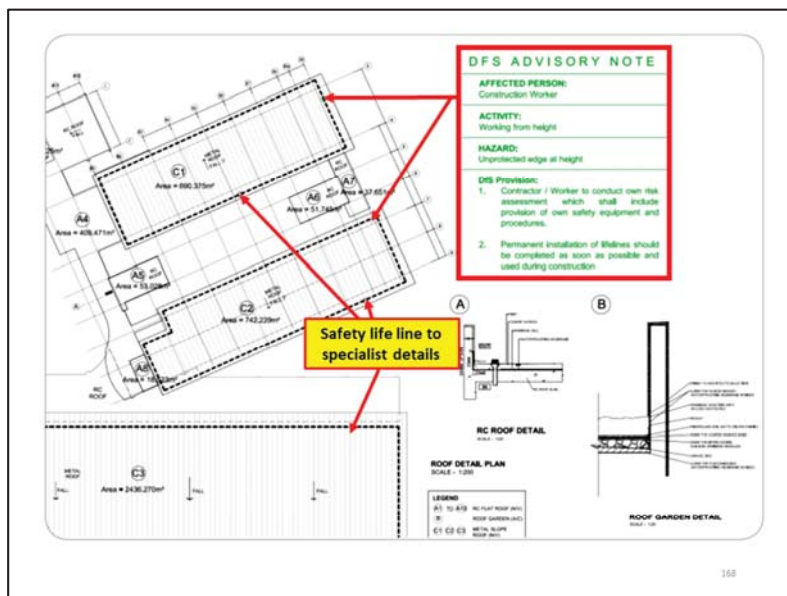
Different sets of affected persons exist at the different stages of a building development's life (i.e. construction, use/ occupancy /maintenance/ alteration, and decommissioning and demolition), and each stage should be considered for Design Review's

This information shall be recorded in the Safety & Health File and relevant documents; formally done an **ADVISORY NOTE**; this is most effectively done by adding safety '**advisory notes**' to the design information that the affected persons will refer to

## RESIDUAL RISK (TO PC & C(S) TO ADDRESS)

- This information shall be recorded in the Safety & Health File and relevant documents; **formally done an ADVISORY NOTE;**
  - this is most effectively done by **adding safety 'advisory notes' to the design information that the affected persons will refer to. For example:**
    - A. **'Advisory notes' for construction workers** is best integrated in the working drawings, shop drawings, specifications, method statements, etc. to which they are referring in the course of their works.
    - B. **'Advisory notes' for maintenance personnel** is best integrated in the as-built drawings and/or operating procedure statements/instructions in operation & maintenance manuals.

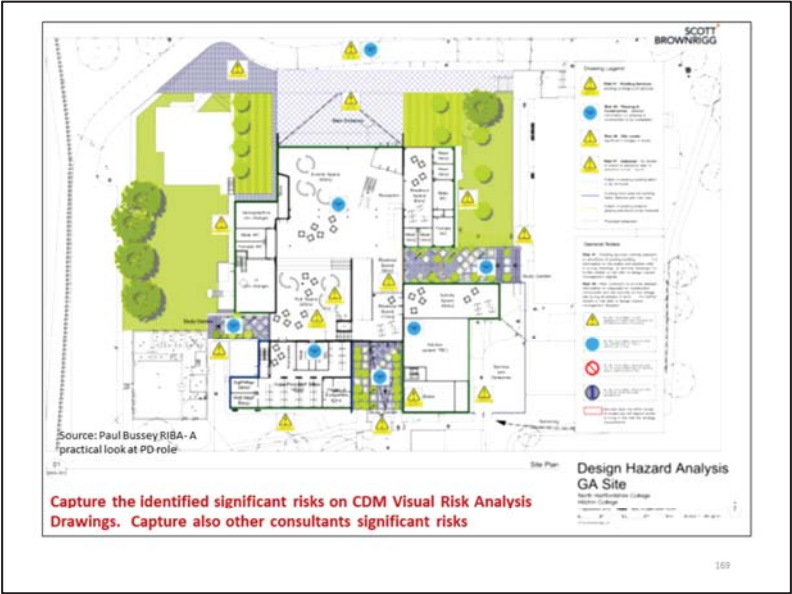
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‘Advisory notes’ for construction workers is best integrated in the working drawings, shop drawings, specifications, method statements, etc. to which they are referring in the course of their works.

‘Advisory notes’ for maintenance personnel is best integrated in the as-built drawings and/or operating procedure statements/instructions in operation & maintenance manuals.

The ‘advisory notes’ specifically seek to make affected persons aware of the significant risks they must address and the safety measures available to them in the course of their activities



Capture the other consultants significant risks

## CDM – INTELLIGENT DRAWING ANNOTATION

RESIDUAL RISK	
RISK NO	RISK DESCRIPTION
01	Management & protection of trees
02	Proximity of canal/overflow pipe flooding risk
03	Narrow Streets/ façade maintenance
04	Adjacent property/party wall (Note sequencing)
05	Smoke extract/ shaft with limited access



RIBA National CPD on CDM 2007  
10 Top Tips for Architects 2012

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Legend to Identify Risk's by what's annotated on each Revit Sheet

There are 1 to 5 Risk together with the descriptions





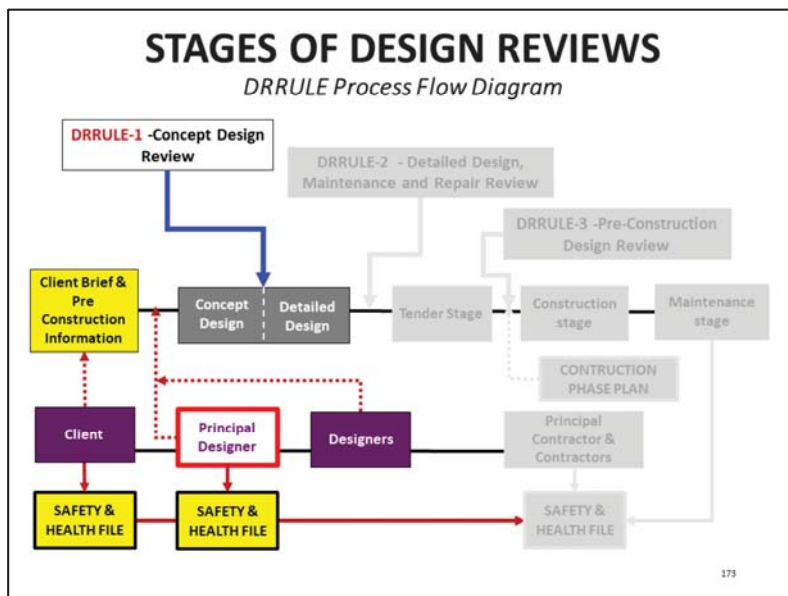
# **DRRULE 1 - CONCEPT DESIGN REVIEW**

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Design review procedure covers respective duty holder's role and shall go through three stages:

- Concept Design Review
- Detail Design Review
- Pre-construction Plan Review

DRRULE 1 will focus on concept design review



Pre-design

-identify design context and concept

Concept Design

- Consult client
- Identify stakeholders



## STAGES OF DESIGN REVIEWS

- **DRRULE-1: Concept Design Review**

- Purpose:

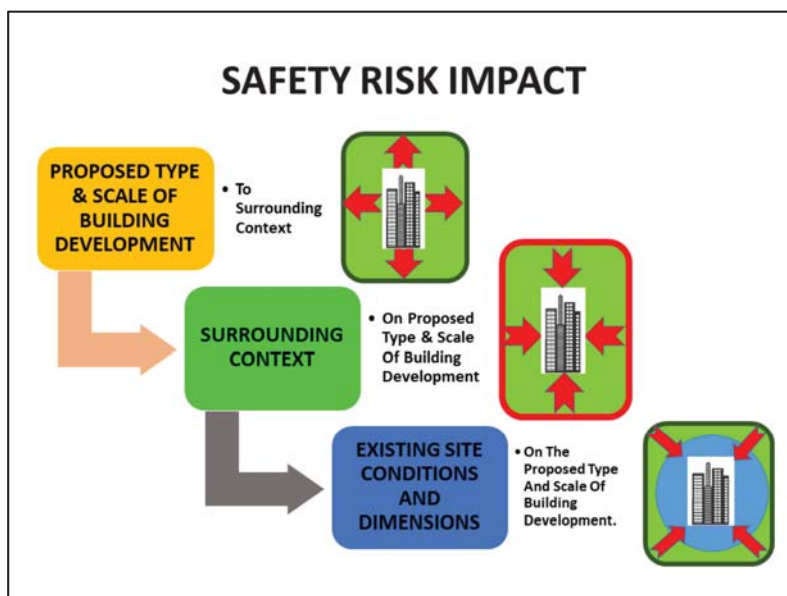
- **To review the conceptual design** and identify the risk associated with the **entire life cycle** of the building.
- By identifying and understanding the **risks in early stage** of the building life cycle, the identified **risks can be eliminated or control measured established.**
- ***Sometime risk identified in DRRULE-1 can only be addressed later in the project when more details become available.***

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### **RULE 1: Concept Design Review**

Concept design review shall look into the project overall perspective including but not limited to site location, public access traffic, and type of buildings in the surroundings, landscape and other general constraints.

**RULE 1** records hazards and risk arising from the design and description of the risk control measures to be taken of (e.g., materials used, structural concepts, and safe system of work considered)



#### For Selection of Site,

The proposed Site should be determined the **safety-feasibility** and shall comprise the acceptability of the proposed Site relative to tolerances for safety risks.

**The safety feasibility should consider: safety risk impact**

Reference: Singapore Institute Of Architects (SIA) Design-for-Safety (DfS) Handbook 2014)

## DRRULE-1: CONCEPT DESIGN REVIEW

- DRRULE-1 Concept design review should look at:
  - General location of the project
  - Traffic and vehicular flow in the surroundings
  - Type of building, and
  - Other general constraints

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The primary concerns of **RULE-1** will be on safety issues related to:

**the generic type (or nature) of the proposed development; and  
the location of the project;**

analysis of potential sites to determine the selection of an appropriate site;

analysis of location will include several major considerations such as soil assessment, the public, traffic, existing services and siting of plant and heavy machineries;

**RULE-1 will focus on hazards and risks identified resulting from the project siting;**

## EXAMPLE: DRRULE 1

Design for Safety consideration:

- General location of the project



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-analysis of potential sites to determine the selection of an appropriate site;

analysis of location will include several major considerations such as soil assessment, the public, traffic, existing services and siting of plant and heavy machineries

## EXAMPLE: DRRULE 1

### **PETRONAS Towers, Malaysia**

- Problems with original location due to soil condition
  - In September 1992, the site for the PETRONAS Towers was moved 200 ft. to the southwest.
  - Results of more thorough **geotechnical studies revealed existence of a subterranean porous limestone cliff,**
    - which dropped in elevation from near the surface to a depth of more than 395 ft. over the span of the site
  - **This made the location of piles extremely difficult in the original location**



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## RULE-1 CONSIDERATIONS

### Geotechnical

- Stability of soil, that is, is it subject to land slip
- Proximity of bodies of water to project
- Presence of water table
- Soil classification/ condition, for example, highly reactive
- Susceptible to flooding
- Susceptible to seismic activities

## EXAMPLE: DRRULE1



Walt Disney Concert Hall in Los Angeles : Oct 2003

### Design for Safety consideration:

- Type of building structure and building material
- Impact of the chosen building material on surroundings and public

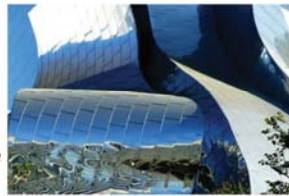
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Open discussion on the safety consideration based on

- Building structure
- The material
- Impact on surrounding

## EXAMPLE: DRRULE1

- This innovative structure has a polished stainless steel skin.
- The sweeping curves of its roof were like a parabolic mirror, reflecting the sunlight on nearby buildings and walk ways.
- Temperatures exceeded 60°C in some places, and drivers and passer-by were temporarily blinded by the glare.
- The impact on safety and health to the public, as well as the workers could have been identified through CDR process.



Walt Disney Concert Hall in Los Angeles.

The 2005 fix reportedly cost as much as \$90,000.

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-Surrounding occupancies, such as other residential (with respect to risks of noise, dust, working hours etc.)

- Dilapidation review of adjoining structures
- Ability to expand the facility in the future

## EXAMPLE: DRRULE 1

### Design for Safety Considerations:

Access to building by occupants, visitors and public.



#### The team should evaluate:

- Vehicular and pedestrian passageway  
– prevent crossing as much as possible.



Hospital waste

- Effective waste disposal paths, away from public access

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### Security

- Theft/malicious damage
- Trespass
- Isolated location



## EXAMPLE: DRRULE 1

### Design for Safety Considerations:

#### Location of underground services



#### The team should:

- Identify underground services, if any, that need to be removed for the project.
- Identify the hazards and impact to the workers and public, if any, due to the removal of these services.
- Provide contractor with existing services plan to plan for diversion, termination etc.

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There are potential hidden dangers. Every digging job requires a call - even "small" projects like planting trees and shrubs, installing mailboxes, hiring a contractor or landscaper to do a digging project. Failure to identify location of underground utilities can result in damage to gas, electric, communications, water and sewer lines, which can lead to service disruptions, serious injuries or even death and costly repairs and fines.



## **5. WORKSHOP**

### **DDRULE 1 CONCEPT DESIGN REVIEW**

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Group activity – discuss in group

## WORKSHOP - DRRULE 1 CONCEPT DESIGN REVIEW

- **Learning Activity**

- Break into groups of 5 to 6
- Use the attached group **workshops questions** to guide your discussion;
- Use a **Concept Design Layout** as provided;
- Take approximately **30 minutes** and record your findings;

- **Questions**

- List down **purpose of conducting** a Design Review Meeting;
- **What scope of hazard identification** for this meeting;
- **Describe the phase or stages** of Design Review and the time to conduct them;
- **Develop a checklist** to identify hazards at the DRRULE 1

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- form a group of 5 or 6 persons
- The questions and concept design layout are provided



# **DAY 02**

## **PRINCIPAL DESIGNER & DESIGNER(S) DESIGN RISK MANAGEMENT (02D)**

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Focus on guidance for PD and D on design risk management

## COURSE CONTENTS DAY 02

1. **Communication of Safety & Health Information**
  - Types of Information
  - Means of Communication
  - Coordination Flow
2. **Managing and Update Safety & Health File**
  - Design Review Outcome (Risk Control)
  - Distributing & Verifying Advisory Notes
3. **WORKSHOP : Discussion & Practice DRRULE-1**
  - HAZID - Hazard Considerations
  - RISK ASSESSMENT
  - Presentation
5. **WORKSHOP : Discussion & Practice DRRULE -2**
  - HAZID - Hazard Considerations
  - RISK ASSESSMENT
  - Presentation
6. **WORKSHOP : Discussion & Practice DRRULE -3**
  - HAZID - Hazard Considerations
  - RISK ASSESSMENT
  - Presentation
7. **Recap. Q & A**
8. **Written Assessment**

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We go on theories first which are covered

- Communication of safety & health information
- Managing and update SHF

then we proceed to workshop

-discussion and practice for DRRULE 1,2,3

After that we recap and open for Q&A

Proceed with written assessment



# 1. COMMUNICATION OF SAFETY & HEALTH INFORMATION

- Types of Information
- Means of Communication
- Coordination Flow

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## 1. Types

- S&H information
- Handover of SHF to client

## 2. Means

- For disseminate and gather safety health information from stakeholders

## 3. Coordination

- **right** safety and health **information** is passed on to the **right stakeholder** at the **right time**.

# COLLABORATION & COORDINATION

Everyone cooperating and communicating with each other and coordinating their work

## Cooperating

- to ensure safety and health
- to ensure everyone complies with the law

## Communication

- to make sure everyone understands the risks and the measures to control those risk
- between main contractors of different sites

## Coordinating

- among sub-contractors who start at different stages
- flow of information and instruction

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Client – PD/D – PC/C – subcontractors collaborate for cooperating and communicate with each other on

-SHF

- Control risk
- Perform duties complies with the law

## TYPES OF SAFETY AND HEALTH INFORMATION FOR COMMUNICATION

- Principal Designer is required to communicate safety and health information to relevant stakeholders.
- The types of safety and health information required for communication may include:
  - **Safety and health** information provided by the designers and contractors,
    - E.g. information on soil movement
  - **Handover of Safety and Health File to client for occupation and maintenance**

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In design review process, PD required to

- communicate the information based on concept and detailed design to the client or stakeholders
- Handover SHF to client for further action



## **TYPES OF SAFETY AND HEALTH INFORMATION FOR COMMUNICATION**

- Sequence of construction works
- Safety and health hazards affecting relevant stakeholders
- Implications of hazards
- Information arising from DRRULE processes
- Control measures to mitigate risks
- Safety and health responsibilities of relevant stakeholders
- Actions required by relevant stakeholders for mitigation of risks
- Means of communication available to stakeholders

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This is part of safety and health information that need to communicate for further action of each duty holders and appointment of subcontractor

## **MEANS OF COMMUNICATION TO RELEVANT STAKEHOLDERS**

- Means of communication for disseminating and gathering safety and health information from relevant stakeholders:
  - **Tendering documents, e.g. residual risks**
  - **Provision of drawings, specifications, calculations and work statements**
  - **Provision of safety and health information and records**
  - **Design reviews**
  - **Sharing of PCI, CCP, SHF**

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This is the way to disseminate and gather information from stakeholders

- Tendering documents
- Drawing provision
- Design review
- Sharing PCU CCP and SHF

## MEANS OF COMMUNICATION TO RELEVANT STAKEHOLDERS

- Meeting of stakeholders
- Consultation / dialogue sessions
- Training / awareness sessions
- Verbal instruction
- Telephone communication
- Formal written correspondence
- Email



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This is the method of communication with the relevant stakeholder

- Meeting of stakeholders
- Consultation / dialogue sessions
- Training / awareness session
- Verbal instruction
- Telephone communication
- Formal written correspondence
- Email

## COORDINATE FLOW OF INFORMATION

Coordinate to ensure the

- **right** safety and health **information** is passed on to the **right stakeholder** at the **right time**.
- **Example residual risk should be passed on to the contractor for his tendering and work purpose.**



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Principal designers should ensure as far as reasonably practicable that:

- (a) everyone involved in working on the pre-construction phase cooperates with each other. They should establish that effective communication is occurring and that information is shared within the project team. This could involve holding meetings with others in the design team. Progress meetings with the client and the principal contractor also provide a way of ensuring work on the project is properly coordinated;
- (b) designers comply with their duties. Appropriate checks should be made to ensure designers are dealing with design risks appropriately. This can be done as part of the design process and through regular progress meetings;
- (c) designers provide information about elements of the design which present significant risks that cannot be eliminated. This should include information about unusual or complex risks that are more likely to be missed or misunderstood by contractors or others on the project rather than risks that are well known and understood.

## COORDINATE FLOW OF INFORMATION

- **Considerations when coordinating flow of safety and health information:**

- *Determine the communication needs for relevant stakeholders*
- *Determine the timing at which information should be made available to or gathered from the relevant stakeholders*
- *Establish and use effective means for communication*
- *Verify effectiveness of communication*



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Determine communication needs → determine relevant timing → establish with effective means of communication → verify effectiveness



## **2. MANAGING AND UPDATE SAFETY & HEALTH FILE**

- **Safety & Health File**
- **Design Review Outcome (Risk Control)**
- **Distributing & Verifying Advisory Notes**

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This section gives guidance on

- the preparation, provision and retention of a safety and health file and the actions on each duty holder
- how the safety and health file relates to and influences other types of information during a construction project involving more than one contractor

## SAFETY & HEALTH FILE

- A live document whereby risks identified from the design stage are,
  - Recorded
  - Kept for future reference
- Contain the information needed for future construction work such as,
  - Cleaning
  - Maintenance, alterations
  - Refurbishment
  - Demolition

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**The safety and health file is only required for projects involving more than one contractor**

- contain relevant information about the project which should be taken into account when any construction work is carried out on the building **after** the current project has finished
- Information included should only be that which is needed to plan and carry out future work safely and without risks to health
- What is likely to be needed for future construction work will be based on the judgement of the principal designer after the construction work has been completed, their detailed knowledge of the project and the receipt of information from the principal contractor

## SAFETY & HEALTH FILE

- Documents residual risks
- Brings about transparency in the tender process. Contractor is
  - Pre-warned of the project hazards and the difficulties faced
  - Able to accurately price for the project
    - Reduce possibilities of any underpricing
    - Reduce inability to complete the project

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When a new construction team has to plan and become involved in subsequent construction for a new project, risks to safety and health from the prior project will be such risks as are evident from a visual inspection and unquantifiable or unseen hazards. However, the information that will not be evident and should be included in the safety and health file will not only assist in identifying hazards for the new project but will contribute to saving costs.



## SAFETY & HEALTH FILE

•The items that should be in the SHF are :

- Records DRRULE 1, 2 and 3 and records of the resultant changes or risks to be mitigated;
- Checklist/matrixes used during Design Review;
- Risk assessment;
- Relevant safety and health information that the contractor and the client should take note of Construction method advisory notes by the designers as guidance notes to the contractor for building and demolition in the future

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The file should contain information about the current project likely to be needed to ensure safety and health during any subsequent work, such as maintenance, cleaning, refurbishment or demolition. When preparing the safety and health file, a non-exhaustive information on the following should be considered for inclusion:

- (a) a brief description of the work carried out;
- (b) historic site data; (c) any hazards that have not been eliminated through the design and construction processes, and how they have been addressed, ground investigation reports and records (for example, surveys or other information concerning asbestos or contaminated land), site survey information and pre- and post-construction phase;
- (d) investigation reports and records;
- (e) photographic records of essential site elements;
- (f) statement of design philosophy, key structural principles (for example, bracing, sources of substantial stored energy – including pre- or post-tensioned members) and safe working loads for floors and roofs, calculations and applicable design standards;
- (g) drawings and plans used throughout the construction process, including drawings prepared for tender purposes;
- (h) record drawings and plans of the completed structure showing, where appropriate, means of safe access to service voids;
- (i) materials used in the structure identifying, in particular, hazardous materials (for

example, lead paints and special coatings), including data sheets prepared and supplied by suppliers and information provided by the client;

(j) information regarding the handling and/or operation together with the relevant maintenance manuals, with particular regard to removal or dismantling of installed plant and equipment (for example, any special arrangements for lifting such equipment);

(k) safety and health information about equipment provided for cleaning or maintaining the structure;

(l) the results of proofing or load tests;

(m) the commissioning test results;

(n) the nature, location and markings of significant services, including underground cables; gas or fuel supply equipment; in-built safety features, for example emergency fire-fighting systems and fail-safe devices;

(o) information and as-built drawings of the building, its plant and equipment (for example, the means of safe access to and from service voids and fire doors)

## SAFETY & HEALTH FILE

- **The items that should be in the SHF are;**
  - **Maintenance method advisory notes** by the designer and/or contractor as guidance notes to the owner
  - **Safe Operating Procedures for**
    - Use and maintenance of equipment/machinery of the completed building
    - Example: gondolas, scissor lifts, etc.
  - Incident/accidents **related to design problem**

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Section 15(2)c: the provision of such information, instruction, training and supervision as is necessary to ensure, so far as is practicable, the safety and health at work of his employees;

Therefore, all documents describe under these Guidance Notes shall be provided and maintained throughout the lifecycle of the project including but not limited to:

Client Brief (CLB)

Pre- Construction Information (PCI)

Appointment of Principal Designer & Principal Contractor

**Design Reviews Report**

Construction Phase Plan (CPP)

Safety & Health Files (SHF)

## SAFETY & HEALTH FILE

- **Maintenance of records:**

1. Records to be kept up to date
2. Retained for as long as it is relevant
3. Normally the lifetime of the building or structure



200

It will not always be necessary to include all design information and 'as-built' records if such information is unlikely to have any consequences for ensuring the safety and health of any persons engaged in future construction work. Information in the file is not needed for the benefit of the occupants or persons using the facilities created by the project. The purpose of creating the file is for the benefit of designing and managing future projects involving construction work. For that reason, there should be a distinction in the documentation between the safety and health file and manuals or instructions for operational and maintenance matters.

## SAFETY & HEALTH FILE

- **Case:**

- A worker sustained a cut due to wrong use of hand tools.
- Investigation showed that the worker was not trained in use of hand tools. Corrective action was taken by sending the worker for training.

- **Question:**

- Should the incident report and training records be included in the SHF file?

201

Open discussion to members of the floor

## SAFETY & HEALTH FILE

### PRACTICAL TIPS ON DOCUMENTATION

- The safety and health records should be properly documented
- According to Organisation's documentation system or
  - *Clear direction for identification and location of documents*
  - *Logical and organised filing for easy location of required document*
  - *Definition on responsibilities concerning creation, amendment, custody, maintenance and up keeping of documents*
  - *Authorisation for access to classified documents*

202

The record need to be

- i) Accurate
- ii) Clear
- iii) Honest ( written as near as possible to the actual time of occurrence)
- iv) Know how to use the information systems and tools at workplace
- v) Protect and do not share with anyone
- vi) Make the record are not left in public places where unauthorized person might see

## SAFETY & HEALTH FILE

- **Practical tips on documentation (contd.)**
- The safety and health records should be properly documented
  - **According to Organisations documentation system or**
    - *Revision control*
    - *Requirements on review of documents*
    - *Retention periods of documents*
    - *Back-up arrangement*
      - Hard copy
      - Electronic copy
  - **Organisation's documentation requirements**

203

Traditionally the file was produced (and given to the client) as a series of paper-based lever-arch files. This format didn't lend itself to easy interrogation or sharing. They also proved difficult to manage - easily being lost or damaged, succumbing to general wear and tear or environmental damage.

In more recent years information has increasingly been created on computers but then printed out. The problem with this approach is that information then immediately dates and falls out of step with the electronic copy creating a maintenance burden for both paper and electronic versions. Users can often find it hard to tell whether they are reading the most up-to-date versions of documents.

## SAFETY & HEALTH FILE

- The safety and health records should be properly documented
  - Organisation's documentation requirements
    - Requirements of management systems
    - Requirements to consider:
      - Size of company
      - Scale and complexity of project
      - Resources available
      - Existing practices

204

Considering health and safety requirements in the context of your digital information model from the start is time well spent. Appropriately tagged information can be input once and then used throughout a project. Indeed, it's feasible that, if designed correctly from the start, the Health and Safety File can be just an output of the model, generated by a user requesting a particular 'view' of the information contained within.



## MONITOR AND REVIEW OF SHF

- **Vigilant monitoring** on the following is essential to ensure safety and health issues are identified and closed:
  - *Areas where design reviews were not yet started or incomplete;*
  - *Part of design concept that was not fully understood;*
  - *Hazards not identified previously;*
  - *Design changes not finalised;*
  - *Incomplete risk register entries ;*
  - *Opened action items for risk control;*

205

Vigilant means always being careful to notice possible hazard or sign of hazard.

Vigilant monitoring required at

- Incomplete design reviews area
- *Part of design concept that was not fully understood;*
- Hazards not identified previously;
- *Design changes not finalised;*
- Incomplete risk register entries ;
- Opened action items for risk control;

## MONITOR AND REVIEW OF SHF

- **The monitoring process** of safety and health issues may include:
  - *Establish current conditions and status of issues*
  - *Compare current with desired conditions and status to identify gaps*
  - *Identify actions required to close gap*



206

Information in the file is not needed for the benefit of the occupants or persons using the facilities created by the project. The purpose of creating the file is for the benefit of designing and managing future projects involving construction work. For that reason, there should be a distinction in the documentation between the safety and health file and manuals or instructions for operational and maintenance matters.

## MONITOR AND REVIEW OF SHF

- **On-going review ensures** that data obtained through monitoring is available for feedback into the system.
- Review process of safety and health records include:
  - *Establish the responsibility, frequency and scope of review of records*
  - *Check safety and health records for up-to-dateness, completeness and accuracy*
  - *Identify safety and health issues*
  - *Address safety and health issues*
- *\*Review records and monitor safety and health issues for design stage, construction stage, until handing over to client for occupation and maintenance.*

207

When a new construction team has to plan and become involved in subsequent construction for a new project, risks to safety and health from the prior project will be such risks as are evident from a visual inspection and unquantifiable or unseen hazards.

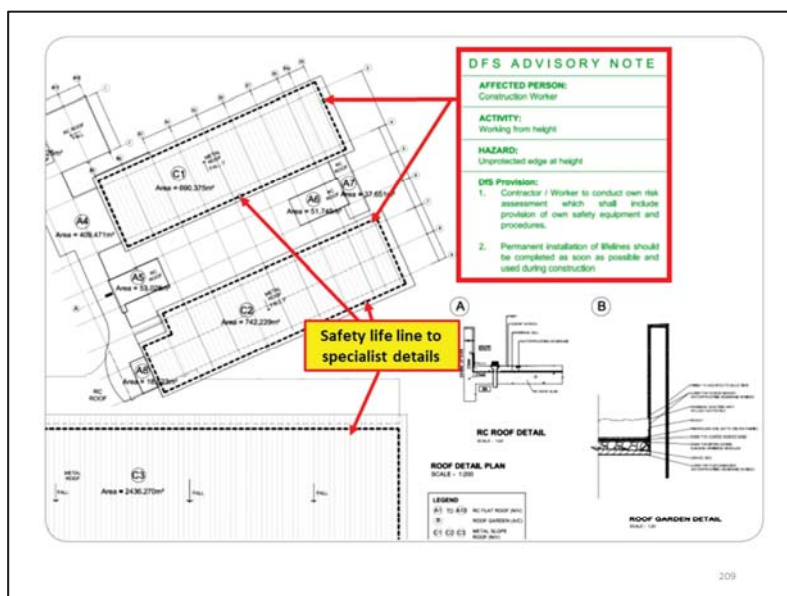
## RESIDUAL RISK (TO PC & C(S) TO ADDRESS)

- This information shall be recorded in the Safety & Health File and relevant documents; **formally done an ADVISORY NOTE**;
  - this is most effectively done by **adding safety 'advisory notes' to the design information that the affected persons will refer to.**  
**For example:**
    - A. **'Advisory notes' for construction workers** is best integrated in the working drawings, shop drawings, specifications, method statements, etc. to which they are referring in the course of their works.
    - B. **'Advisory notes' for maintenance personnel** is best integrated in the as-built drawings and/or operating procedure statements/instructions in operation & maintenance manuals.

208

Ideally the design review risk control shall consider the above principles in determining the respective initiatives to **DESIGNING OUT THE RISK** and when not able to do so minimize the risk so far as reasonably practicable and the provide to the **CONTRACTORS** the information of the **RESIDUAL RISK in a formalize manner**;

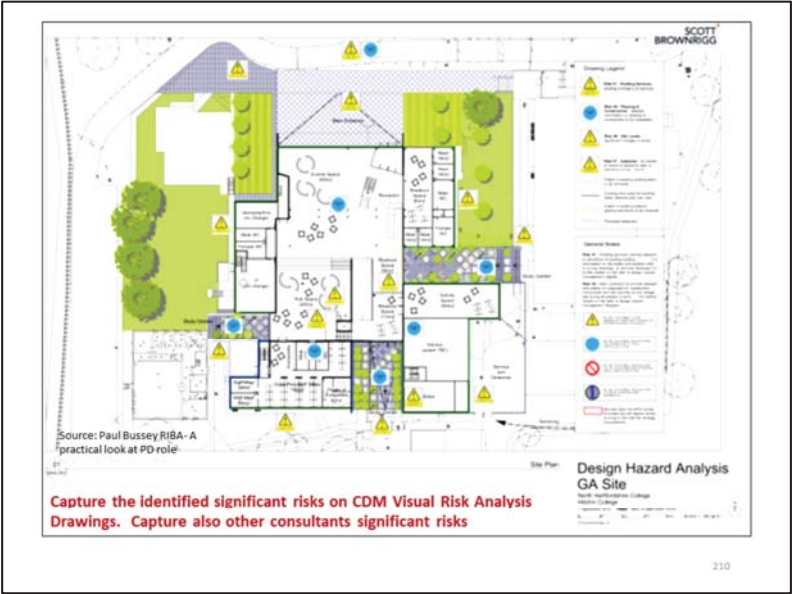
This information shall be recorded in the Safety & Health File and relevant documents; formally done an **ADVISORY NOTE**; this is most effectively done by adding safety **'advisory notes'** to the design information that the affected persons will refer to.



Advisory notes' for construction workers is best integrated in the working drawings, shop drawings, specifications, method statements, etc. to which they are referring in the course of their works.

'Advisory notes' for maintenance personnel is best integrated in the as-built drawings and/or operating procedure statements/instructions in operation & maintenance manuals.

The 'advisory notes' specifically seek to make affected persons aware of the significant risks they must address and the safety measures available to them in the course of their activities



Capture the other consultants significant risks

## CDM – INTELLIGENT DRAWING ANNOTATION

RESIDUAL RISK	
RISK NO	RISK DESCRIPTION
01	Management & protection of trees
02	Proximity of canal/overflow pipe flooding risk
03	Narrow Streets/ façade maintenance
04	Adjacent property/party wall (Note sequencing)
05	Smoke extract/ shaft with limited access



RIBA National CPD on CDM 2007  
10 Top Tips for Architects 2012



211

Legend to Identify Risk's by what's annotated on each Revit Sheet

There are 1 to 5 Risk together with the descriptions







# 3. WORKSHOP

## Discussion & Practice

### DRRULE -1

- HAZID - Hazard Considerations
- RISK ASSESSMENT
- Presentation



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The discussion and practice will be based on DRRULE 1 which is Concept Design Review

The participants have to understand to

- identify hazard by HAZID,
- Carry out risk assessment

Finally present to the members of the floor

## WORKSHOP REQUIREMENTS

### Purpose:

1. *Become familiarised with the roles and responsibilities of various stakeholders in a Design Review through role play.*
2. Apply the hazard identification method in Design Review
3. Become familiarised with the recording of results of hazard identification and risk assessment



214

The objective of the workshop basically

-familiarised each of participant with the roles of stakeholders in Design Review

- Apply HAZID in Design Review
- Familiarised with documentation and risk assessment

## WORKSHOP REQUIREMENTS

- **Instruction: Get into groups of about 5.**
- **Designate the roles among group members according to**
  - *Client*
  - *Designer*
  - *Principal Designer*
  - *Principal Contractor*
  - *Observer*
- **“Observer” roles are to**
  - observe how well group member played their roles
  - record all observation;
  - serve as time keeper
- **At the end of discussion, give feedback to members.**
  - **The discussion should take no more than 1 hour.**
  - **Additional case information will be provided.**
  - **The PD will facilitate the session.**

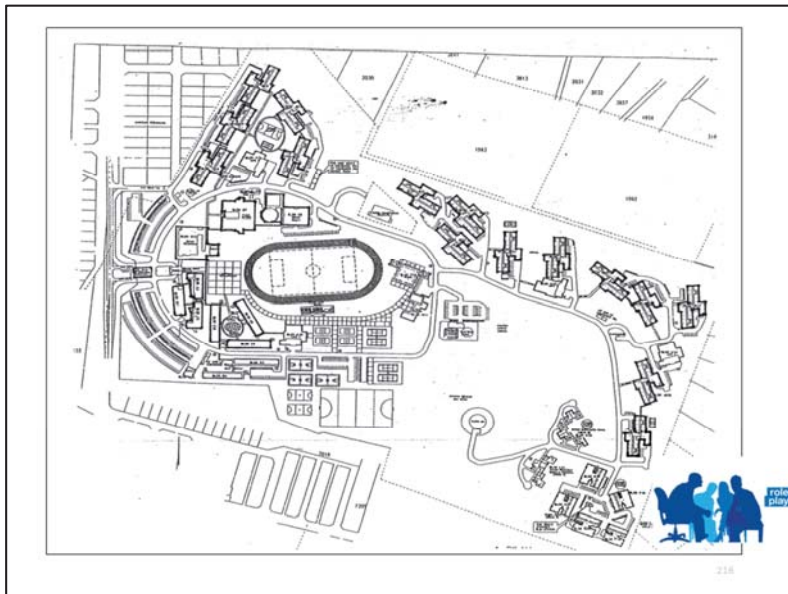


Form a group of 5

Then each member play a role accordingly

- Client
- Designers
- PD
- PC
- Another one is observer

the discussion is about 1h and PD will facilitate the session



Each member act their role play in specific situation/ case study given

## DISCUSSION CONSIDERATIONS

- **Questions:**
  - Identify the hazards at this Concept Design Stage
- **Narrative:**
  - Plan layout of a boarding school, complete with full facilities;
  - Plan Project to build a Swimming Pool with Olympic standards;
- **Issues**
  - Roofing's of ASBESTOS origins to be changed;
  - Construction during normal working days, academic session on schedule;
  - Consideration of ON GOING PUBLIC programs using facilities (wedding; events):



The component of discussion

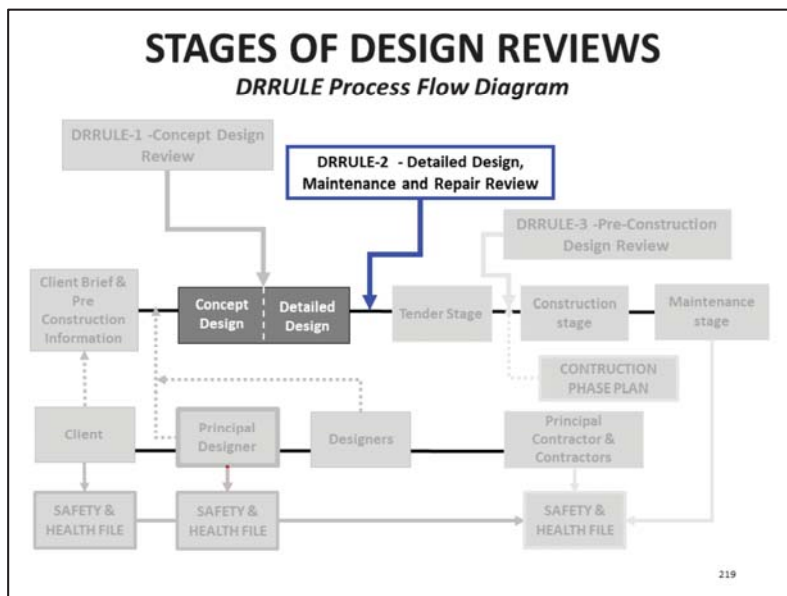


## DRRULE 2 – DETAIL DESIGN REVIEW

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### **Detailed Design, Maintenance and Repair Review**

Detailed design, operations, maintenance and repair review should look at a building's detailed architectural and structural design



The review should determine risks involved in the construction methods, access and egress, and whether the design will create confined space or other hazards. Risks related to maintenance and repair of a building, such as cleaning methods, should also be studied.

## STAGES OF DESIGN REVIEWS

- **DRRULE-2: DETAILED DESIGN, MAINTENANCE & REPAIR REVIEW**

- **Purpose:**

- To assist designers to review the detailed design where most of the design is in process but still subject to possible modifications
- Review issues raised during DRRULE-1, and close them out if possible



220

serves to assist the Designer to review a building's or structure's design progressively as it develops. Although building or structure design is often done by Consultant Designers on behalf of the Client, designs can also be done on a D&B basis by a Contractor. Parts of the building or structure can also be designed by the Contractor's Specialist Contractors or other Designers



## STAGES OF DESIGN REVIEWS

- **DRRULE-2: Detailed Design, Maintenance and Repair Review**

- For Design and Build contracts where the contractor is in-charge of the design of the project, DRRULE-2 should be done with the contractor's input.
- Contractor can highlight constraints when constructing the building or structure.



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*For D&B contracts which the Contractor is in-charge of the project's design.*  
**RULE 2** should be done with the **Contractor's** input.

The Contractor can then highlight constraints that he or she will face when constructing the building or structure. This would further help in the DR process.

## DRRULE-2: DETAILED DESIGN, MAINTENANCE & REPAIR REVIEW

- DRRULE-2 review should include considerations such as:

- *Fabrication*
- *Heavy lifting*
- *Falling from height*
- *Temporary works and sequencing*
- *Layout*
- *Confined Space*
- *Emergency Route*
- *Health hazards*
- *Weather*
- *Others (early warning of hazards, fire risk source of energy stored etc)*



222

To assist in the **RULE-2** Design Review Team, the following consideration shall be used. While the considerations highlight important issues, they are not complete and serve only as references for the team. As such, the team should have brainstorming sessions to identify hazards and concerns of the main stakeholders.

## STAGES OF DESIGN REVIEWS

- **DRRULE-2: Detailed Design, Maintenance & Repair Review**
- **During DRRULE-2 review, should:**
  - Look at detailed architectural and structural design
  - Determine the risks involved in:
    - **Construction methods**
    - **Access and egress**
    - **Whether the design will create confined space or other hazards.**
    - **Risks related to maintenance and repair of the building, e.g. cleaning methods**

223

Upon brainstorming of the considerations and identifying hazards; using the respective risk assessment forms, the Design Review Team shall complete the process, determine the action plans and record them accordingly.

Design issues highlighted in **RULE-1** should be addressed by the Designer when he or she is doing the detailed design

**RULE-2** will hence be a session to identify new hazards and making sure that hazards raised in **RULE-1** are eliminated or mitigated.

## **R2- DETAIL DESIGN REVIEW (DDR) EXAMPLE**

### **Maintenance corridor on external facades. (During Detail Design Review)**

#### **1. Area of health and safety concerns**

- Routine maintenance work and planting work at the external of the building.
- Falling from heights.

#### **2. Identify the special risk problems**

- workers accessing the work area and performing their work tasks.

#### **3. Improvement in design**

- Maintenance corridors are provided at typical floors.
- Maintenance corridors are wide
  - Safe and easy access for the workers to the areas to maintain soft landscape or
  - Provision protective barriers to minimize the hazards of falling.



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**RULE-2** address the following:

Refer Figure 18: Safety Risk Impact

Existing site conditions

Conceptual or schematic site planning—constraints and opportunities

Feasibility of construction operations and site management

Design of permanent works—layouts, configurations, relationships and spatial use or function

Developed Buildings Plans

Developed BP designs and/or construction contract

## EXAMPLE: DRRULE 2

Design for Safety Considerations:

### Construction Methods



**In evaluating the construction method**, the team considered the use of prefabrication.

- lift shaft made of precast components hoisted up using heavy lifting cranes
- mobile working platform erected to facilitate jointing and painting works.
- Eliminated need for scaffold, minimized working at height

225

- Can elements such as steel structures be prefabricated, assembled on ground and then lifted to position for installation?
- Can the cutting of steel members be done offsite, under controlled conditions to reduce the dust created?
- Can site welding be minimised to reduce fire or burn risks?
- If the prefabricated structure is required to be temporarily suspended for a period of time before final installation, are there means to ensure the hazards arising this are removed?

## EXAMPLE: DRRULE 2

Design for Safety Considerations:

Safe installation and maintenance access for air condition units



Old Houses and Flats

Lack of secured foothold for the persons who install and maintain air-con subjecting them to risk of falling from height.



New flats

Provisions for foothold are made in newer flats for the installation and maintenance of air con.

226

- Does the provision of access take into account the safe and efficient movement of maintenance workers and the tools and equipment needed to carry out maintenance work?
- Can temporary means of access (e.g., scaffolding, makeshift ladder, etc.) be eliminated by providing workers with permanent safe access to areas requiring regular maintenance?
- Does the design incorporate permanent safety lines, anchorage and hoisting points into structures for maintenance work that need to be carried out at height?

## EXAMPLE: DRRULE 2

### Design for Safety Considerations:

#### Safe maintenance access



#### The team should consider to:

- Services ledges should not be located in building recesses or enclosed areas that make access difficult;
- AC equipment in confined spaces increases the chance of rejected heat being recirculated into the equipment intake, thereby affecting its proper function.

227

- Can the maintenance work be carried out at ground level in a safe and productive manner?

For example, locating air-conditioning units at ground level, locating luminaires within reachable height.

- Does the design minimise the need for maintenance workers to enter ducts and crawlspaces?
- Does the design minimise the need for the deconstruction of bulkheads, claddings, casings, and so on, during routine inspection and maintenance?

## EXAMPLE: DRRULE 2

### Design for Safety Considerations:

Layout of the structure affecting flow of human traffic.



The team should review layout of structures, such as escalators:

- During high traffic flow, congestion might occur in the landing area between escalator 1 and 2.
- This might lead to people on escalator 1 having no place to land and result in accidents as the escalator is still moving.

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- Can the layout be optimised to prevent any accidents arising from the flow of traffic, pedestrian, equipment, and so on within and around the site during the construction stage?
- Can the layout be optimised to prevent accidents?
- Is there a need to designate specific material, equipment, vehicle and human traffic flow diagram?



## EXAMPLE: DRRULE 2

### Design for Safety Considerations: Detailed architectural design.



Damaged flooring from unsuitable usage



The team should evaluate the architectural design such as flooring finishes and:

- Choose finishes of sufficient hardness and strength for intended use in the finished buildings.
- Choose finishes that do not add to pedestrian slip and trip risks.
- Note that the right flooring helps to reduce WSH risk (as well as costs) for modification / repair at later stage.

229

- Are there safety concerns on elements of specialist design to be considered by the Contractor?
- Can alternative safe work practices be used to mitigate such concerns?

## EXAMPLE: DRRULE 2

Design for Safety Considerations:  
Installation and maintenance of fixtures.



- The team should consider the:
  - Ease of installation of floodlighting, and feeder systems essential.
  - Safe access for future maintenance.

230

- Is there a possibility of floods happening in the site? If so, how can the hazards be minimised in the temporary and permanent stages?
- Is there a possibility of lightning strike happening in the site? If so, how can the hazards be minimised in the temporary and permanent stages?
- What are the effects of extreme temperature or humidity on instruments?

## EXAMPLE: DRRULE 2

### Design for Safety Considerations:

#### Accessibility for maintenance.



The team should evaluate the accessibility of the structure for maintenance:

- Foothold and anchorage point for maintenance should be provided, otherwise maintenance personnel need to deal with falling from height hazard.

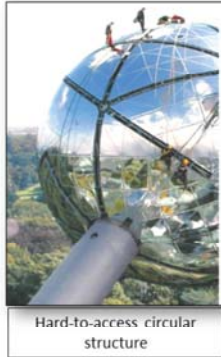
231

- Does the provision of access take into account the safe and efficient movement of maintenance workers and the tools and equipment needed to carry out maintenance work?
- Does the design incorporate permanent safety lines, anchorage and hoisting points into structures for maintenance work that need to be carried out at height?
- Does the design create low headroom that reduce the safety and efficiency of workers carrying out the maintenance work?

## EXAMPLE: DRRULE 2

Design for Safety Considerations:

**Maintenance methods.**



The team should evaluate the design and:

- **Avoid the use of abseiling methods or long ladders for building maintenance.**
- **Position permanent anchorage and hoisting points into buildings**

- Does the design minimise the need for maintenance workers to enter ducts and crawlspaces?
- Does the design minimise the need for the deconstruction of bulkheads, claddings, casings, and so on, during routine inspection and maintenance?
- Does the design provide maintenance access at every level if there are vertical greenery systems that span a few storeys?

## EXAMPLE: DRRULE 2

### Design for Safety Considerations:

#### Maintenance



Facade lighting fixtures should be easy to access for maintenance

#### The design should consider:

- Providing safe external access to high areas of the building for maintenance personnel
- Preventing the risk of falls from height when carrying out maintenance or cleaning duties

- Can edge protection or other features which allow safe access and construction be designed and installed?
- Can anchor points for installation of life-line or safety harnesses be mounted where work platforms cannot be installed?
- Can the need to work at heights be removed?

For example, removing the need to work at heights when a safe means of access cannot be provided.

## EXAMPLE: DRRULE 2

### Design for Safety Considerations:

#### Maintenance



#### In evaluating the maintenance issues:

- Risk involved in maintenance of MEP Pipes and conduits.
- Work platforms (as far as possible) should be designed to address maintenance issue.

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- Can fragile roofing materials be removed or can an alternative access route to the roof (e.g., a work platform) be designed?
- Can an early installation of permanent access (e.g., stairs) reduce the use of ladders or scaffolds?



## **4. WORKSHOP**

### **Discussion & Practice DRRULE -2**

- **HAZID - Hazard Considerations**
- **RISK ASSESSMENT (RISK CONTROL OPTIONS)**
- **Presentation**

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#### **Discussion & Practice DRRULE -2**

- Determine hazard considerations
- Choose applicable risk control
- Presentation

## SCENARIO

**3 Aug 2015 - Two cranes hoisting a massive section of bridge collapsed flattening a row of houses injuring at least 20 people. Dramatic**



236

Open for discussion

- HAZID
- Risk control assessment



## DISCUSSION CONSIDERATIONS

- **Questions:**

- Identify the hazards at this Detail Design Stage
- What consideration can be done on the lifting operations;

- **Narrative:**

- Report finds that poor planning made Dutch crane collapse unavoidable

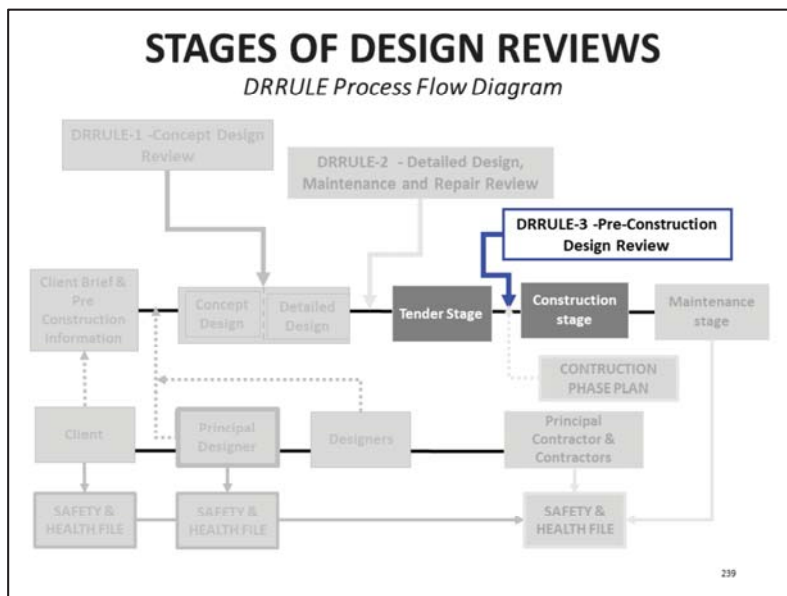
237



## **DRRULE 3 – PRE CONSTRUCTION REVIEW**

238

Pre-construction design review should examine temporary works design and design by specialist contractors not covered during the concept and detailed design phases.



Pre-construction Design Review must be handled after the tender stage of the project or during the handover before start the construction stage

The purpose of the design review is to ensure that the design:

- Meets the client's requirements;
- Complies with statutory and regulatory requirements;
- Is applying appropriate methodologies and standards;
- Is using correct criteria and assumptions;
- Provides the most practical and economical result for the client;
- Can be constructed in a practical and economical way;
- Minimises traffic disruption and provides a practical traffic management approach to the project;
- Meets road safety requirements; and
- Documents the design in an accurate and functional way.

## R3 – PRE-CONSTRUCTION DESIGN REVIEW



Nightmarish: Motorists along the Cheras-Kajang Highway inching their way into the East-West Link and Jalan Cheras that is drastically tightened to make way for MRT construction. -

- In evaluating the temporary works design, the design review team should ensure:
- Proper planning of work activities, diversion of road etc. to reduce the impact on traffic condition, and more importantly safety of workers, public and road users.

240

The review conducted by the design review team (Each of these teams will be instrumental in how this process is implemented. There will be updates as to the implementation progress at each of these teams quarterly or semi-annual meetings.)

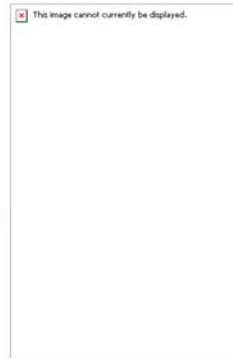
They have to proper plan all the temporary works design for the safety of workers, publics and users

# STAGES OF DESIGN REVIEWS

## DRRULE-3: Pre-Construction Review

### Purpose:

- To identify and address the hazards and risks associated with the **design and methods of construction**, especially those which **are not covered during the concept design and detailed design stages**.
- To identify and address risk associated with **temporary work design and design provided by specialist contractors**.



Gantry use to install  
incline glass panels

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- **RULE-3** purpose is to provide the Design Review Team with a tool to identify and address risks associated with temporary works design. Temporary works designs are part of the scope of works in construction contracts, but sometimes temporary works are designed by Consultants on behalf of their clients

- **RULE-3** typically addresses the following:

### **Employer or consultant design**

Prescription or specification of site arrangements, facilities and scheduling requirements

Prescription or specification of interim works for construction of permanent works

### **Contractor design**

Interim works for site arrangements and facilities

Interim works for construction of permanent works

# STAGES OF DESIGN REVIEWS

## DRRULE-3: Pre-Construction Review

Pre-construction design review should

- Examine design of temporary works and design by specialist contractors not covered during the concept and detailed design phases.
- All hazards highlighted in the **DRRULE Process** should be singled out and addressed in the Safety and Health Risk Assessment Form.



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A review of the risk control action plans shall be carried out to verify its outcome;

Aside from going through the RULE-3 Process, further Design Review sessions should be held to ensure that risks identified in RULE-1 and RULE-2 are eliminated or mitigated.

Temporary works designs are part of the scope of works in construction contracts, but sometimes temporary works are designed by Consultants on behalf of their clients.

## EXAMPLE: DRRULE 3

### Design for Safety Considerations:

#### Temporary works



In evaluating the temporary works design, the team should ensure:

- Proper planning of work activities, diversion of road etc to reduce the impact on traffic condition, and more importantly safety of workers, public and road users.

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- Can a safer means of access or egress, instead of the temporary means, be used
- Can temporary works required during construction be planned for earlier? For example, specifying the type and position of temporary works required to ensure that spatial considerations are taken into the account during the design stage.
- Are there alternatives or measures that could reduce or minimise such adverse effects?

## EXAMPLE: DRRULE 3

### Design for Safety Considerations: Works by Specialist Contractors

 This image cannot currently be displayed.

- The specialist contractor had proposed a modular method of construction for the stone panel walls.
- The panels are lifted and bolted directly onto the steel structure. In doing so:
  - Manual handling risk is eliminated by utilising mechanical means to lift the panels.
  - Working at height is also eliminated.

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244

- Are there safety concerns on elements of specialist design to be considered by the Contractor?
- Can alternative safe work practices be used to mitigate such concerns?



## EXAMPLE: DRRULE 3

### Design for Safety Considerations:

#### Works by Specialist Contractors



- The Specialist Contractor proposed to **change the design to modular units to facilitate tight schedule and ease of construction.**

Considerations include:

- **Minimising work at height** as each were fabricated on the ground and subsequently installed.
- **Pre-fabrication** also meant that time was saved in the process.
- **The location of the prefabrication yard** and the final structure were evaluated and located such that transportation distance was minimized.
  - This also **ensure less hazards from transporting and lifting the structure.**

245

- Are there special construction considerations that need to be highlighted to the Contractor?
- Are there alternatives or measures that could reduce or minimise such adverse effects?
- Has a proper schedule for monitoring of instrumentation been provided?

## EXAMPLE: DRRULE 3

### Design for Safety Considerations:

#### Construction stage hazards – fall from height



Temporary stair handrails installed at ground level (same holes were later used for the permanent handrail)



Staircase with Edge Protection being lifted into the Structural Steel Frame

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246

- Have the risks and hazards identified in DRRULE-1 and DRRULE-2 been addressed or mitigated?
- Can alternative safe work practices be used to mitigate such concerns?
- Can monitoring instrumentation that provides early warning of possible collapse or ground movements be installed?
- Can the permanent staircase and lifts be completed first so that they can be used during the construction stage?

## STAGES OF DESIGN REVIEWS



- Adequate provisions for temporary works during the design stage minimise risks during construction.

- Designing a structure so that work does not need to be performed at height will prevent fall incidents
- e.g. lifting and erection of a roof truss.



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- Design reviews outcomes as prescribed in Section 10.3.1 (RULE-1), Section 10.3.2 (RULE-2) and Section 10.3.3 (RULE-3) shall be updated, affected parties shall be notified, and the outcomes shall be distributed accordingly.
- A review of the risk control action plans shall be carried out to verify its outcome. Aside from going through the RULE-3 Process, further Design Review sessions should be held to ensure that risks identified in RULE-1 and RULE-2 are eliminated or mitigated
- Client should ensure that all these design reviews outcomes and action plans for risk control shall be documented, updated and distributed accordingly.

## At least 40 killed in scaffolding collapse at east China power plant. 24 Nov 2016



INDEPENDENT



<https://www.independent.co.uk/news/world/asia/china-power-plant-scaffolding-collapse-latest-at-least-40-dead-a7435891.html>

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<https://www.independent.co.uk/news/world/asia/china-power-plant-scaffolding-collapse-latest-at-least-40-dead-a7435891.html>

China has suffered a series of major industrial accidents over recent months blamed on corruption, disregard for safety and pressure to boost production

work platform at a power plant cooling tower being built in the city of Fengcheng came tumbling down at about 7.30am, an official with the local Work Safety Administration said by telephone.

He put the confirmed death toll at 22 but the official Xinhua News Agency said that figure had risen to at least 40 by midday. Xinhua did not cite its source for the information and calls to local government information offices rang unanswered.



# **5. WORKSHOP**

## **Discussion & Practice**

### **DRRULE -3**

- **HAZID - Hazard Considerations**
- **RISK ASSESSMENT**
- **Presentation**

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- Determine HAZID at Pre-construction phase
- Possible risk control based on reported in DRRULE 1 and 2
- Make a presentation

## SCENARIO



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Open discussion to the floor

## DISCUSSION CONSIDERATIONS

- **Questions:**

- Identify the hazards at this Pre Construction Review;
- What consideration can be done on the trenching activities;

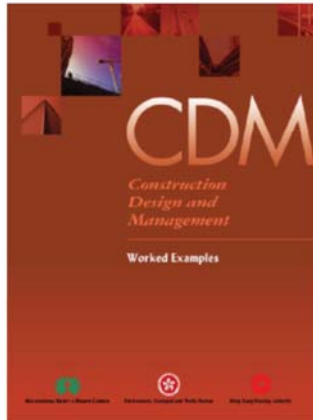
- **Narrative:**

- Work to be done by a Sub Contractor whereby the procurement was a replacement contractor;

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The discussion must consider following questions and narrative

## CDM WORKED EXAMPLES



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Can refer this link

[https://www.devb.gov.hk/filemanager/en/content\\_29/Design\\_for\\_Safety\\_Worked\\_Examples.pdf](https://www.devb.gov.hk/filemanager/en/content_29/Design_for_Safety_Worked_Examples.pdf)



## REFERENCE PUBLICATIONS



Façade Access Design Guide

- [https://www.bca.gov.sg/PerformanceBased/others/DM\\_FADG\\_2017.pdf](https://www.bca.gov.sg/PerformanceBased/others/DM_FADG_2017.pdf)

Design for Maintainability Checklist

- [https://www.bca.gov.sg/PerformanceBased/others/DM\\_Checklist\\_2016.pdf](https://www.bca.gov.sg/PerformanceBased/others/DM_Checklist_2016.pdf)

## REFERENCE PUBLICATIONS



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Please view this link for

Guidebook for Design

- <https://www.bca.gov.sg/StructuralPlan/others/BC3-2013.pdf>

Design for Manufacturing

- [https://www.bca.gov.sg/Professionals/Technology/others/PPVC\\_Guidebook.pdf](https://www.bca.gov.sg/Professionals/Technology/others/PPVC_Guidebook.pdf)

## ASSESSMENT 1

- In-class assessment
- Trainees may refer to their notes
- 10 Multiple Choice Questions
- Duration: 30 mins
- Make use of appropriate knowledge and skills from the course to answer the questions
- Passing mark is 70%



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At the end of the course, You may refer note to answer all the 10 objective questions within 30 mins

You must get at least 70 marks to pass this assessment

## ASSESSMENT 2

- **Individual Written Report**

- Take on the role of a Principal Designer and implement the DRRULE Process
- To be completed outside training schedule
- **Submit within ## weeks**
- All questions in the reports must be addressed. Report must be submitted in full
- Late submission will result in marking you as not yet competent



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- This assessment allow you to do it at your workplace with your own project as case study
- Report must be submit in full within 2 months
- Please follow all the term and instructions. Otherwise you will not be certified as competent for this course



A big thanks for your kind attention and participation along this course