ENGINEERING

# OSHCIM

### **Promotion of Best Practices of Regulations and Guidelines on Safety and Health**

Presented by: KAMARIZAN KIDAM UTM & UNBOX Resources

**BEM Engineers** 

Date : 9<sup>th</sup> May 2023

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Venue : BEM Webinar Series 2023 via ZOOM Platform





### **Outline of Presentation**

#### The Need

**OSHCIM Impact Assessment** 

#### **OSHCIM Benefits**

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**Engineer/ Designer Roles and Responsibilities** 









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### Occupational Injuries & Fatal Occupational Injuries Statistics (2012-2021)



#### Fatal Occupational Injuries



Reference: Big Data Analytics: National Occupational Accident and Disease Statistics 2021, Department of statistics Malaysia 2021

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### Unbalance Risk Management Approach • Accident Corrective Action

Accident Causes

Organizational

Errors

9%

Human Errors

23%

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Technical

Errors

22%





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Ref: Kidam et.al (2010) 13<sup>th</sup> Loss prevention, Rome

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### **Suitability Analysis**

Type of	No. of	Percentage of Process Safety Actions (%)												
Errors	Actions	Most Suitable		Suitable	•	Less Suitable	Not Suitable							
External	33		15	21		9	55							
Design	3,233		11	12		11	67							
Technical	1,131		14	15		17	54							
Human	1,715		78	7		8	7							
Organizational	967		85	5		6	4							
Average 1,416			41%	15%		10%	37%							
Suitabl	e		56	%										
Unsuital	ble					4	17%							

Jurnal Teknologi, Vol. 79 No. 3: March 2017

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### >70% of Accident Repeated Naturally....



Ref: Jihan et.al (2015) Jurnal Teknologi

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Hierarchy of Control MANAGEMENT & PROCEDURAL CENTERED

	Safety m	Degree of safety achieved	
1	Inherent safety	/PtD/Df/OSHCIM	100%
2	Safeguards		80%
3	Control	Indications, warnings, etc.	20%
4	method	Manuals, approved systems, etc.	20%
Source:	Japan Industrial Safet no Jissai" (Realities o	y and Health Association, "Sh Workplace Risk Assessment)	okuba no Risk Assessment , 1999, p.26





#### **BEM** Upbinition **Overall Risk Management throughout Project Lifecycle**





SSOW, MS, Procedural, Human, Cl Engineers

#### **Development & Design** Procurement, contract, Spec-in

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# OSHCIM Impact Assessment

- ✓ Legal
- ✓ Management
- ✓ Documentation



### **OSHCIM IMPACT ASSESSMENT - LEGAL**



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- The majority of the legal aspect gets a high impact score (75%) implying an urgent need to comply with OSHCIM requirements based on Section 18A and 18B to avoid penalty based on OSHA (Amendment) 2022.
- Impact of non-compliance is high, because the penalty in OSHA (Amendment) 2022 is RM500,000.

### 



- The aspect for impact on Client Project management are focusing on existing management system, including overall project management, design risks procedure and contracts.
- Assessment shows a 50% high impact of the management aspects which indicates some improvements or additional aspect are needed, to fully implemented and comply with OSHCIM.

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- The assessment shows that documentation aspects have a high impact (83%) on Client in implementing the OSHCIM.
- Current practice, the basic documentation: Client Brief, Pre-Construction Information (PCI), and Construction Phase Plan are already in place. However, most of the documents are lacking OSHCIM-related details as per OSHCIM guidelines. Hence, the existing documents need to be upgraded to fulfill the OSHCIM compliance.
- Other new documentation are to be prepared including design risk assessment, OSHCIM-inclusive TOR and LOA for appointment of designers, contractors and others as per assessment checklist.





# OSHCIM Impact Assessment

#### ✓ Pros & Cons

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✓ Benefits



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**COST IMPACT** 



• The costs and benefits of OSH implementation are found to be in balance.

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- Negative impacts have been identified are only the short term, i.e.: Appointment and professionals' fees, designers' risk assessments, and training.
- For positive impact, it is a long-term impact, i.e.: reduction of accidents at site, which reduce the cost due to accident, reduction in maintenance cost, improvement of management procedures for on-time project delivery, improved productivity and quality and avoidance of ad-hoc cost during construction.





 In terms of project's progress, most of respondents decided that OSHCIM implementation have a positive impacts to Client.

- OSHCIM implementation will ensure poor design and poor work schedule are eliminated in the first place.
- Resulting in a well-planned and positive impact on the project's progress due to the improvement in management procedures for on-time project delivery, improving productivity and quality





# **SAFETY & HEALTH IMPACT**

• Assessments indicate that the safety and health impact of OSHCIM implementation is mostly positive.

- OSHCIM promotes the concept of the general principle of prevention (GPP) from the early design stage, where the hazard has been identified and designed out, while the remaining risk is carefully mitigated with proper method.
- Thus, resulting in a safer, healthier and more robust design of construction, with fewer risk to the workers, building structure and operability and safety and health of the users.





# **ACCIDENT RATE IMPACT**

• For the accident rate, the assessment shows a positive impact in this aspect.

- This is due to the core of OSHCIM that is to prevent hazards rather than controlling hazards by performing the risk assessment and applying the general principle of prevention.
- Application of OSHCIM-based aspect such as CDM in UK, DfS in Singapore and WSH in Australia, has proven a significant reduction in accident cases at construction projects.
- Implementation of OSHCIM is expected to positively impact construction projects in the reduction of construction errors, failures and accidents.





# **PRODUCTIVITY IMPACT**

 In terms of productivity, OSHCIM is found to have a positive impact on productivity.

- A systematic and well-planned project construction for the whole project lifecycle will ensure effective productivity for day 1 of project planning.
- Identification of hazards and constraints helps to provide better work scheduling. Therefore, any barrier or obstacle is identified and corrected at an early stage.
- OSHCIM will also improve management procedures for productivity and quality
- i.e.: work method, physical constraint and traffic arrangements to be designed early and will boost productivity





# SERIES SUSTAINABILITY IMPACT

- OSHCIM approach is part of Sustainable Development Goals (SDG)
- The impact assessment show that OSHCIM considers the SDG requirement significantly and supports several goals such as
  - Good health and well-being
  - Industry, innovation, and infrastructure
  - Decent work and economic growth





# MAINTAINABILITY IMPACT

 OSHCIM promote maintainability throughout project lifecycle. Starting from project idea until demolishment of a project.

- It is significantly being emphasized during design risk assessment 2 (DRA2).
- For the long-term effect, it could positively reduce any ad-hoc maintenance costs in future.
- However, the negative impact may be due to additional cost during construction for accessibility or any special structure





# SERIES CONSTRUCTIBILITY IMPACT

- In terms of constructability, OSHCIM has a positive impact on this aspect.
- As mentioned, OSHCIM promotes a systematic and well-planned project construction lifecycle in the early phase.
- Thus, improving the proper schedule, constructability technology, and constructability methods such as precast, IBS, remote sensing, and other methods that are safer and more reliable and effective.





# MODIFICATION/RENOVATION IMPACT

- The impact assessment shows a negative impact, where the aspect is considered a new design task and it seems like a load to the current designer on top of their existing tasks.
- Consideration on modification and renovation should be provided in the early stage as it able to ease in the long term, future, or next project





## SERIES OPERABILITY/UTILISATION IMPACT

- OSHCIM promote systematic and wellplanned project construction life-cycle, hence it will positively impact the operability and utilization of the buildings.
- Foreseeable functional use of the building were considered during the design phase to ensure the positive impact in terms of its full function.
- Majority of the positive impact shows that Operation of Uter Content of Uter Cont





# VARIATION ORDER IMPACT

• Based on this aspect, the negative impact is based on the perspectives from the designer that they are overdoing their duty with OSHCIM.

- However, proper planning and communication between team project will help reducing unnecessary costs and disruption of the project progress
- As a result, it optimizes the client's benefits against the resource input and reduce miscommunication





# SERIES CLASH DETECTION IMPACT

- In terms of clash detection, a systematic and wellplanned of project, it will reduce the clashes during design and construction.
- OSHCIM promotes the usage of Building Information Modeling (BIM) in the early-stage planning, which could help in detecting clashes.
- It effectively identify, inspect, and report interference in a construction project model.
- It will speed up projects progress and eliminate chances of multi-level design changes which can result in budget exceeding and delay in project completion time.





### PROJECT COOPERATION AND COORDINATION IMPACT

- Based on OSHCIM concept, the client should ensure that the design team cooperates, and coordinates work frequently.
- Any design constraint or problem on site, should be brainstormed and come up with proper design solutions involving multi-engineering discipline.
- Hence, OSHCIM will have a positive impact in ensuring the cooperation and coordination of a project.





### TECHNOLOGICAL ADVANCEMENT IMPACT

 OSHCIM involves efforts to anticipate and design out hazards by the usage of new technologies

- The basic principle of technology could be applied when doing the risk assessment to trigger the critical design and user-friendly technology selection
- Thus, it increases awareness of the work environment and all the potential dangers.





# WASTE MANAGEMENT IMPACT

 OSHCIM promotes systematic and wellplanned project construction lifecycle that start in early phase with the idea of robust design

- The systematic method could reduce the one-off usage of material or equipment and upgrade planning on work activities to make it usable multiple times and able to be recycled.
- Enhancement of efficient procurement with a correct bill of quantity that just enough for the current process, without excessive waste materials help in waste management as well.







# OSHCIM The Roles of Engineer at Pre & Construction Phase







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# Who is the designer & principal designer?

# Designer

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A designer is an organisation or individual, who in the course or furtherance of a business :

- a)Prepares or modifies a design for a construction project; or
- b)Arranges for, or instructs someone else under their control to do so, relating to structure, or to a procduct or mechanical or electrical system intended for a particular structure.



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# Who is the designer & principal designer?

## **Principal Designer**

- A principal designer is the designer with control over the preconstruction phase of the project.
- The principal designer can be an organisation or an individual that has :
- a)The technical knowledge of contruction industry relevant to the project;
- b)The skills, knowledge and experience to understand, manage and coordinate pre- construction phase, including any design work carried out after construction begins.





### 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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### ROLE OF PD & DESIGNER – PRE webinär **CONSTRUCTION STAGE** 1. Site Visit



 The Principal Designer should visit the site to assess the health and safety issues affecting the project.

ROLE OF PRINCIPLE DESIGNER – PRE- CONSTRUCTION STAGE

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 If this is not possible, the use of Google Street View is useful but should always be supplemented by an actual site visit.



 Supplementary Pre-Construction Information provided by Designers as the design of the project progresses should:

✓ Be relevant

Have an appropriate level of detail
Be proportionate to the risks involved.





### 3. Design Risk Management

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- The Principal Designer should use a schedule to keep a record of the required information as it is received. This should cover:
  - Adequacy of information provided
  - Date of receipt and source of information.

### Significant remaining risk information from Designers;

When receiving information on significant remaining risks from Designers, check the following:

- Is the information clear, precise and in a form suitable for others?
- Could or should the information be on a drawing?
- The Principal Designer should log the responses from Designers; it is easy to lose track of returns. The Principal Designer should be proactive about seeking information

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#### BEM Webinar ROLE OF PRINCIPLE DESIGNER PRE- CONSTRUCTION STAGE

Design Risk Management checklist

Design Risk Management should take place during:

- ✓ Feasibility Preparation and Brief
- ✓ Outline design Concept Design (DRA 1)
- ✓ Detailed design stages Developed Design and Technical (DRA 2)

✓ Construction – (DRA 3)







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Working Sheet for DRA-1

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Example of Working Sheet DRRULE 3

	1. Hazard I	dentification		2. Risk Analysis							3	Risk Control					4. Ri	sk Ans	alysis
									Prevention Through Design (PtD)					Control Measures					
Code	Element of design	POSSIBLE EVENT	IBLE EVENT Elaboration (optional) POSSIBLE EFFECT TO IF TO		Avoid risks		Develop a coherent overall prevention policy Collecti protecti measur		Give appropriate instructions to employees	PPE	(A) Likelihood	(B) Sevenity	(AxB) Risk						
D1-1-a (i)	Stability of soil, that is,	unoven settlement	sandy (SI Report)	nronarty damaga	3	4	12	na	concrete piling	na	na	na	na	na	na	na	1	4	4
D1-1-a (ii)	is it subject to land slip		soft clay	property unitage	4	4	16	na	concrete piling	na	na	na	na	na	na	na	1	4	4
D1-5-a	Trespass	illegal entrance	sabotaj	property damage	3	з	9	na	hoarding	na	CCTV	na	security	na	na	na	2	3	4
D1-6-c	Surrounding hazards, such as proximity to storage tanks associated with a petrol station	explosion, fire, contamination	Flammable chemical storage	loss of lide, property damage	4	5	20	na	na	na	outdoor storage & distant follows ms- 871	na	contaiment pit, deflection wall	fire proof equipment			3	3	9

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DRRULE FORM - Occupational Safety Health Construction Industry (Management)





#### FORM A DR-RULE 1- Concept Design Review

PROJECT RISK REGISTER:				JOB No.:	PR	DJECT:	REVISION:							
	PRELIMI	IARY WORK		101	PRI	EPARED	BY: Lar	d Surveyor	APPROVED	) BY: Principal Designer	DATE: 10th Sept 201	8	1	
ELEMENTS OF POS DESIGN:		POSSIBLE F	POSSIBLE EVENT		Likelihood	T Likelihood Consequence Severity			RISK CONTI	ROL	CLIENT/PD TO INCLUDE IN PCI (Yes or No)	PD/PC TO INCLUDE IN HEALTH & SAFETY FILE (Yes at No)	DATE RISK OR HAZARD REMOVE FROM LIST & BY WHOM	
					L									
D11A	Soil conditio	d	Worker and public				Geotechnical review of the	generic desi	gn Undertaken.	Yes	Yes	20 <sup>h</sup> Jan 2019 by Principal Contractor		
D12B	D12B Underground Damage to underground services on the site services resulting in disruption and injury.							Design to account for servi locations on the site and de 'clashes' where they are id Contact stats companies for	ices known to esign out kno lentified and v or plans of se	o exist at win verified. rvices locations.	Yes	Yes	20th Jan 2019 by Principal Contractor	
L1: Inconceivable C/Si L2: Remote C/Si L3: Conceivable C/Si L4; Possible C/Si L5: Most likely C/Si		C/S1: Negligible C/S2: Minor R1-4: 1 C/S3: Serious R5-12: C/S4: Fatal R15-25 C/S5: Catastrophic		: Negligible : Minor R1-4: Low / : Serious R5-12: Medium : Fatal R15-25: High : Catastrophic		PROJEC	T LEA have b DATE:	ADER'S COMMENTS: een explained to all designe 13th Sept 18	rs	H & S MANAGER'S COM All risky work needs to obtain p DATE: 14 <sup>th</sup> Sept 1	IMENT'S: permit to work	ISSUED TO PRINCIPI	LE DESIGNER DATE: 15 <sup>th</sup> Sept 2019 2 DESIGNER & DATE: 15 <sup>th</sup> Sept 2019	

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#### Working Sheet for DRA-2

No

#### \* based on the drawing (refer to Table 7A)

						** refer to Appendix B (GL DOSH	HIRARC 2008)							
					-		RISK			R	SK			
	DESIGN ELEMENTS		DESIGNER TO CONSIDER THE FOLLOW SIGNIFICANT RISK (Table 7)	NG	Component / Condition / Circumstances *	Possible Design Issues*	Possible Hazards**	ι	5	R	Possible Design Solutions	L	s	R
1	Prefabrication				Sewerage system	Confine space	chemical hazard/oxygen difficiancy	2	2	4	install cctv			0
			Can building components be prefabricated, assembled on ground and then lifted to position	Ver	Wall	used Block work	ergonomic	2	1	2				0
				16	Roof truss	Working at height	manual handling/WH/heat stress			o				0
		a								0				0
		-	for installation?							0				0
				No: In-	Wall	Brick work	ergo/delay	4	3	12	block work	2	2	4
				situ						0				0
				шешоа						0				0
										0				0
		Ъ	Can the cutting of steel members be done offsite, under controlled conditions to reduce the dust	Yes		Consider transportation method				0				0
										0				0
										0				0
										0				0

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DRRULE FORM - Occupational Safety Health Construction Industry (Management)

#### FORM B

DR-RULE 2- Detail Design, Maintenance and Repair Review

PROJE	CT RISK REC	SISTER:			JOB No.: 105		PROJECT: TO DEVELOP TOWN HOUSE									REVISION:
	F	PRECA ST WORK			STAGE: CONSTRUCTION	PREPARE	D BY: ECT	7: APPROVED 1 PRINCIPLE DE S						DATE: 30	<sup>th</sup> March 2019	
ELEMENTS OF DESIGN DWG. / SPEC POSSIBLE EFFEC				ECT	WHO LIKELY TO BE HARMED	IS THE RISK ACCEPTABLE	RISK MANAGEN	ENT	ACTION REQUIRED	Ris L	ik Anal S	ysis R	PD TO I (Ye	) INCLUDE N PCI 16 or No)	PD/PC TP INCLUDE IN HEALTH & SAFETY FILE (Yes or No)	DATE RISK OR HAZARD REMOVE FROM LIST & BY WHOM
D21E	Precast concrete wall installation handling, transporting and erecting precast concrete	-	Uncontrolled collapse of pre- concrete eleme and being crus between a prec concrete eleme and another ob	cast ents hed ast ent ject.	Worker	Acceptable	Competent worker permitted to wo	rs wilth Irik.	Contractor shall follow best practice approach to conduct the Installation work					Yes	Yes	20th April 2019 by Principal Contractor
D22A	2A Heavy lifting biant - crushing due t impact of movin objects loads failing from vehicles because they are not align property		e to ing m se gned	Worker Acceptable		Competent handler with permitted to work.		Contractor shall design and carried out the process of work according to the best practice.					Yes	Yes	20th April 2019 by Principal Contractor	
			-													
L1: Inconceivable S L2: Remote S L3: Conceivable S L4: Possible S L5: Most likely S		: Negligible : Minor : Serious	R1-4: Low R5-12: Medium	PROJ	ECT LEADER'S COMP	MENTS:	H & S MANAG	H & S MANAGER'S COMMENT'S: All risky work needs to obtain permit to work DATE: 1" April 2019					↓ ISS	UED TO PR	INCIPLE DESIGNER	DATE: 2 <sup>™</sup> April 2019
		: Fatal : Catastrophic	R15-25: High	DATE	E: 1" April 2019		DATE: 1" April						√ ISS	UED TO AN	IOTHER DESIGNER & CLI	ENT DATE: 2 <sup>nd</sup> April 2019

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DRRULE FORM - Occupational Safety Health Construction Industry (Management)

#### FORM C DR-RULE 3-Pre-Construction Review

Risk Analysis Design Measure taken, or being taken to eliminate or Action Data Issues Information on the Residual Risk Ref Activity Hazard Persons at risk reduce the hazard Raised Required by: L S R Contractor to propose safe Principal Geotechnical review of the generic design 15<sup>th</sup> Sept 18 D11A Earthworks Slope / ground instability Worker and public construction sequence and Contractor undertaken. methods. Contractor to obtain accurate Design to account for services known to exist at locations location of underground services / Damage to underground on the site and design out known clashes' where they are highway drainage before Principal Underground services on services - Striking 15<sup>th</sup> Sept 18 D21B Workers identified and verified. Contact stats companies for plans of commencement of Contractor the site services resulting in services construction works and to verify / disruption and injury. locations. locate prior to commencement of any construction activity. Principal Precast concrete wall 20<sup>th</sup> May Uncontrolled collapse of Designer and installation -Competent workers with permitted D21E Worker Design for precast concrete wall has been standardize precast concrete elements Principal handling, transporting, and to work. 2018 and being crushed between Contractor erecting precast concrete a precast concrete element and another object.





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DRRULE FORM - Occupational Safety Health Construction Industry (Management)

#### FORM D RISKS REGISTER

	ACTIVITIES	<b>WHO AT</b>	000050050050	RIS MI	k bef Tigat	ORE		RI M	SK AFT	ER ON		
ELEMENT	ACTIVITIES	RISK	CONSEQUENCES	L	LSR		PRELIMINARY DESIGN	DETAILED DESIGN	CONSTRUCTION		s	R
D11A - Earthworks	Deep Excavations	Construction Staff	1. Risk of land slips 2. Slips/trips/falls	4	2	8	Alignment should be adjusted where possible to minimise the depth of	Discussions held with the contractor	Contractor to determine safe method of earthwork	1	1	1



# **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 nondangerous 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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#### Capture the identified significant risks on CDM Visual Risk Analysis Drawings. Capture also other consultants significant risks





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### 4. Preparing the Health and Safety File

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- The Principal Designer must prepare the Health and Safety File, and review, update and revise it as the project progresses.
- The Principal Designer must also **hand over** the completed Health and Safety File to the Client to keep.

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 The Principal Contractor must then take responsibility for reviewing, updating and revising it and passing it to the Client when the project finishes.

# BEM Webinar ROLE OF PRINCIPLE DESIGNER

# 5. Continuing liaison during the Construction Phase

- Dealing with design changes by Designers and Contractors during the Construction Phase
- Consider the impact of these design changes on the Design Risk Management strategy for the project in consultation with the Principal Contractor.
- Assist Principal Contractor in identifying the risks associated with the work and determining the necessary controls that need to be put in place.
- Regular meetings will usually be the most effective management tool.





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#### SUMMARY: The role of the Principal Designer & Designer



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 Assessment of the Construction Phase Plan is not if the Principal Designer's duties

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