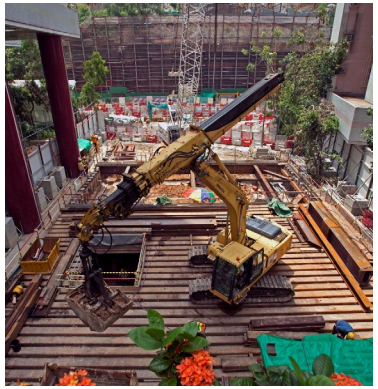
16 Sep 2022

Construction Industry Council Webinar
Work Safety of Temporary Works and Tower Cranes

Temporary Works covers almost everything we do in construction

falsework



working deck

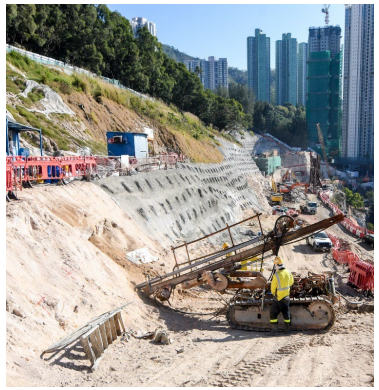
ELS cofferdam

traffic deck

permanent slope cutting

structure under demolition

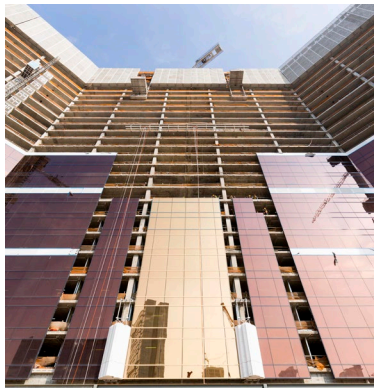
formwork



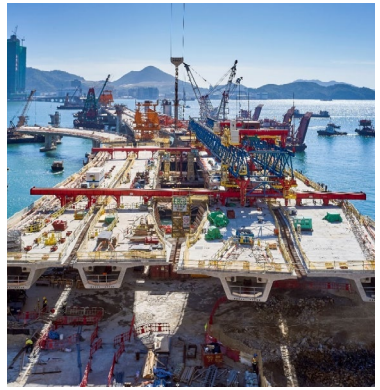
temporary slope cutting

tunnel support

tower crane base



completed permanent structure supporting temporary works



permanent structure under construction

partially completed permanent works which are subject to a different loading condition during the temporary stage are also considered part of the temporary work

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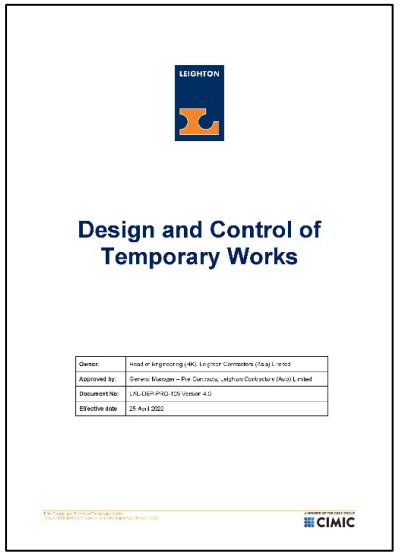
Leighton Design and Control of Temporary Works

Do all these pieces of paper ensure temporary works are safe?



Project teams make temporary works safe, the paperwork merely provides a framework to encourage achievement of the underlying temporary works objectives

TWMS

H2751 AirTrunk Data Centre HKG1

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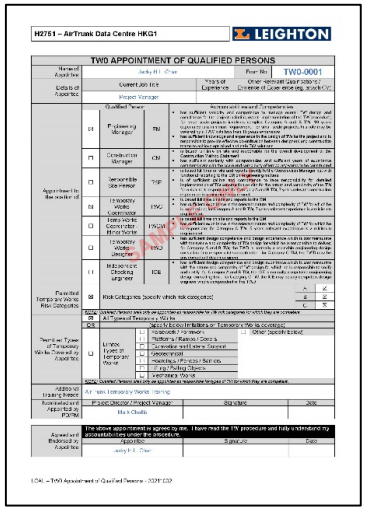
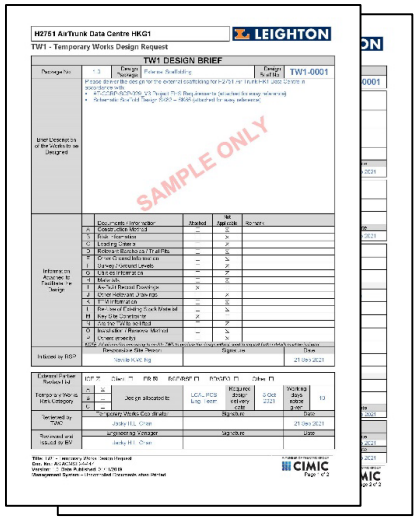
TEMPORARY WORKS MASTER SCHEDULE

Design Package No.	TW Package Description	TW Risk Cat.	TWD	ICE	TWC / TWCM	RSP	Date Design Required	Related TW1	Related TW2	Related TW3	Related TW4
1.0	External Scaffold	A	LCAL PCS Eng Team	SMEC		NN	8 Oct 2021	TW1-0001	TW2-0001	TW3-0002	TW4-0005
2.0	Derrick Crane Foundation	A	LCAL PCS Eng Team	SMEC		AMD	13 Sep 2021	TW1-0002			
3.0	Loading Platform	A	LCAL PCS Eng Team	SMEC		NN	15 Oct 2021	TW1-0003			
4.0	Passenger Hoist Foundation	A	LCAL PCS Eng Team	SMEC		NN	Oct 2021	TW1-0004			
5.0	Temporary Storage of Cooling Towers	A	LCAL PCS Eng Team	SMEC		AMD	28 Oct 2021	TW1-0005			
6.0	Corbel Removal Temporary Propping	C	LCAL PCS Eng Team	SMEC		NN	15 Oct 2021	TW1-0006			
8.0	Check of Girder Beams for Generator Delivery	A	LCAL PCS Eng Team	SMEC		AMD	4 Nov 2021	TW1-0008			
9.0	Temporary Support for Genset Exhaust Pipe	B	LCAL PCS Eng Team	SMEC		AMD	11 Nov 2021	TW1-0009			

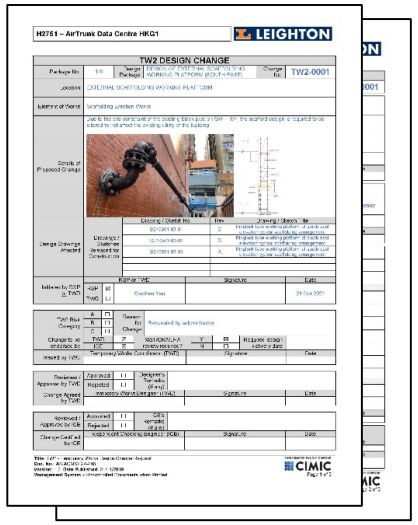
TW0



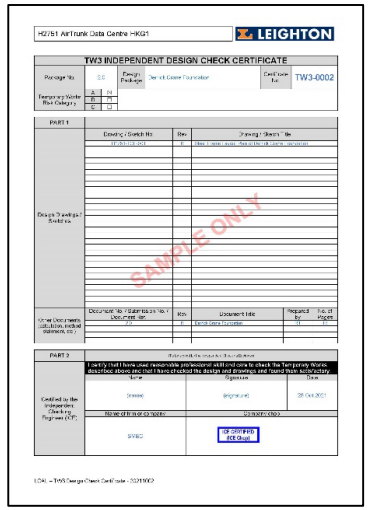
TW1



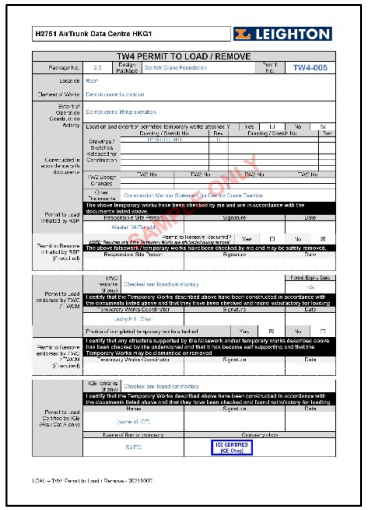
TW2



TW3



TW4



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Inhibitors to Safe Temporary Works

"The design is unbuildable and too conservative"

"The Designer has a lack of understanding of the site difficulties"

"I've already put all the requirements in the drawings"

"Better to keep quiet rather than rock the boat"

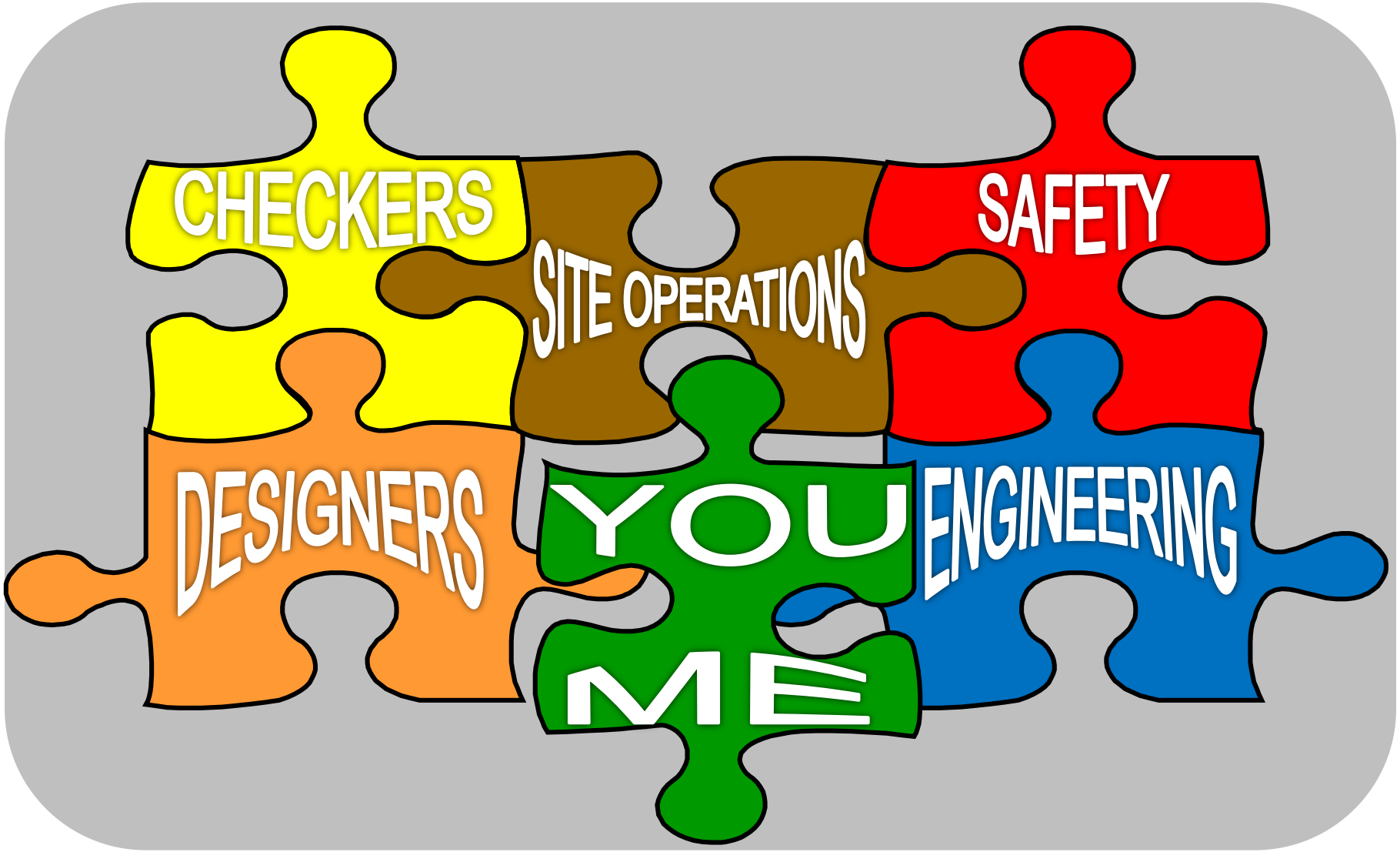
a key inhibitor to safe TW is <u>LACK OF EMPATHY</u> for others who need to design, check and construct TW

"I don't have endless time to spend amending this design"

"Why am I being asked to change the design and method so many times?"

"A wrong decision is better than no decision. Why can't a decision be made?"

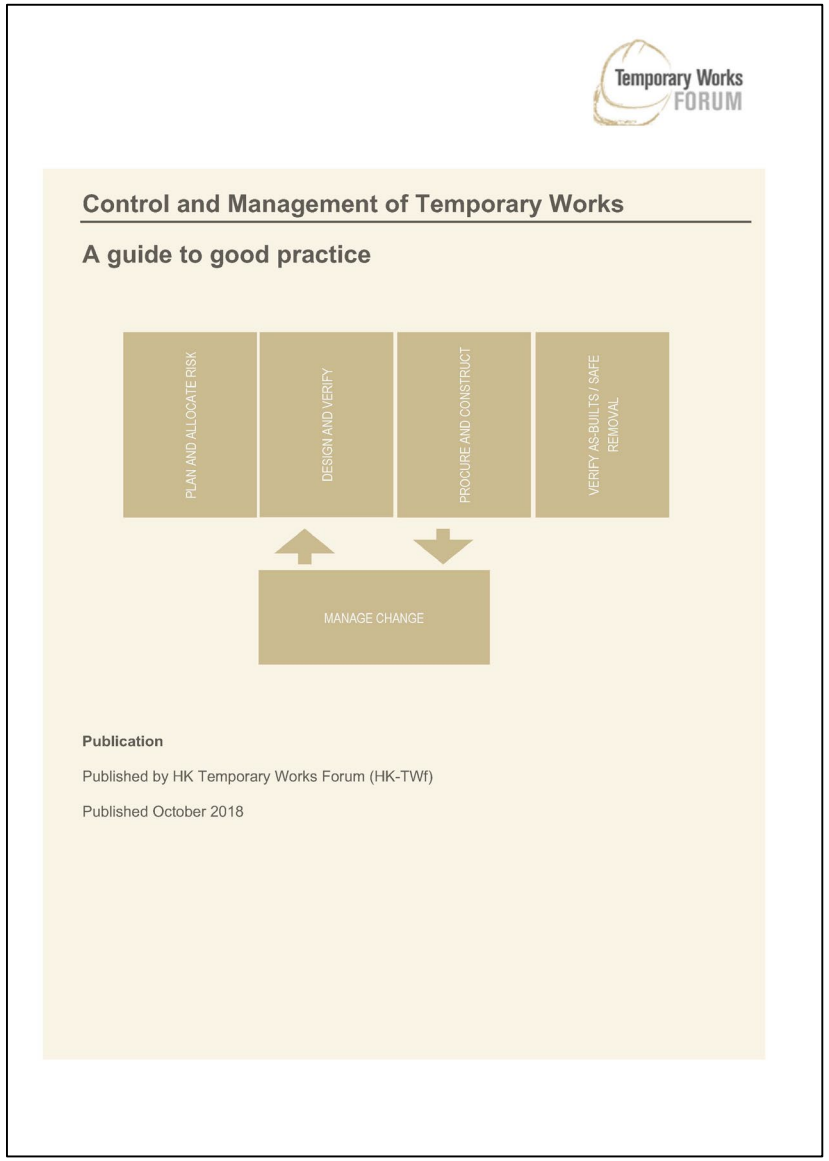
What is Safety by Design?



Successful Implementation of Safety by Design in Temporary Works requires …

- Teamwork
- Collaboration
- Communication
- Co-operation
- Understanding
- Empathy

TWF(HK) Control and Management of Temporary Works



Temporary Works Forum (Hong Kong) has published a guide to good practice on "Control and Management of Temporary Works"

T0 Appointment of Qualified Persons

T1 Temporary Works Master Schedule

T2 Design Brief

ICE certified TW Drawings and ICE certified T3 Design Changes

T4 Permit to Load / Remove

PLAN AND ALLOCATE RISK → DESIGN AND VERIFY → PROCURE AND CONSTRUCT → VERIFY AS-BUILTS / SAFE REMOVAL

MANAGE CHANGE

T3 Design Change

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Client Influence on Temp Works Management Control

香港機場管理局 | AIRPORT AUTHORITY HONG KONG

1.14.6 Temporary Works Control

1.14.6.1 The Contractor shall be fully responsible for the safety of the Temporary Works (TW) and treat temporary works management as a priority in all activities throughout the contract period. ***Temporary Works Management***

1.14.6.2 The Contractor shall establish a Temporary Works Management Plan (TWMP) and ensure that no temporary works commence on site before the TWMP is submitted to Project Manager for review without objection. ***Temporary Works Management Plan***

The Contractor's Representative holds the ultimate responsibility to ensure the TWMP is implemented effectively and that adequate resources, training and monitoring of the system are in place. He shall ensure that prompt action is taken when any inadequacies are identified.

1.14.6.3 The content and management regime of the TWMP shall cover as a minimum the following :-

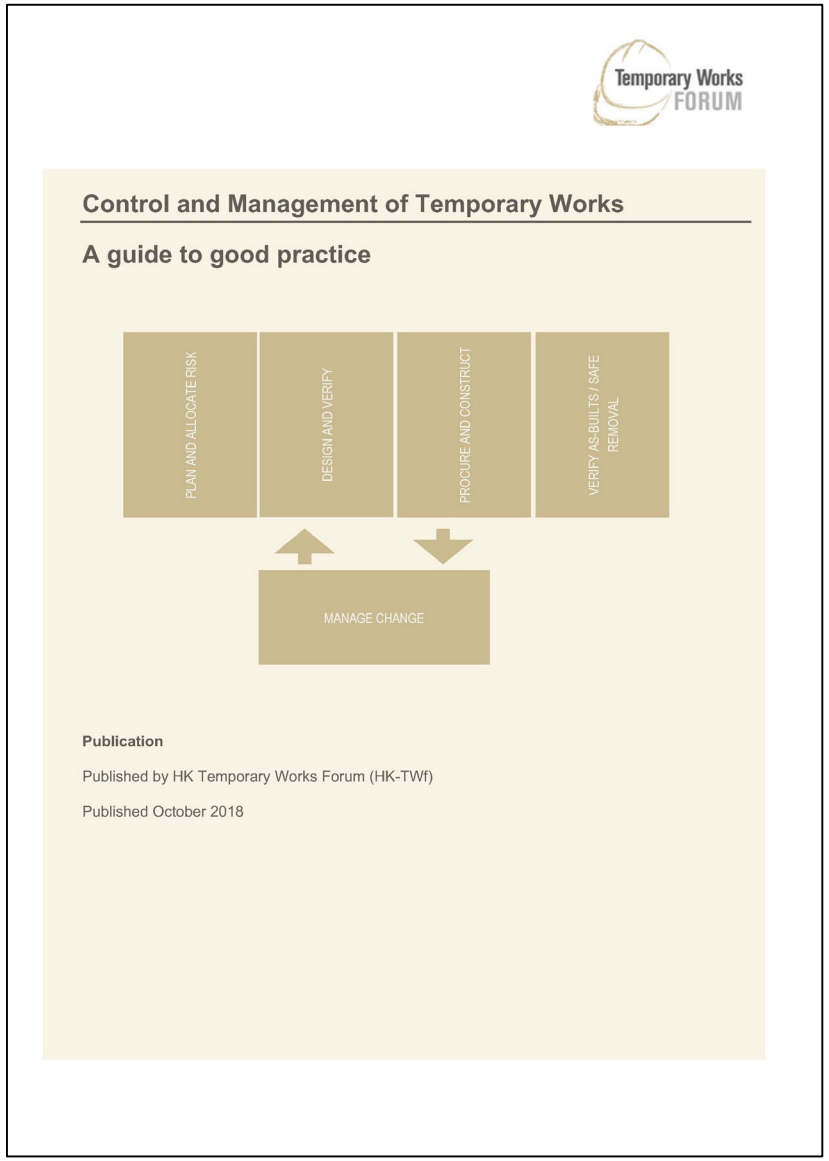
- Key stakeholders and their competence
- Classification of temporary works complexity
- A temporary works ITP (Inspection and Test Plan)
- A systematic temporary works checking process and associated documentation
- A temporary works Non-conformance and AAHK notification process
- A regular temporary works review meeting
- A temporary works compliance verification system
- A systematic follow up procedure to correct any findings identified at any stage of the temporary works process
- In-house TW Assurance System

AAHK have recently imposed PS requirements for a TW Management Plan.

Many other Clients do not include expectations for TW Management Plans.

Will all Contractors have the same interpretation of the requirements of a TW Management Plan?

TWF(HK) Control and Management of Temporary Works



Some but not all Contractors have robust Temporary Works Management procedures embedded within their organisation.

TW Management Plans / Procedures are not mandatory in the industry but should they be?

How similar / different are Contractor's procedures amongst the industry?

TWF(HK) Qualified Persons

Appendix A – Sample TW Forms

T0 APPOINTMENT OF QUALIFIED PERSONS

Job No.: J584 | Project: Contract No. MRE855 Mountain Rail Extension Peak Station and Eastern Approach Tunnels

Details of Appointee	Name	Years of Experience	Other Relevant Qualifications / Evidence of Experience (eg. attach CV)
	Adam Ho	9	see attached CV

Appointment to the position of	Responsible Person			Accountabilities and Competencies
	☐	TW Engineering Manager	EM	• has sufficient seniority and competence to manage overall TW design and compliance for the project including overall implementation of this TW procedure; for large scale projects involving complex Category A and B TW, 10 years' experience is a minimum requirement; for small scale projects, this role may be covered by a TWC with less than 10 years' experience • has sufficient knowledge and experience in the design of TW for the project and is responsible to provide effective co-ordination between designers and construction teams to achieve optimised and safe TW solutions
	☒	TW Supervisor	TWS	• is based full time on site and reports directly to the CR but with functional reporting to the EM on engineering matters • is of sufficient calibre and competence to take responsibility for detailed implementation of TW construction on site for the nature and complexity of the TW for which he is responsible; for Category A and B TW, 7 years relevant construction experience is a minimum requirement;
	☐	TW Coordinator	TWC	• is based full time on site and reports to the EM; • has sufficient experience in the relevant nature and complexity of TW for which he is responsible; for Category A and B TW, 7 years relevant experience is a minimum requirement
	☐	TW Designer	TWD	• has sufficient design competence and design experience which is commensurate with the nature and complexity of TW design for which he is responsible to deliver; for Category A and B TW, the TWD is normally a reputable engineering design consulting firm or specialist subcontractor; for Category C TW, the TWD may be any competent design engineer
	☐	Independent Checking Engineer	ICE	• has sufficient design competence and design experience which is commensurate with the nature and complexity of TW design for which he is responsible to verify and certify; for Category A and B TW, the ICE is normally a reputable engineering design consulting firm; for Category C TW, the ICE may be any competent design engineer who is independent of the TWD
	NOTE: Please refer to Section 4 for elaboration of required accountabilities and competencies for Responsible Persons.			

Permitted Temporary Works Risk Categories				
	☐	Risk Categories (specify which risk categories)	A	☐
			B	☐
			C	☐
	NOTE: Responsible Persons shall only be appointed as responsible for TW risk categories for which they are competent.			

Permitted Types of Temporary Works Covered by Appointee					
	☐	All Types of Temporary Works			
	OR	(specify below limitations on Temporary Works coverage) *NOTE: Refer Appendix B Table B2 for typical Types of Temporary Works*			
	☐	Limited Types of Temporary Works	☐	Falsework / Formwork	☒ Other (specify below)
			☐	Platforms / Ramps / Covers	
			☐	Excavation and Lateral Support	
			☐	Geotechnical	
			☐	Hoardings / Fences / Barriers	
			☐	Lifting / Falling Objects	
			☐	Mechanical Works	
	NOTE: Responsible Persons shall only be appointed as responsible for types of TW for which they are competent.				

Additional Training Needs	Safety Leadership Training Scaffold Appreciation Course

Nominated and Appointed by CR	Contractor's Representative	Signature	Date
	Thomas Li	Thomas Li	6 Mar 2017

Agreed and Endorsed by Appointee	The above appointment is agreed by me. I have read the TW procedure and fully understand my accountabilities under the procedure.		
	Appointee	Signature	Date
	Adam Ho	Adam Ho	6 Mar 2017

Responsibilities of TW Coordinator, TW Designer, and ICE are often specified under the Contract differently by different Clients.

Different Contractors allocate different TW responsibilities to key responsible staff.

TW responsibilities of some other staff (eg. Engineering Manager, Construction Manager, Site Supervisor, etc) are often not specified at all.

Does the construction industry need to more clearly define the TW responsibilities of key Contractor's staff more consistently across the industry?

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TWF(HK) Master Schedule & Risk Allocation

Appendix A – Sample TW Forms

T1 MASTER SCHEDULE

Job No.: J584 | Project: Contract No. MRE855 Mountain Rail Extension Peak Station and Eastern Approach Tunnels

T1 Package No.	TW Package Description	TW Risk Cat	TWD	ICE	TWC / TWCM	TWS	Date Design Required	Related T2	Related T3	Related T4
A	Contract Wide TW Packages									
A01	TW Geological Drawings	A	Consultant 1	ICE 1	Cecilia Singh	Paul Green	-	n/a	-	-
A02	Contract Wide ELS General Notes & Details	A	Consultant 1	ICE 1	Adam Ho	-	-	n/a	T3-0008	-
A03	Instrumentation and Monitoring Drawings	A	Consultant 1	ICE 1	Cecilia Singh	Kai Tak Chan	20 Mar 17	n/a	T3-0005	-
B	Site Establishment									
B01	Works Area Plans & Site Utilisation Plans	C	Site Eng Team	CK Hau	Cecilia Singh	Andrew Pang	13 Mar 17	T2-0001		-
B02	Project Site Office	B	Specialist Subcon 1	ICE 1	Cecilia Singh	Andrew Pang	13 Mar 17	T2-0003		T4-0001
B03	Hoarding / Fencing	C	Specialist Subcon 2	ICE 1	Cecilia Singh	Andrew Pang	20 Mar 17	T2-0002		T4-0002
B04	Project Signboard	C	Specialist Subcon 2	ICE 1	Cecilia Singh	Andrew Pang	20 Mar 17	T2-0005		T4-0019
C	Station									
C01	ELS & Strutting - Station	A	Consultant 1	ICE 1	Adam Ho	James Steel	1 May 17	T2-0009	T3-0003 T3-0007 T3-0013 T3-0018	T4-0012 T4-0014
C02	ELS & Strutting – Entrance A+B	A	Consultant 1	ICE 1	Adam Ho	James Steel	18 Dec 17	T2-0017		
C03	Construction Decking - Station	A	Consultant 1	ICE 1	Adam Ho	James Steel	11 Sep 17	T2-0012	T3-0014 T3-0019	T4-0020
C04	Temporary Underpinning of Footbridge	A	Consultant 1	ICE 1	Adam Ho	James Steel	17 Apr 17	T2-0007 T2-0015	T3-0012	T4-0006
C05	Settlement Reducing Pretreatment Grouting	A	Specialist Subcon 3	ICE 1	Cecilia Singh	Paul Green	24 Apr 17	T2-0008		T4-0010
C06	Formwork - Station In-Situ Walls	B	Specialist Subcon 4	ICE 1	Adam Ho	James Steel	16 Apr 18			
C07	Steel Shutters - Station Column Moulds	B	Specialist Subcon 4	ICE 1	Adam Ho	James Steel	16 Apr 18			
C08	Formwork & Falsework - Station Slabs	B	Specialist Subcon 4	ICE 1	Adam Ho	James Steel	21 May 18			
C09	Formwork & Falsework – In-situ Staircases	B	Specialist Subcon 4	ICE 1	Adam Ho	James Steel	4 Jun 18			
D	Approach Tunnels									
D01	Demolition – Hay Road Flyover	A	Specialist Subcon 5	ICE 1	Tom West	Rachel Wong	31 Mar 17	T2-0004	T3-0001 T3-0002 T3-0004	T4-0003 T4-0005 T4-0008
D02	Temporary Worker Access Footbridge – Hay Road Flyover	C	Site Eng Team	CK Hau	Tom West	Rachel Wong	31 Mar 17	T2-0006		T4-0004
D03	D-Wall Guidewall	C	Specialist Subcon 3	ICE 1	Cecilia Singh	Paul Green	10 Jul 17	T2-0011		T4-0015 T4-0016 T4-0018
D04	ELS & Strutting – Approach Tunnels	A	Consultant 2	ICE 1	Tom West	Rachel Wong	10 Jul 17	T2-0013	T3-0006 T3-0009 T3-0010 T3-0011 T3-0017	T4-0011 T4-0012
D05	ELS – Shallow Utility Diversions	C	Site Eng Team	CK Hau	Tom West	Rachel Wong	12 Jun 17	T2-0012	T3-0008	T4-0007 T4-0009
D06	ELS – Box Culvert Diversion	B	Consultant 2	ICE 1	Tom West	Rachel Wong	28 Aug 17	T2-0014	T3-0015 T3-0016	
D07	Traffic Decking - Tunnels	A	Consultant 2	ICE 1	Tom West	Rachel Wong	20 Nov 17	T2-0016		
D08	Construction Decking - Tunnels	A	Consultant 2	ICE 1	Tom West	Rachel Wong	22 Jan 18	T2-0018		
D09	Formwork – Tunnel In-Situ Walls	B	Specialist Subcon 4	ICE 1	Tom West	Rachel Wong	23 Jul 18			
D10	Formwork & Falsework – Tunnel Roof Slab	B	Specialist Subcon 4	ICE 1	Tom West	Rachel Wong	17 Sep 18			
E	Traffic									
E01	TTM1 – Hay Road Flyover Demolition	A	Consultant 3	ICE 2	Cecilia Singh	Andrew Pang	20 Mar 17	n/a		n/a
E02	TTM2A – Stack Street Stage A	A	Consultant 3	ICE 2	Cecilia Singh	Andrew Pang	15 May 17	n/a		n/a
E03	TTM2B – Stack Street Stage B	A	Consultant 3	ICE 2	Cecilia Singh	Andrew Pang	13 Nov 17	n/a		n/a
E02	TTM3 – Box Culvert Diversion	A	Consultant 3	ICE 2	Cecilia Singh	Andrew Pang	7 Aug 17	n/a		n/a
E04	TTM4 – Entrance A+B	A	Consultant 3	ICE 2	Cecilia Singh	Andrew Pang	18 Dec 17	n/a		n/a

Note: As stated in Section 5.1.3, these fields and columns below may be omitted from the T1 if they can be audit traceable against unique T1 package numbers via other project systems (eg. separate tracking schedules and or electronic document management systems).

Assessment of TW risk category is fundamental to determining the necessary competencies of the Designer, Checker, Site Staff and Subcontractor.

Minor / Simple TW can be safely constructed with lesser experience and skill.

Major / Complex TW requires much higher competence, skill and proven experience.

Should TW risk categories together with minimum TW competencies be imposed across the construction industry?

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TWF(HK) Design Brief

Appendix A – Sample TW Forms

T2 DESIGN BRIEF

Job No.:	J584	Project:	Contract No. MRE855 Mountain Rail Extension Peak Station and Eastern Approach Tunnels

T1 Ref.No.	D06	Design Package	ELS – Box Culvert Diversion	Design Brief No.	T2-0014

Brief Description of the Works to be Designed

Please deliver the ELS design for the box culvert diversion following the tender scheme but with changes as follows:

- construction sequence to be amended to suit revised TTM3 sequence (details attached) as well as the revised construction sequence of interfacing contract MRE854 which will now excavate after MRE855 instead of before
- designer to review the list of available second hand steel sections as attached and where possible make use of them in the design
- change the sheet piles at the eastern area marked in the attached sketch to pipe piles in order to overcome the large boulder encountered in post contract award GI boreholes
- for the vertical bracing restraint, the designer is requested to specifically develop a safe solution to avoid the need for workers to use cherry pickers or scaffold at the upper connection and instead adopt bolted connection which can be accessed by workers from the S1 strut.
- take into account the attached updated information

Information Attached to Facilitate the Design

	Documents / Information	Attached	Not Applicable	Remark
A	Construction Method	☒	☐	
B	Risk Information	☐	☒	same as tender
C	Loading Criteria	☐	☒	same as tender
D	Relevant Boreholes / Trial Pits	☒	☐	New GI boreholes attached
E	Other Ground Information	☐	☒	same as tender
F	Survey / Ground Levels	☒	☐	see attached survey
G	Utilities Information	☒	☐	see attached as-built survey
H	Materials	☒	☐	please reuse steel as per attached
I	As-Built Record Drawings	☐	☒	unchanged since tender
J	Other Relevant Drawings	☐	☒	
K	TTM Information	☒	☐	attached updated TTM proposal
L	Others (specify)	☐	☒	

NOTE: All information necessary to enable TWD to produce the design without need to request further details must be included.

Initiated by TWS	Temporary Works Supervisor	Signature	Date
	Rachel Wong		11 Jun 2017

Temporary Works Risk Category	A ☐ B ☒ C ☐	Design allocated to	Consultant 2	Required design delivery date	31 Jul 2017	Working days notice given	10

Reviewed and Issued by TWC	Temporary Works Coordinator	Signature	Date
	Tom West		13 Jun 2017

Received and acknowledged by TWD	Temporary Works Designer	Signature	Date
	James Chan (Consultant 2)		14 Jul 2017

Task Review Workshop Outcome		Task Review Workshop Date
	Based on the T2 request, TWD to prepare available TW options which address competing SBD objectives and TW optimisation objectives and hold a task review workshop with the Contractor's project team. The agreed TW option is as follows:	27 Jul 2017
	It was agreed to adopt Option 2 presented by the TWD (attached for reference)	

Agreed by TWS or CR	Temporary Works Supervisor or Contractor's Representative	Signature	Date
	Rachel Wong		27 Jul 2017

"Safety by Design" objectives are often (although not always) in conflict with "TW Optimisation" objectives (with respect to cost, time, etc).

The objective of Safety by Design is to achieve a balanced decision amongst competing alternative TW options / TW methods / TW schemes with due consideration of time and cost constraints

Responsibility for "Safety by Design" rests with:

- **TW Designer?**
- **TW Coordinator?**
- **Construction Manager?**
- **Site Supervisor?**
- **Commercial Manager?**
- **Planner?**
- **Sub-Contractor?**
- **Permanent Works Designer?**
- **… or all the above?**

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TWF(HK) Change Management

Appendix A – Sample TW Forms

T3 DESIGN CHANGE

Job No.:	J584	Project:	Contract No. MRE855 Mountain Rail Extension Peak Station and Eastern Approach Tunnels

T1 Ref.No.	D06	Design Package	ELS – Box Culvert Diversion	Change No.	T3-0016
Location	TTM2 Stage B at Site Area WA6a				
Element of Works	Strut Layer 2 Knee Brace				
Details of Proposed Change	Due to the change in TTM2 Stage A and B, the extent of temporary Box Culvert Diversion completed during Stage A now clashes with the Stage B knee brace. The designer is requested to adjust the knee brace to avoid clash with completed Stage A temp culvert diversion structure				

RELEASED FOR CONSTRUCTION 批准作建造用途
T1 No.: D06 Risk Cat. 風險類別: B
(signature) TWC: Tom West Date: 20/9/2017

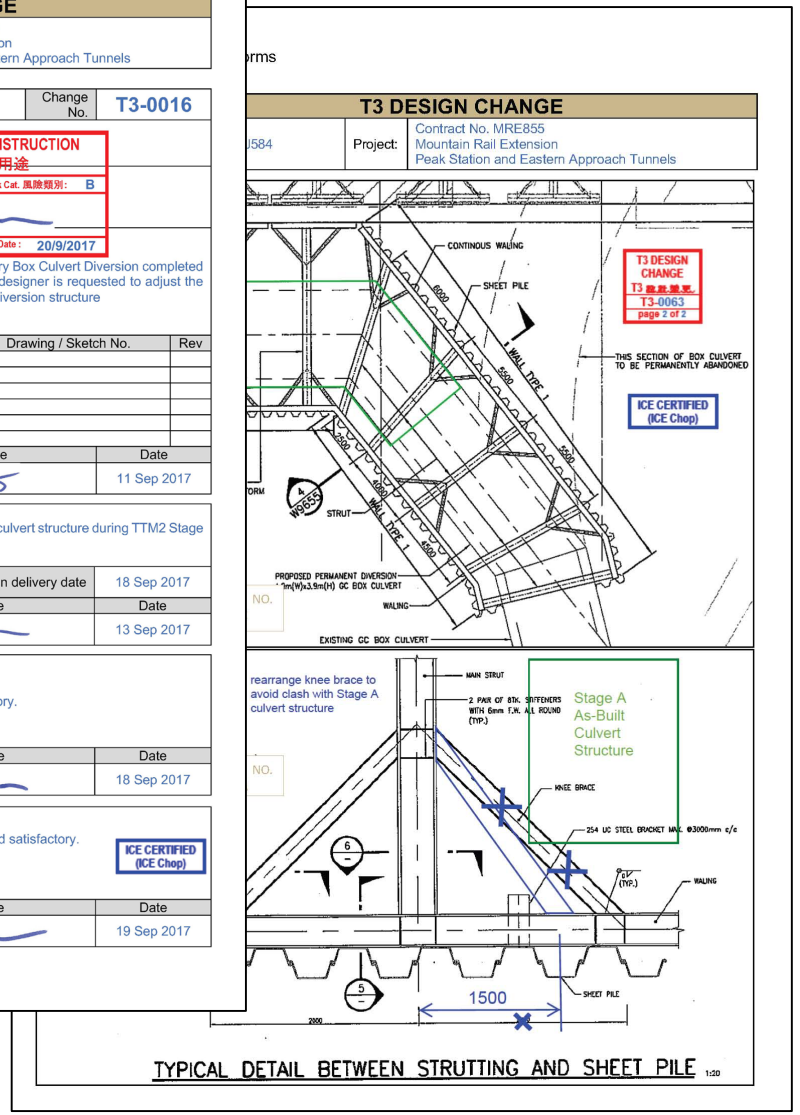
Design Drawings Affected	Drawings / Sketches Released for Construction	Drawing / Sketch No.	Rev	Drawing / Sketch No.	Rev
		MRE855/EAT/CON2/TW/3001	C		
		MRE855/EAT/CON2/TW/3004	A		

Initiated by TWS or TWD	Temp Works Supervisor or Designer	Signature	Date
	Rachel Wong		11 Sep 2017

T3 Risk Category	A ☐ B ☒ C ☐	Reason for Change	Obstruction caused by completed temp culvert structure during TTM2 Stage A			
Change to be endorsed by	TWD ☒	ICE ☒	Required design delivery date	18 Sep 2017		
Issued by TWC	Temporary Works Coordinator	Signature	Date			
	Tom West		13 Sep 2017			

Reviewed / Approved by TWD	Approved ☒ Rejected ☐	Designer's Remarks (if any)	Checked and found satisfactory.		
Change Agreed by TWD	Temporary Works Designer	Signature	Date		
	James Chan (Consultant 2)		18 Sep 2017		

Reviewed / Approved by ICE	Approved ☒ Rejected ☐	ICE's Remarks (if any)	The proposed change is found satisfactory.	ICE CERTIFIED (ICE Chop)	
Change Certified by ICE	Independent Checking Engineer	Signature	Date		
	William Tsang (ICE1)		19 Sep 2017		



Many TW failures can be attributable to unauthorized changes

TW changes are often managed at site level by the Contractor's project team without sufficient scrutiny and review by the original TW Designer and ICE

Should our industry provide clearer mandatory guidance and requirements for managing and checking TW changes?

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TWF(HK) Permit to Load / Remove System

Appendix A – Sample TW Forms

T4 PERMIT TO LOAD / REMOVE

Job No.:	J584	Project:	Contract No. MRE855 Mountain Rail Extension Peak Station and Eastern Approach Tunnels		
T1 Ref.No.	C03	Design Package	Construction Decking - Station	Permit No.	T4-0020
Location	Construction Decking – Station				
Element of Works	Construction Deck B at Eastern Portion of WA6a				
Extent of Operation and Construction Activity	Partially completed construction deck B as demarcated in the attached markup plan.				

Constructed in accordance with documents

Drawings / Sketches Released for Construction

Drawing / Sketch No.	Rev	Drawing / Sketch No.	Rev
MRE855/EAT/CON1/TW/6101	C		
MRE855/EAT/CON1/TW/6111	B		
MRE855/EAT/CON1/TW/6112	C		
MRE855/EAT/CON1/TW/6121	A		
MRE855/EAT/CON1/TW/6122	A		

T3 Design Changes

T3 No.	T3 No.	T3 No.	T3 No.
T3-0014			
T3-0019			

Other Reference Documents: Construction Method Statement for Construction Decking (Station)

Permit to Load Initiated by TWS

The above temporary works have been checked by me and as far as I can ascertain they are in accordance with the documents listed above.

Temp Works Supervisor	Signature	Date
James Steel		28 Sep 2017

Permit to Remove Required? Yes ☐ No ☒

NOTE: Required only if the Temporary Works are still loaded during removal.

Permit to Remove Initiated by TWS (if required)

The above temporary works have been checked by me and may be safely removed.

Temp Works Supervisor	Signature	Date

Permit to Load endorsed by TWC / TWCM

TWC remarks (if any): Checked and found satisfactory

Permit Valid Until Date: n/a

The above temporary works have been checked by me and as far as I can ascertain they are in accordance with the documents listed above.

Temporary Works Coordinator	Signature	Date
Adam Ho		2 Oct 2017

Permit to Remove endorsed by TWC / TWCM (if required)

The above temporary works have been checked by me and may be safely removed.

Temporary Works Coordinator	Signature	Date

Permit to Load Certified by ICE (Risk Cat A only)

ICE remarks (if any): Checked and found satisfactory

ICE CERTIFIED (ICE Chop)

The above temporary works have been checked by me and as far as I can ascertain they are in accordance with the documents listed above.

Independent Checking Engineer	Signature	Date
William Tsang (ICE1)		2 Oct 2017

Most contract PS expect signoff of the Permit to Load / Remove (or Construction Certificate) by the ICE

An ICE who is not site-based is normally unable to verify all as-builts and defects based on a short inspection

Contractors prefer to allocate responsibility to their own staff (ie. TW Supervisor / TW Coordinator) … not the ICE.

Who is best suited to be responsible for checking as-built TW?:

- **ICE?**
- **TW Supervisor?**
- **TW Coordinator?**
- **Subcontractor?**

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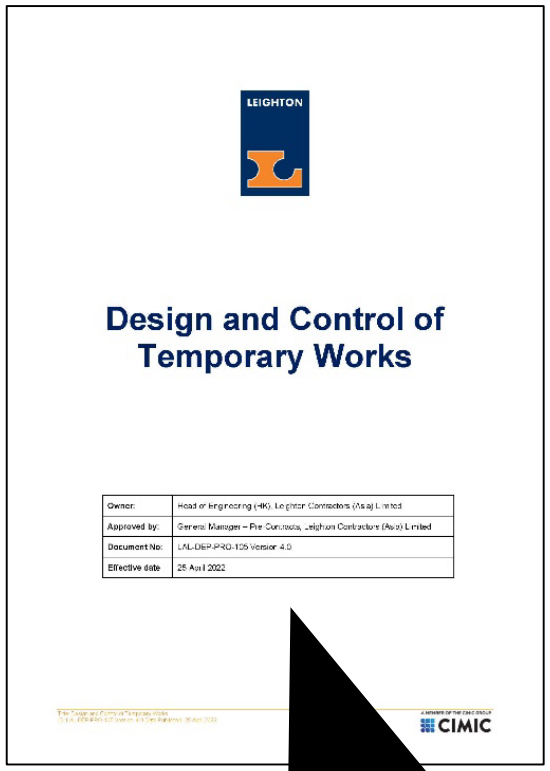
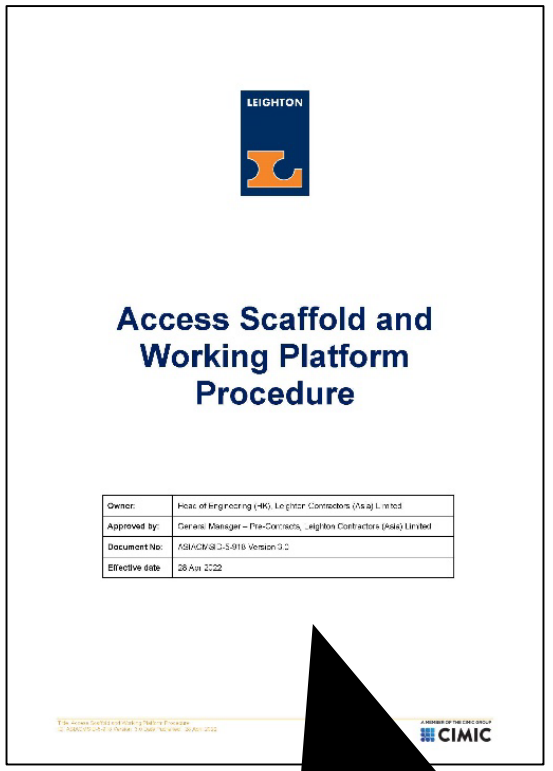
Leighton Temporary Works Procedures



Leighton D&CTW procedure has a similar framework as TWf(HK) Procedure … but includes Leighton specific additional safety requirements / standards

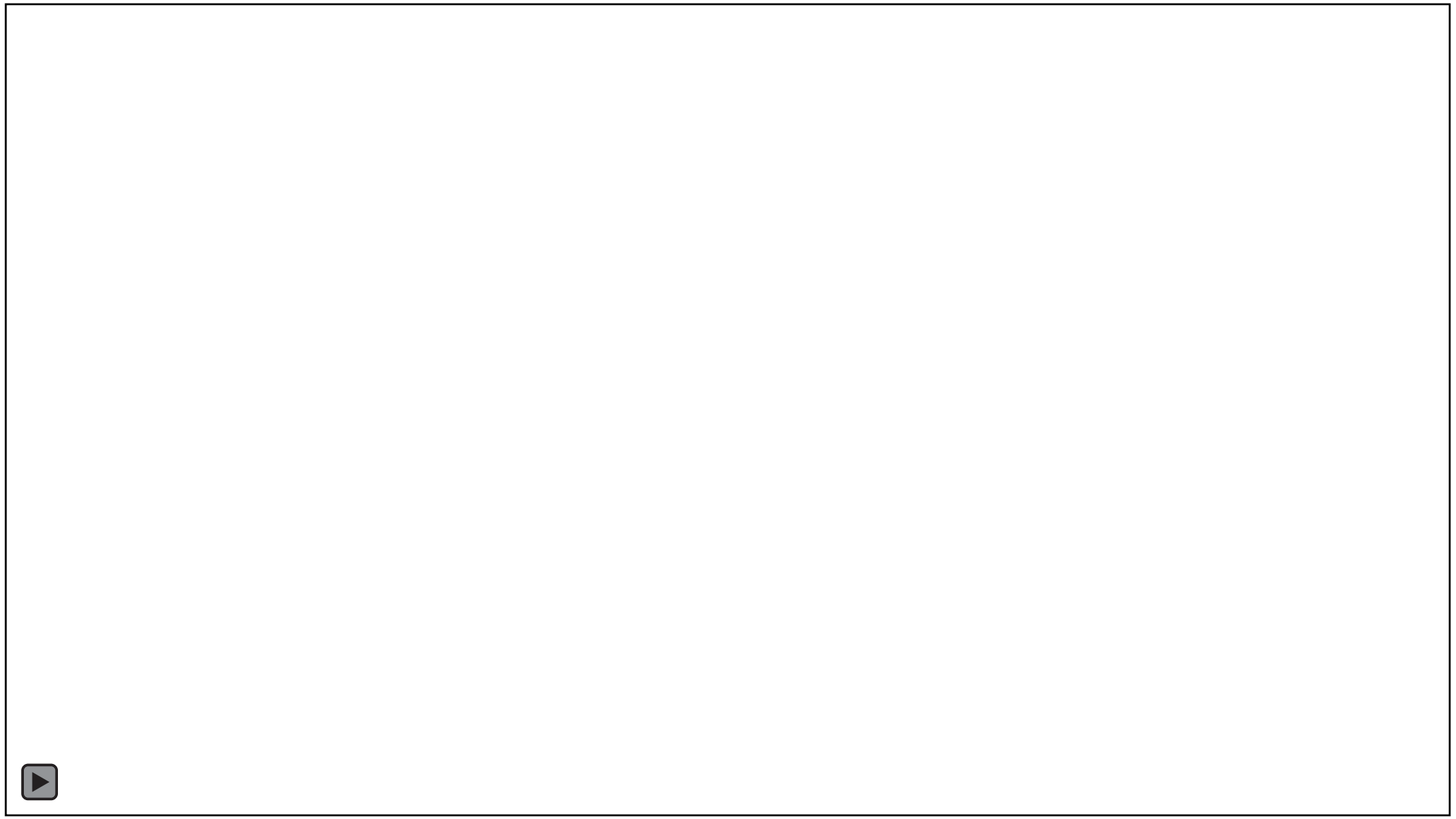


ASWP may be exempt from the D&CTW procedure … this Leighton ASWP procedure clarifies when ASWP is or isn't exempt and provides clear standards to follow

This CTW procedure is under development which will eventually supersede Leighton existing rebar stability procedure.

Why does Leighton have an ASWP Procedure?

What happens if we put workers on ad hoc un-designed platforms?



Leighton Access Scaffold and Working Platform Procedure

Appoint qualified persons to plan, manage, supervise and authorise ASWP

AS0 Appointment of Qualified Scaffold Persons

TW0

Classification ("Typical" or "Non-Typical" ASWP)

AS1 Access Scaffold Exemption Review

TYPICAL

exempt from *Design and Control of Temporary Works Procedure*

NON-TYPICAL

must comply with the *Design and Control of Temporary Works Procedure*

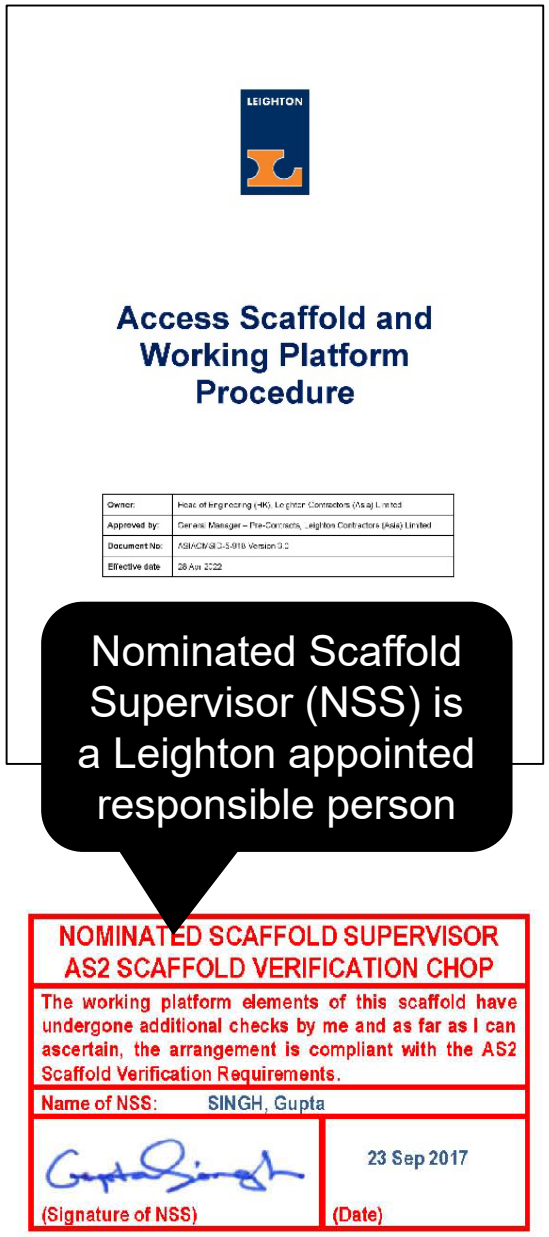
TW1
TW3
IFC TW Dwgs
IFC TW2
TW4

must comply with Leighton AS2 Scaffold Verification Requirements (this procedure)

AS2 Scaffold Verification

NSS oversight and verification of all "Typical" and "Non-Typical" ASWP (this procedure)

NSS Chop for AS2 Scaffold Verification



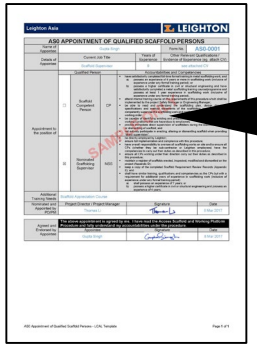
Nominated Scaffold Supervisor (NSS) is a Leighton appointed responsible person

NOMINATED SCAFFOLD SUPERVISOR AS2 SCAFFOLD VERIFICATION CHOP

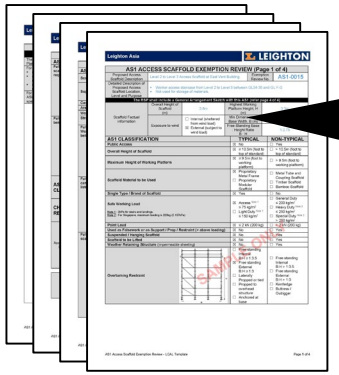
The working platform elements of this scaffold have undergone additional checks by me and as far as I can ascertain, the arrangement is compliant with the AS2 Scaffold Verification Requirements.

Name of NSS: SINGH, Gupta

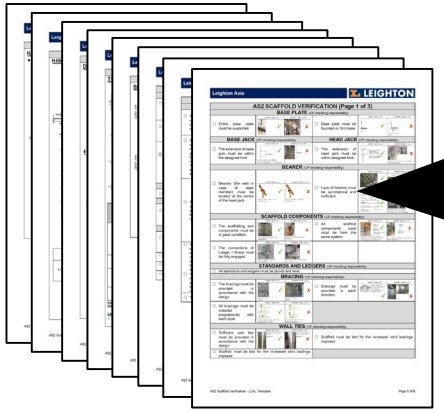
(Signature of NSS) | 23 Sep 2017 (Date)



AS0 to appoint :
- CP
- NSS



AS1 to determine :
- "Typical" ASWP
- "Non-Typical" ASWP



AS2 for NSS + CP to verify Leighton scaffold requirements (which may exceed industry standards)

Leighton Access Scaffold and Working Platform Procedure

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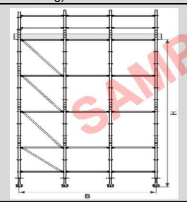
AS1 ACCESS SCAFFOLD EXEMPTION REVIEW (Page 1 of 4)

Proposed Access Scaffold Description	Level 2 to Level 3 Access Scaffold at East Vent Building	Exemption Review No.	AS1-0015
Detailed Description of Proposed Access Scaffold Location, Level and Purpose	▪ Worker access staircase from Level 2 to Level 3 between GL34-35 and GL F-G ▪ Not used for storage of materials.		

The RSP shall include a General Arrangement Sketch with this AS1 (refer page 4 of 4)

Scaffold Factual information	Overall Height of Scaffold (m)	3.8m	Highest Working Platform Height, H (m)	3.3m
	Exposure to wind	☐ Internal (sheltered from wind load) ☒ External (subject to wind load)	Min Dimension of Base Width, B (m)	1.2m
			Free-Standing Base : Height Ratio B : H	1:2.75

AS1 CLASSIFICATION	TYPICAL	NON-TYPICAL
Public Access	☒ No	☐ Yes
Overall Height of Scaffold	☒ ≤ 10.5m (foot to top of standard)	☐ > 10.5m (foot to top of standard)
Maximum Height of Working Platform	☒ ≤ 9.5m (foot to working platform)	☐ > 9.5m (foot to working platform)
Scaffold Material to be Used	☒ Proprietary Metal Frame ☐ Proprietary Modular Scaffold	☐ Metal Tube and Coupling Scaffold ☐ Timber Scaffold ☐ Bamboo Scaffold
Single Type / Brand of Scaffold	☒ Yes	☐ No
Safe Working Load Note 1 : 2kPa for stairs and landings. Note 2 : For Singapore, maximum loading is 220kg (2.157kPa)	☒ Access Note 1 ≤ 75 kg/m² ☐ Light Duty Note 1 ≤ 150 kg/m²	☐ General Duty ≤ 200 kg/m² ☐ Heavy Duty Note 2 ≤ 250 kg/m² ☐ Special Duty Note 2 > 250 kg/m²
Point Load	☒ ≤ 2 kN (200 kg)	☐ > 2 kN (200 kg)
Used as Falsework or as Support / Prop / Restraint (> above loading)	☒ No	☐ Yes
Suspended / Hanging Scaffold	☒ No	☐ Yes
Scaffold to be Lifted	☒ No	☐ Yes
Weather Retaining Structure (impermeable sheeting)	☒ No	☐ Yes
Overturning Restraint 	☐ Free standing Internal B:H ≤ 1:3.5 ☒ Free standing External B:H ≤ 1:3 ☐ Laterally Propped or tied ☐ Propped to overhead structure ☐ Anchored at base	☐ Free standing Internal B:H > 1:3.5 ☐ Free standing External B:H > 1:3 ☐ Kentledge ☐ Buttress / Outrigger

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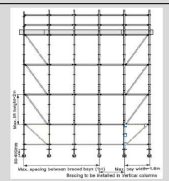
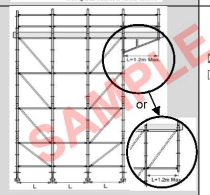
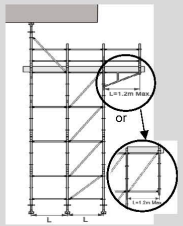
AS1 ACCESS SCAFFOLD EXEMPTION REVIEW (Page 2 of 4)

AS1 CLASSIFICATION	TYPICAL	NON-TYPICAL
Scaffold on Sloping Surface	☒ Slope Gradient ≤ 1:25	☐ Slope Gradient > 1:25
Supporting Surface	☒ Hard (well compacted) and thick (no risk of penetration)	☐ Soft or thin (risk of penetration) ☐ Cantilever Bracket / Spanning Beam
Can Condition of Supporting Surface Change / Deteriorate	☒ No	☐ Yes
Are Standards Vertical?	☒ Yes	☐ No
Working Platform Planking Hook-board	☒ Yes	
Straight plank – Maximum Span Between Supports	☒ Not Used ☐ ≤ 1.6m	☐ > 1.6m
Fulfill all typical Access Scaffold and Working Platform requirements listed below: • Max. SWL = 150 kg/m² • Max. 2 levels of working platform loaded simultaneously • Max. bay length = 1.6m • Max. lift height = 2m • A min. of 1 in 4 bays braced • Bracing installed in opposite pairs 	☒ All these requirements are fulfilled	☐ Some or all of these requirements cannot be fulfilled
Fulfill all typical free-standing cantilever scaffold requirements listed below: • Max. SWL = 150 kg/m² • Min. 3 bays of scaffold behind cantilever bay • Min. 2 bays of bracings • Max. cantilever: 1 bay not exceeding 1.2m • Cantilever bay immediately below working platform • Only one level of working platform on cantilever 	☒ Not applicable ☐ This case is applicable and all these requirements are fulfilled	☐ This case is applicable but these requirements cannot be fulfilled
Fulfill all typical top-propped cantilever scaffold requirements listed below: • Max. SWL = 150 kg/m² • Min. 2 bays of scaffold behind cantilever bay • One full line of scaffold to be propped to overhead structure to ensure stability • Supporting structure must be sufficient to provide overturning restraint (e.g. permanent works concrete slab; concrete or steel beam. not suspended ceiling or cladding) • Bracing: min. 1 bay at cantilever; braced at top prop • Max. cantilever: 1 bay not exceeding 1.2m • Cantilever bay immediately below working platform • Only one level of working platform on cantilever 	☒ Not applicable ☐ This case is applicable and all these requirements are fulfilled	☐ This case is applicable but these requirements cannot be fulfilled

AS1 to determine :
- “Typical” ASWP
- “Non-Typical” ASWP

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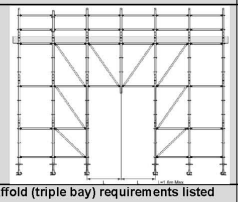
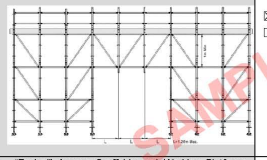
AS1 ACCESS SCAFFOLD EXEMPTION REVIEW (Page 3 of 4)

AS1 CLASSIFICATION	TYPICAL	NON-TYPICAL
Fulfill all typical bridge-over scaffold (double bay) requirements listed below: • Max. SWL = 150 kg/m² • At least 2 bays of scaffold on each side of bridge-over • Bays immediately adjacent to bridge-over to be braced • Max. bridge-over span = 3.2m (max. 2 bays) 	☒ Not applicable ☐ This case is applicable and all these requirements are fulfilled	☐ This case is applicable but these requirements cannot be fulfilled
Fulfill all typical bridge-over scaffold (triple bay) requirements listed below: • Max. SWL = 150 kg/m² • At least 3 bays of scaffold on each side of bridge-over • Min. bracing as sketch below • Max. bridge-over span=3.75m (max. 3 bays) • Each bay of bridge-over to be of same length (L) 	☒ Not applicable ☐ This case is applicable and all these requirements are fulfilled	☐ This case is applicable but these requirements cannot be fulfilled
AS1 CLASSIFICATION	▪ “Typical” Access Scaffolds and Working Platforms (ASWP) are exempt from the Design & Control of Temporary Works procedure ▪ RSP is responsible to ensure any ‘Non-Typical” Access Scaffolds and Working Platforms (ASWP) are subject to the full application of the Design & Control of Temporary Works procedure.	☒ **“Typical”** (If only boxes in this column are ticked)	☐ **Non-Typical** If any boxes in this column are ticked)
CHECKING REQUIREMENTS	Note 3 : Hong Kong = Statutory Form 5 Other countries = Use LCAL ‘Scafftag’ system.	☒ **CP** (Note 3) ☒ **NSS** (working platform only)	☐ **CP** (Note 3) ☐ **NSS** (scaffold & platform) ☐ **RSP** ☐ **TWC**

Access Scaffold Exemption Review Initiated by RSP	I have determined the AS1 Classification to be “Typical” ASWP or “Non-Typical” ASWP in accordance with the criterion listed above and will follow up to ensure that the requirements of the Access Scaffolds and Working Platforms procedure for this AS1 Classification are complied with. For “Typical” ASWP, I authorise the NSS/CP to proceed erection of the “Typical” ASWP in line with this AS1 as it is exempt from the application of the Design & Control of Temporary Works Procedure.		
	Responsible Site Person	Signature	Date
	James Steel		8 Sep 2017

Received and Acknowledged by NSS	I acknowledge receipt of this AS1 classification. During erection, modification, and/or use, if “Typical” ASWP are found to no longer comply with the AS1 criterion, I will immediately notify the RSP to reclassify as “Non-Typical” ASWP.		
	Nominated Scaffolding Supervisor	Signature	Date
	Gupta Singh		8 Sep 2017

Leighton Access Scaffold and Working Platform Procedure

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AS2 SCAFFOLD VERIFICATION (Page 1 of 3)

BASE PLATE (CP checking responsibility)

- ☐ Entire base plate must be supported.
- ☐ Base plate must be founded on firm base.

BASE JACK (CP checking responsibility)

- ☐ The extension of base jack must be within the designed limit.

HEAD JACK (CP checking responsibility)

- ☐ The extension of head jack must be within designed limit.

BEARER (CP checking responsibility)

- ☐ Bearers (the web in case of steel member) must be located at the centre of the head jack.
- ☐ Laps of bearers must be symmetrical and sufficient.

SCAFFOLD COMPONENTS (CP checking responsibility)

- ☐ The scaffolding and components must be in good condition.
- ☐ All scaffold components used must be from the same system.
- ☐ The connections of Ledger / Brace must be fully engaged.

STANDARDS AND LEDGERS (CP checking responsibility)

- ☐ All standards and ledgers must be plumb and level.

BRACING (CP checking responsibility)

- ☐ The bracings must be provided in accordance with the design.
- ☐ Bracings must be provided in each direction.
- ☐ All bracings must be installed progressively with each layer.

WALL TIES (CP checking responsibility)

- ☐ Sufficient wall ties must be provided in accordance with the design.
- ☐ Scaffold must be tied for the increased wind loadings imposed.
- ☐ Scaffold must be tied for the increased wind loadings imposed.

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AS2 SCAFFOLD VERIFICATION (Page 2 of 3)

PLANKING (NSS+CP checking responsibility)

- ☐ Scaffold boards must not be used as transoms to support other boards.
- ☐ Planks must be tied to support at each end (ledger, transom or scaffold tube) to prevent tipping by steel tying wire.
- ☐ Where boards overlap, top boards must be centred over gap between bottom boards. Top board must extend a min. of 100mm past common support with bottom board at each end.
- ☐ Max. distribution load must be ≤ 1.5kPa (150kg/m²).
- ☐ Refer to Engineering Department if higher safe working load is required.
- ☐ Signage must be provided at max. 20m spacing.
- ☐ Stacking of materials on the planking system must be within the loading capacities.
- ☐ For plain scaffold board, a min. of 3 points of support (ledger, transom, scaffold tube) must be provided for 3m and 4m long boards. A min. of 2 points of support must be provided for 2m boards.
- ☐ Typical planking arrangement refer to the attached **Drawing A and B.**
- ☐ Additional scaffold tube used as structural support must be 48.3mm diameter, 4mm wall thickness with yield stress of 275N/mm².
- ☐ All 4mm tube must be marked with green paint with 100mm bands at 500mm centres.
- ☐ Double ledger must be installed in a proper way.
- ☐ Timber planks not permitted.
- ☐ Typical decking arrangement between adjacent scaffolds refer to attached **Drawing C.**

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AS2 SCAFFOLD VERIFICATION (Page 3 of 3)

WORKING PLATFORM (NSS+CP checking responsibility)

- ☐ Handrails and sufficient spaces must be provided for all access staircase.
- ☐ Access hatches must be marked and closed when not in use.
- ☐ Proper edge protection must be in place.
- ☐ The materials loading bay on the platform must be properly demarcated.
- ☐ All the scaffold boards must be in good condition in accordance with the type of the board.
- ☐ All working platform plank spans must be less than 1.83m between the supports.
- ☐ The working platforms and access must be fitted with double guard rails and toe boards. Typical handrail details refer to attached **Drawing D** and **Drawing E.**
- ☐ No loose material on the working platform.
- ☐ All the ladders must be tied/fixed correctly.

FALLING MATERIAL PROTECTION (NSS+CP checking responsibility)

- ☐ Debris netting must be installed.
- ☐ Protective fans or covered walkways must be erected for falling material protection.

OPENINGS (NSS+CP checking responsibility)

- ☐ All openings on the formwork or floor slab must be covered.

OTHER MISCELLANEOUS CHECKING (NSS+CP checking responsibility)

- ☐ Approved falsework design drawings must be issued.
- ☐ The erection and alteration of scaffold / falsework must be carried out by appointed trained workers.
- ☐ The approved design drawings of scaffold must be displayed on site.
- ☐ Form 5 must have been issued and signed by a competent person.
- ☐ Signage must be displayed to indicate the load capacity of the scaffold and the type of the scaffold.
- ☐ Effective bonding system to earth was provided to the scaffold.
- ☐ Scaffold must be erected under the instruction of competent person.
- ☐ Barriers were erected to prevent collision from plant or traffic.

AS2 for NSS + CP to verify Leighton scaffold requirements (which may exceed industry standards)

Leighton Rebar Stability Procedure

The "permit to load" system introduces a hold point before loading is applied

a permit to load system does not address rebar cage stability because it can fail during "interim stages of erection"








Leighton has an extra Rebar Stability Procedure with an objective to prevent incidents like these

Reinforcement Stability Assessment Procedure

Table of Contents

Temporary Works FORUM

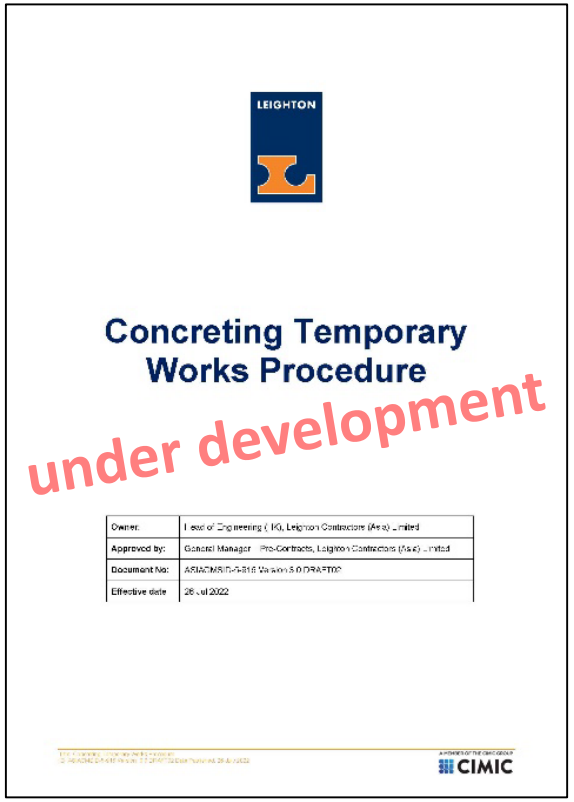
Reinforcement Cage Design & Construction
A guide to good practice

Publication
Published by Hong Kong Temporary Works Forum (HK-TWF)
Published October 2019
Issue 1

TWF(HK) also has a guide to good practise on this topic

Leighton Concreting Temp Works Procedure – Under Development

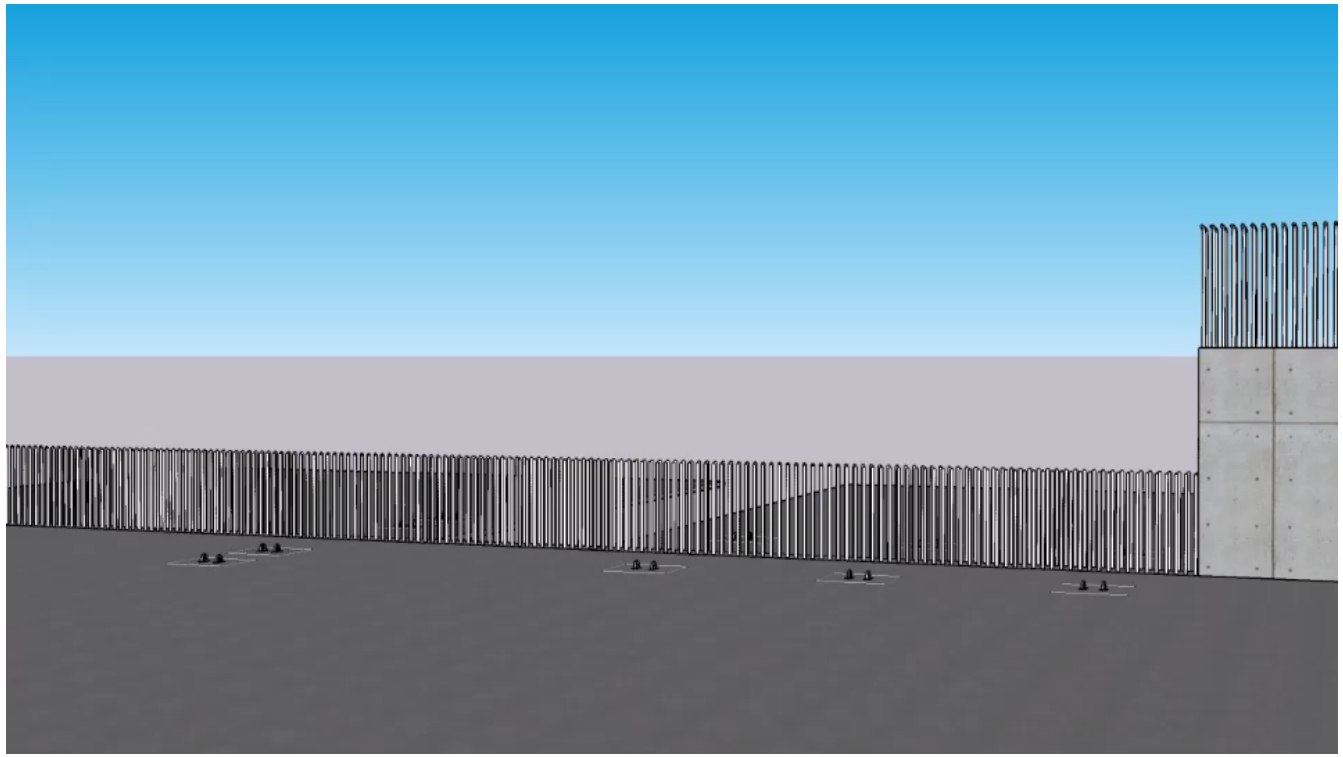
Concreting Temporary Works (CTW) include:
- **Access Scaffolds**
- **Rebar Erection**
- **Formwork/Falsework Erection**



CTW may be constructed concurrently and/or in any permutation and combination of sequencing

CTW often rely on each other for stability during interim stages of construction

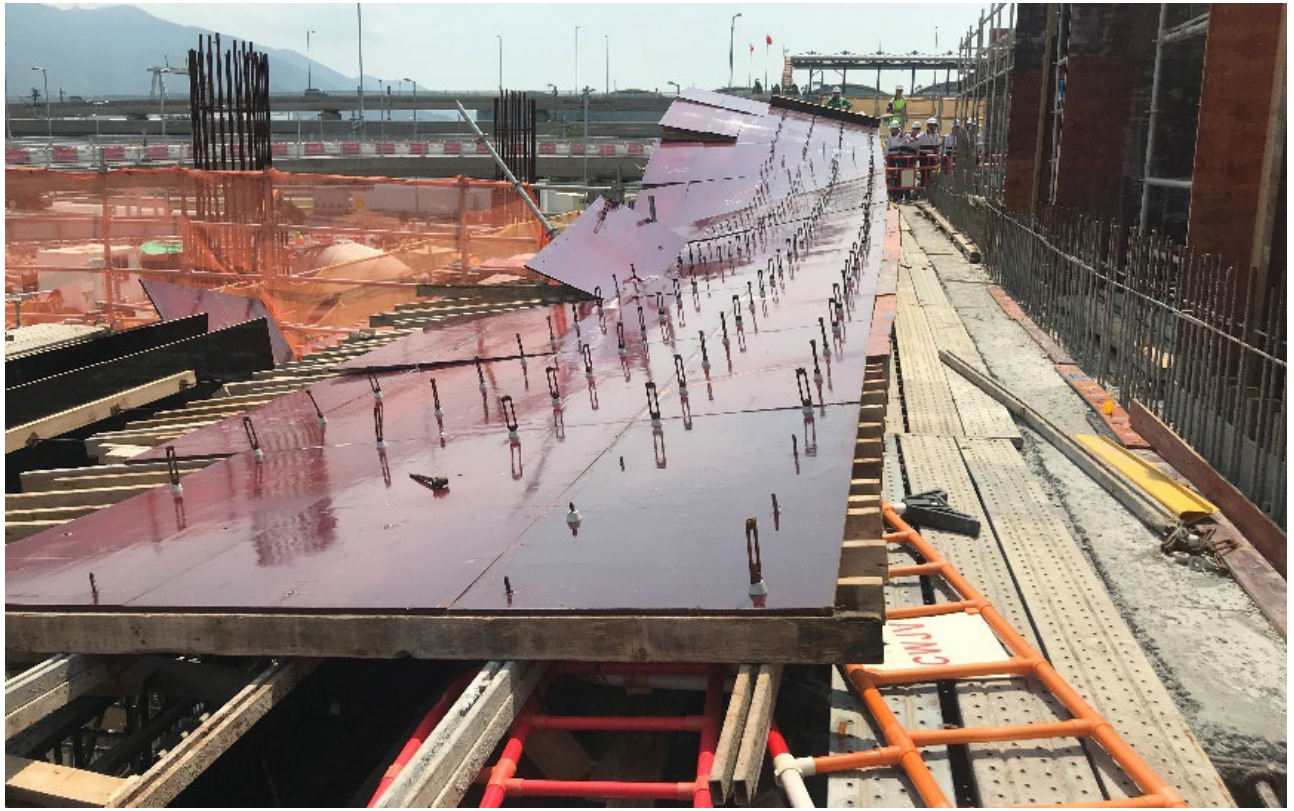
More often than not, the stability of CTW during interim stages of construction are decided by scaffolders / carpenters / bar benders with little or no clear guidance of what is acceptable

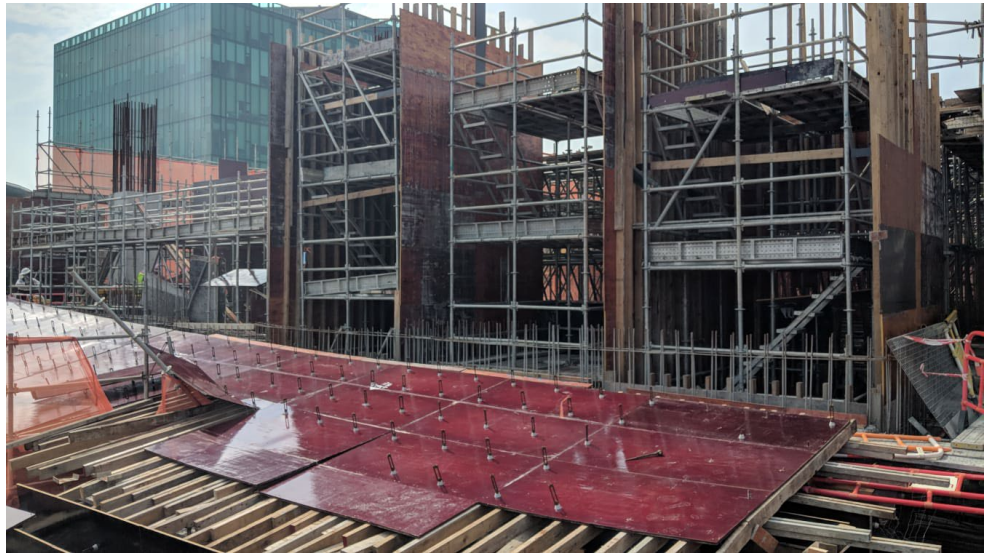


Why is Leighton developing a Concreting Temp Works Procedure?

This collapse could have killed our colleagues

Should we just hope to have lucky escapes?





Why is Leighton developing a Concreting Temp Works Procedure?

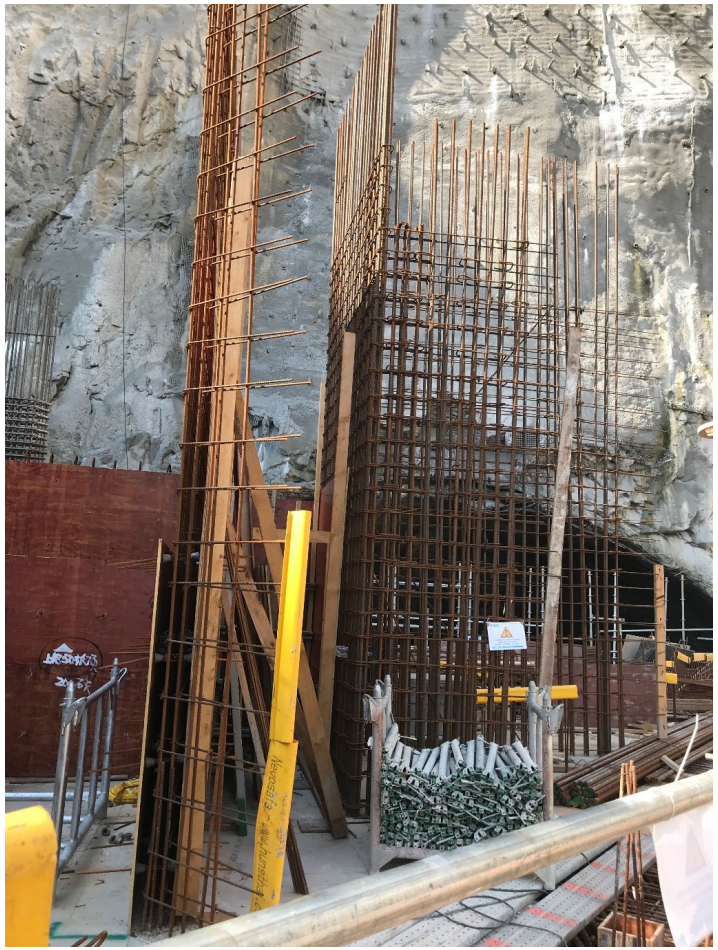
What do we see on our sites which makes us thing twice?

Do we take action or turn a blind eye?

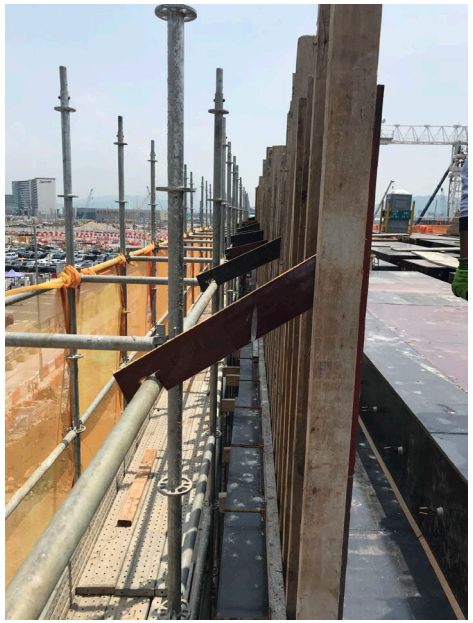
What makes concreting temporary works fall over during interim stages of construction?

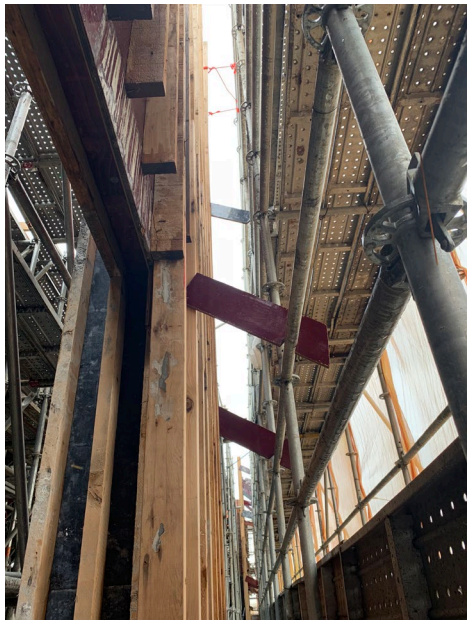
Why is Leighton developing a Concreting Temp Works Procedure?

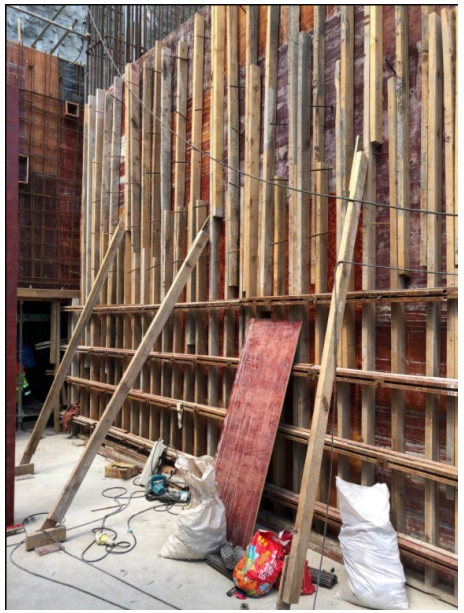
How many supports is enough during interim stages of construction?



Why is Leighton developing a Concreting Temp Works Procedure?







What type of supports are considered acceptable?

Why is Leighton developing a Concreting Temp Works Procedure?

failure of Concreting Temporary Works can easily cause injury or death

Why is Leighton developing a Concreting Temp Works Procedure?

failure of Concreting Temporary Works can easily cause injury or death

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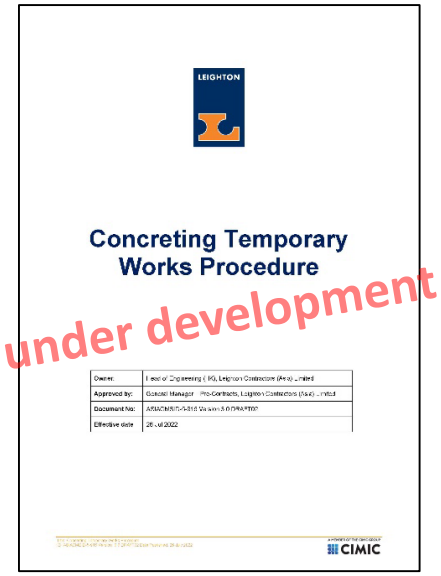
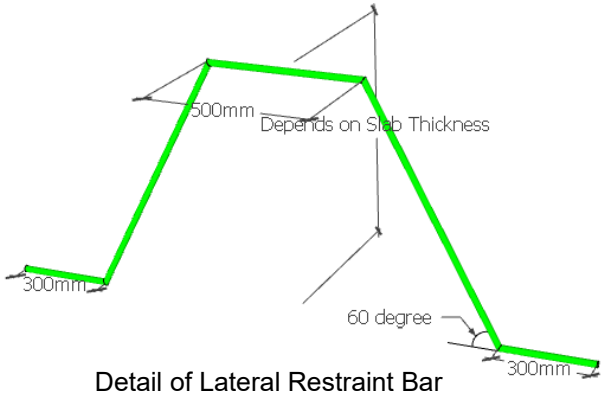
Leighton Concreting Temp Works Procedure – Under Development

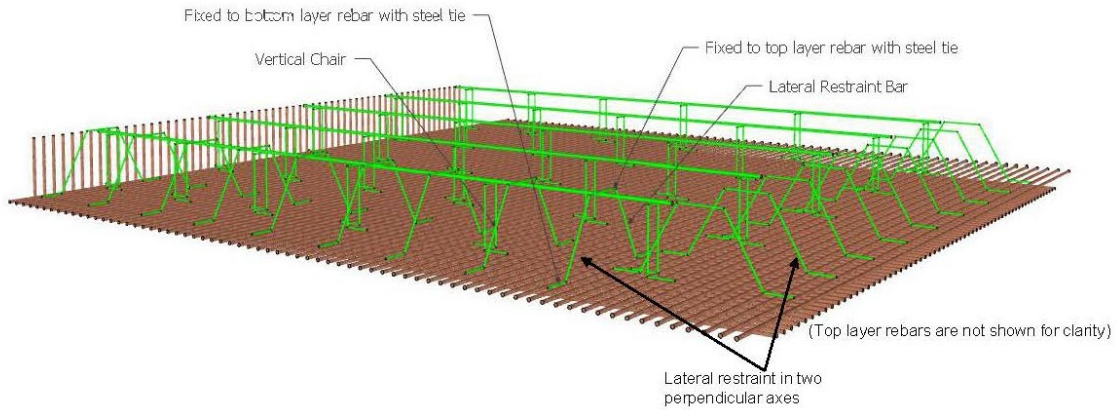


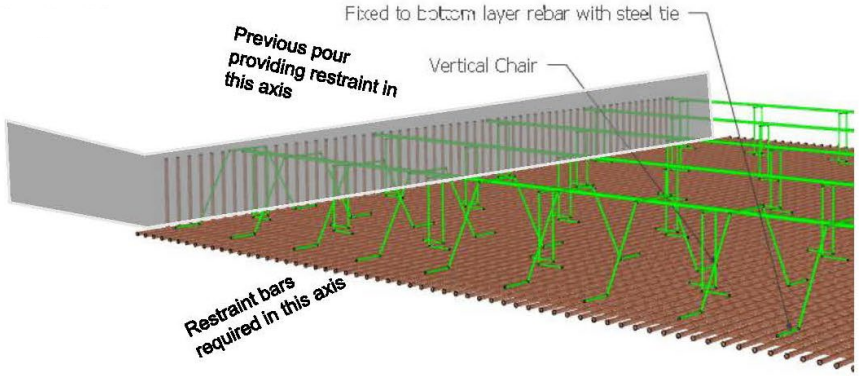
Leighton proposing mandatory lateral restraint bars for slab rebar fixing

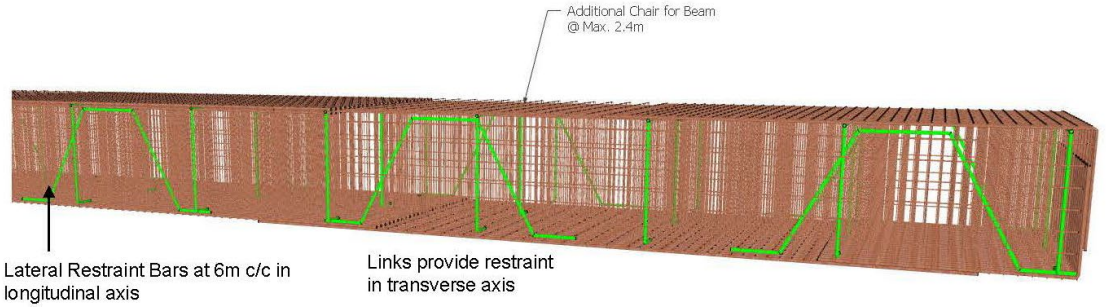
Should these types of mandatory restraints be imposed across the industry?



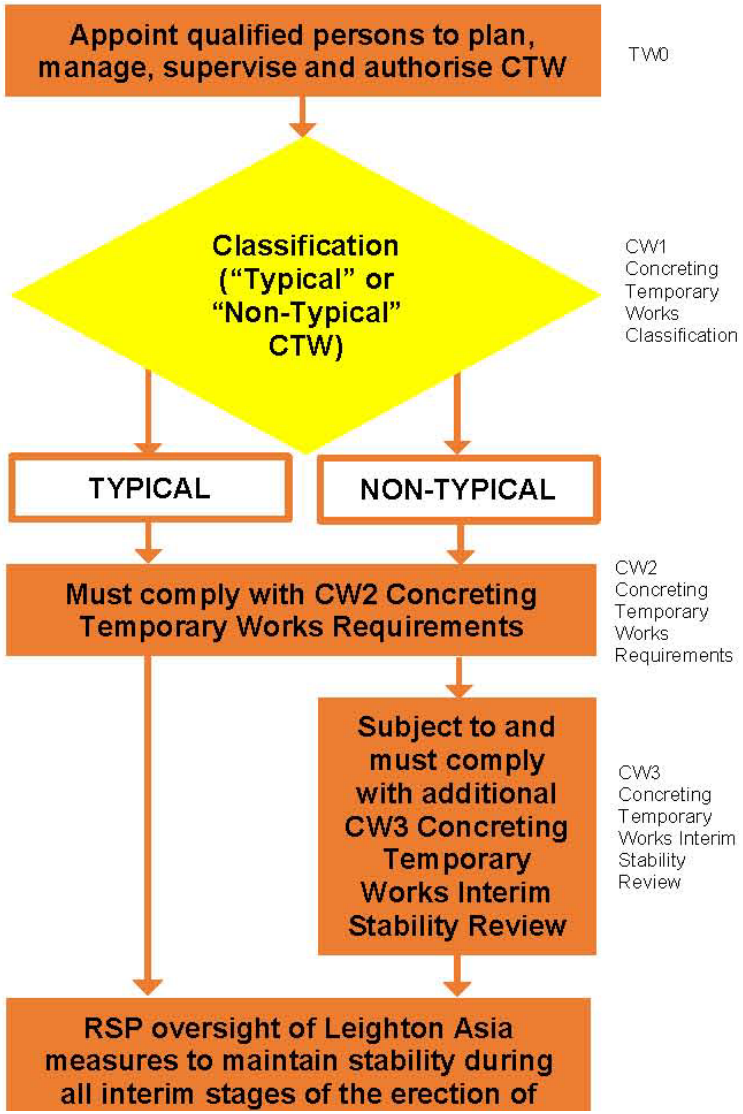
Detail of Lateral Restraint Bar
T20 @ Max. 1.5m c/c along
unrestrained axis

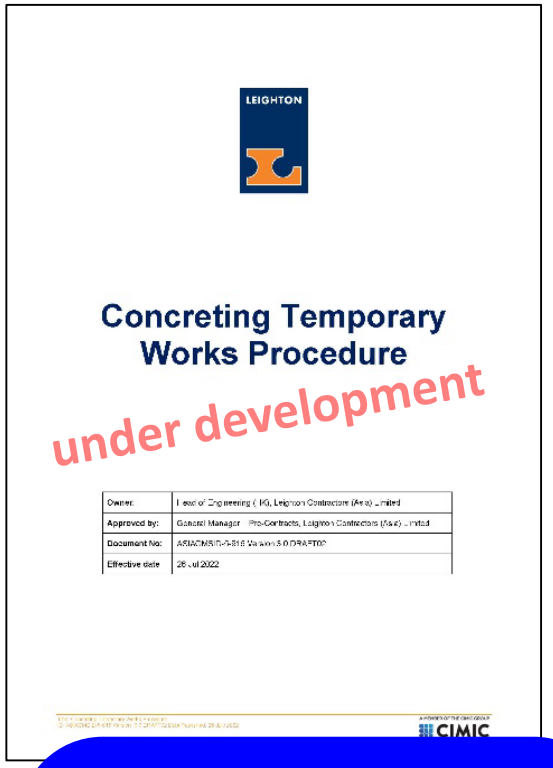






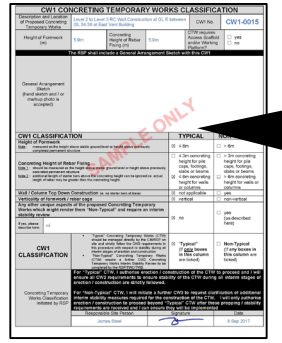
Leighton Concreting Temp Works Procedure – Under Development





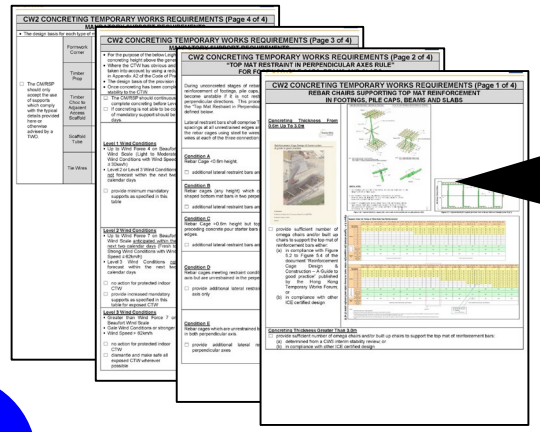
For wall and column CTW:

- **"Typical CTW" require <u>mandatory props</u>**
- **"Non-Typical CTW" will require designer to advise required propping during interim construction stages of erection**

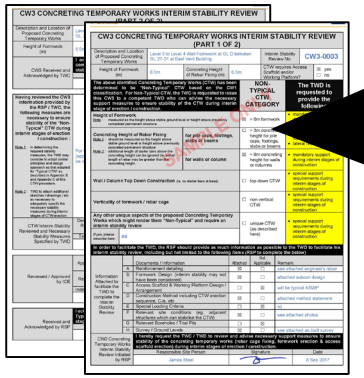


CW1 to determine :

- "Typical" CTW
- "Non-Typical" CTW



CW2 defines mandatory CTW support requirements for "Typical" CTW



CW3 for "Non-Typical" CTW for TWD to carry out CTW interim stability review and advise support requirements

Temporary Works outcomes are within our control