



Design Risk Assessment – OSHCIM PROCESS

Presented by:

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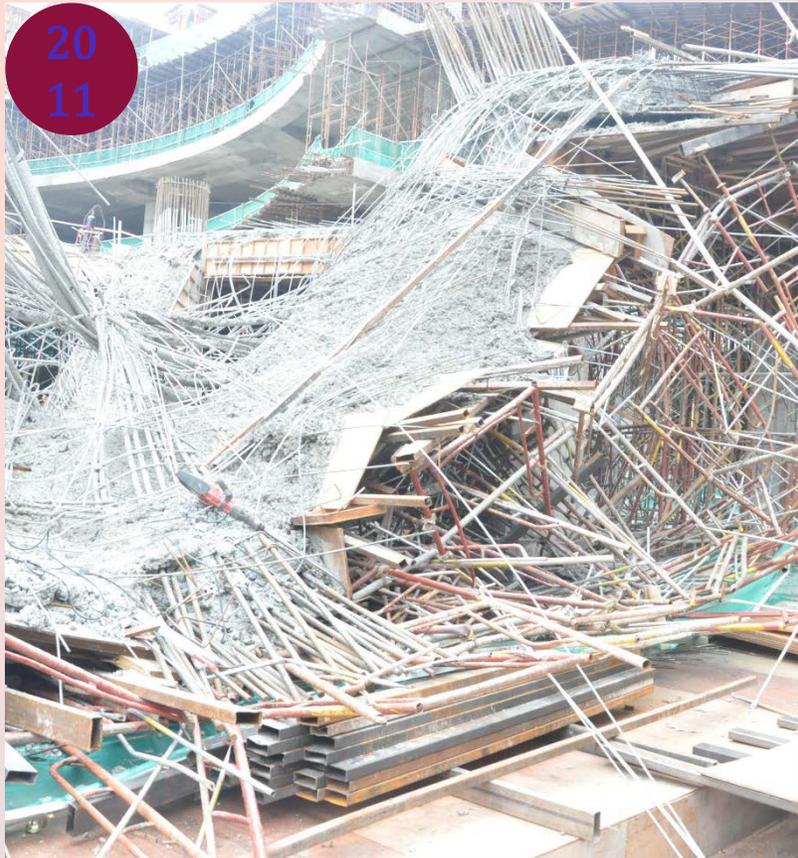


Outline of Presentation

Your (legal) duties

Design risk assessment process

Good practices in design



PAST ACCIDENTS: HAVE WE LEARNED OUR LESSON?



PENANG FATAL LANDSLIDE: COURT FINES ENGINEER, CONSULTANT COMPANY RM80,000

REPORT OF THE COMMISSION OF ENQUIRY: 22 JULY 2019

Opalyn Mok
11 September 2019



Rescue workers search for victims of a landslide at a construction site in Tanjung Bungah, George Town October 22, 2017. — Reuters pic

GEORGE TOWN, Sept 11 — A consultant engineer and an engineering consultancy firm were fined RM40,000 each for failing to provide safe working procedures that led to a fatal landslide at the Granito project site in 2017.

The consultant engineer, Khoo Koon Tai, and Perunding KAA Sdn Bhd both changed their plea and admitted to the offence when the case came up for mention at the Sessions Court today.

Perunding KAA Sdn Bhd was charged under Section 15 (1) of the Occupational Safety and Health Act 1994 in which as an employer, it had failed to provide engineering calculations for the temporary slope where the fatal landslide occurred and therefore had failed to ensure the safety, health and welfare of all workers at the site.

5.17 Mr T disclosed that his “supervision work” consisted mainly of taking photographs of ongoing construction works, and sending them to Ir K by WhatsApp, for the latter to have a look and to give him further instructions³. Mr Tan himself had insufficient knowledge and experience to know whether or not all the construction works were being carried out properly.

5.21 It is not an exaggeration to say that what Ir K was doing, most of the time, was **‘supervising by remote control’**.

PAST ACCIDENTS: THERE ARE MANY GOOD PRACTICES AS POINTED OUT BY THE REPORT



PAST ACCIDENTS:

LRT 3 SITE, 29 July 2021



JABATAN KESELAMATAN DAN KESIHATAN PEKERJAAN SELANGOR
Tingkat 7 & 8 (East Wing), Wisma Consplant 2, Jalan SS16/1,
47500 Subang Jaya, Selangor
Tel: 03-5623 6400, Faks: 03-5638 9159
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SIARAN MEDIA
UNTUK LIPUTAN MEDIA MASSA

JURUTERA PROFESIONAL DIDAKWA DI BAWAH
AKTA KESELAMATAN DAN KESIHATAN PEKERJAAN 1994

Klang, 26 April 2022 – Hakim Mahkamah Sesyen Jenayah Klang, Puan Rohatul Akmar Binti Abdullah hari ini telah menjatuhkan hukuman denda Dua Puluh Lapan Ribu Ringgit (RM28,000) atau sepuluh (10) hari penjara terhadap Chu Kwai Kuen yang mengaku bersalah bagi pertuduhan di bawah Seksyen 17(1), Akta Keselamatan dan Kesihatan Pekerjaan 1994, (Akta 514).

Chu Kwai Kuen sebagai Jurutera Profesional yang diwakili peguam dari Tetuan Derek Chong, didapati telah gagal memastikan kewajipan setakat yang praktik keselamatan dan kesihatan orang lain, yang bukan pekerjaanya, dengan gagal memastikan pemasangan struktur penyangga dapat menampung beban yang dikenakan ke atasnya, sehingga menyebabkan kemalangan maut ke atas seorang pekerja akibat dihempap oleh struktur *falsework* yang runtuh, manakala dua lagi pekerja turut cedera semasa kejadian tersebut. Kesalahan dilakukan di tapak projek LRT3, Pakej GS09, di

Tiang P22-41, Bandar Bukit Tinggi 1/KS6, Jalan Langat, 41200 Klang, Selangor, pada 29 Julai 2021 yang lalu, lebih kurang jam 2.30 petang.

Pendakwaan bagi kes ini dikendalikan oleh Pegawai Pendakwa dari Jabatan Keselamatan dan Kesihatan Pekerjaan (JKKP) Selangor, Encik Muhammad Redzuan Bin Razali. Manakala, siasatan telah dijalankan oleh Pegawai Penyiasat JKKP Selangor, Encik Mohamad Firdaus Bin Abu Hassan. Kes ini diharap dapat memberi pengajaran kepada semua majikan-majikan dan pekerja agar pematuhan kepada undang-undang perlu diambil berat demi kepentingan awam dan keselamatan pekerja.

###

Dikeluarkan oleh:
Pejabat Pengarah
Jabatan Keselamatan dan Kesihatan Pekerjaan Selangor
Kementerian Sumber Manusia
26 April 2022

Jabatan Keselamatan dan Kesihatan Pekerjaan Malaysia (JKKP/DOSH) merupakan salah satu Jabatan di bawah Kementerian Sumber Manusia (KSM) yang menguatkuasakan Akta Keselamatan Dan Keselamatan Pekerjaan 1994 dan Akta Klang Dan Jentera 1987. JKKP/DOSH bertanggungjawab untuk memastikan keselamatan, kesihatan dan kebajikan orang yang sedang bekerja, dan melindungi orang lain daripada bahaya-bahaya keselamatan dan kesihatan yang berpunca daripada aktiviti pekerjaan pelbagai sektor.

Some good practices...

- **Prepare for the worst:** understand the 'high risk' nature of falsework in the design and site controls

BS 5975:2008+A1:2011



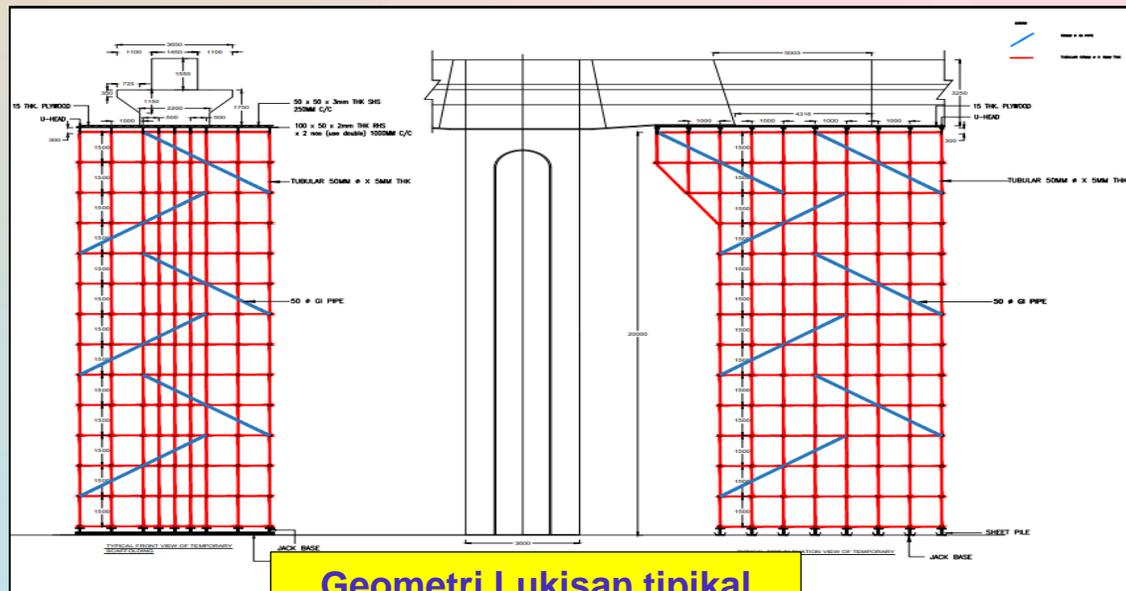
BSI Standards Publication

Code of practice for temporary works procedures and the permissible stress design of falsework

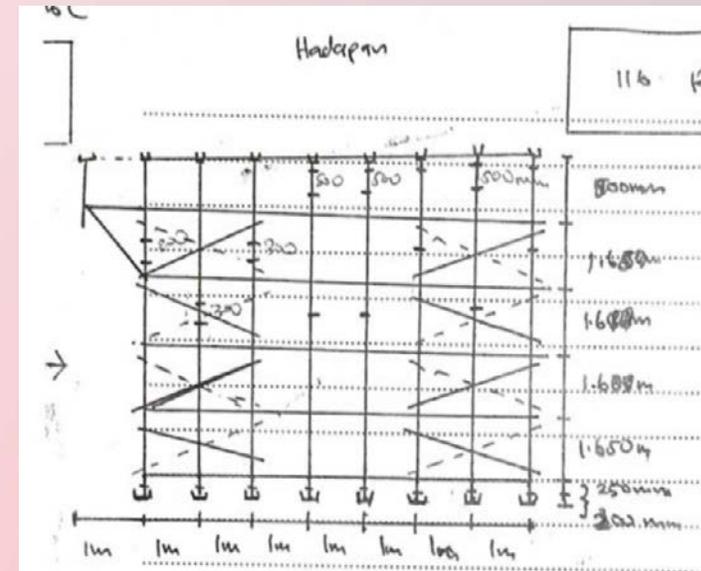


Some good practices...

- **Design procedures:** the need for clarity of brief, design information (in drawings, etc.) and adequate checking



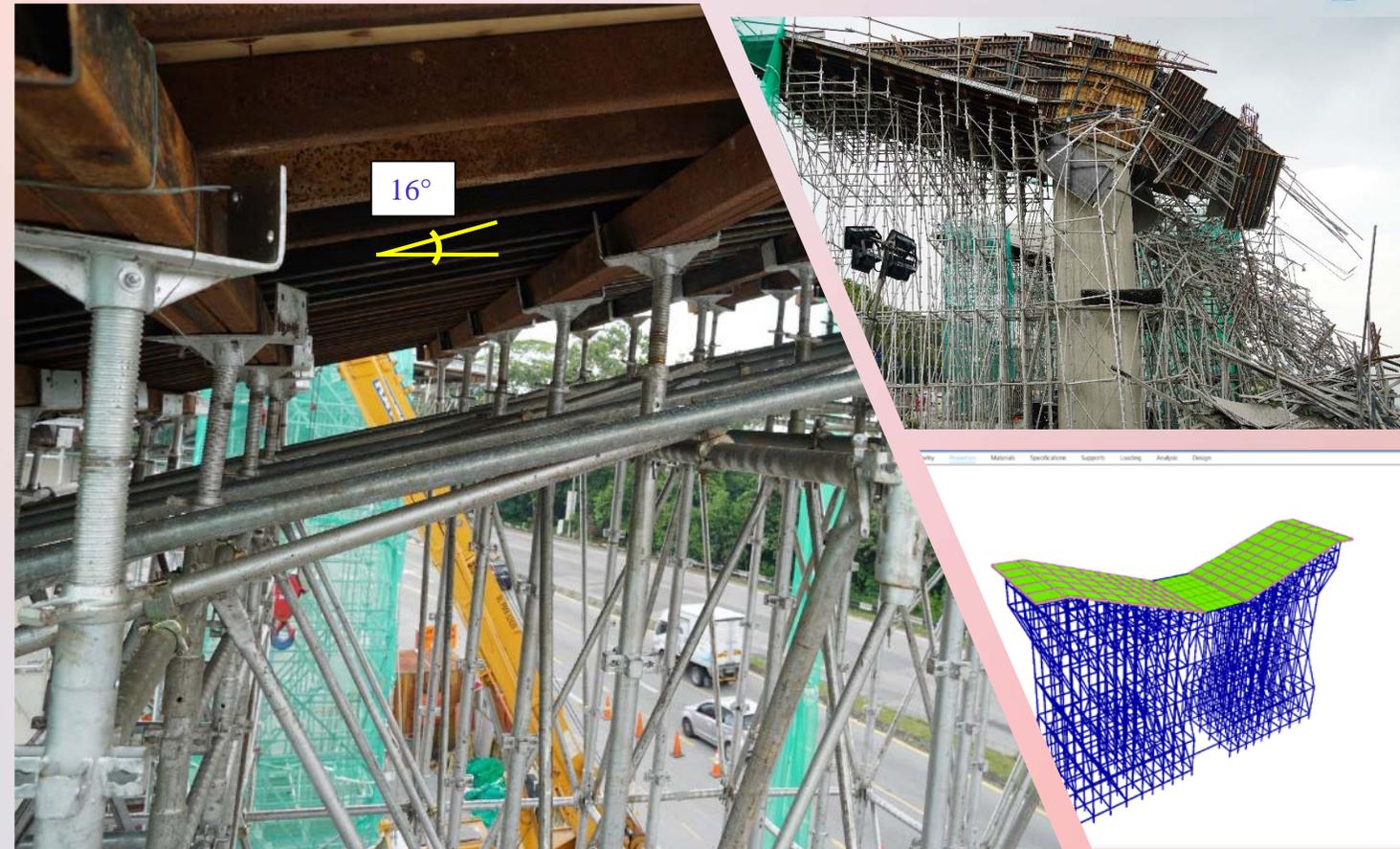
**Geometri Lukisan tipikal
(Typical drawing)**



Geometri Binaan

Some good practices...

- **Lateral stability:**
- a crucial aspect of most falsework structures and a key example of where coordination between permanent and temporary works is needed





Some good practices...

- Site & material inspection by PEPC – soil conditions

Tube

Sleeve coupler



1. Most of best practices are common sense



OSH Duties for Construction Project Team

- gazzetted as Act A1648 – OSHA (AMENDMENT) 2022
- will be enforced in 2023
- [Akta A1648 2022](#)



Duty of Principal (Project Owner)

18A. (1) ... mengambil apa-apa langkah sebagaimana yg perlu utk memastikan keselamatan & kesihatan—

- (a) ... kontraktor ...;
- (b) ... subkontraktor atau subkontraktor tidak langsung ...; dan
- (c) ... pekerja apabila sedang bekerja.

“**prinsipal**” ertinya ... org yg ...
**membuat kontrak dgn ...
kontraktor** utk pelaksanaan ...
kerja yg diusahakan oleh prinsipal
itu.

“**kontraktor**” ertinya ... orang
yang membuat kontrak dengan ...
prinsipal untuk menjalankan ...
kerja yang diusahakan oleh
prinsipal itu

“**subkontraktor**” ertinya ...
orang yg membuat kontrak
dgn ... kontraktor bagi
pelaksanaan ... kerja yg
diusahakan oleh kontraktor
itu bagi prinsipalnya
dan termasuklah ... org yg
membuat kontrak dgn
subkontraktor



Reg. 24 of Registration of Engineers Regulations

A registered person shall

- (a) discharge his professional duties with due **skill, care, diligence & good faith;**
- (b) at all times hold paramount the **safety, health & interest of the public**

Safety in Design *- protecting safety of people*

SECOND SCHEDULE [Rule 28] PART ONE

CODE OF CONDUCT FOR ARCHITECTS [Subrule 28(1)]

Objective of Code.

1. The objective of the Code of Conduct is to promote the standard of professional conduct and self discipline required of Architects **in the interest of the public.**



Duty holders to carry out risk assessment

18B. (1) ... hendaklah menjalankan pentaksiran risiko KKP yang terdedah kepada ... orang yang mungkin terjejas dengan pengusahaannya di tempat kerja.

(2) ... hendaklah melaksanakan kawalan untuk menghapus atau mengurangkan risiko KKP.

“pentaksiran risiko” ertinya proses membuat penilaian risiko KKP ... dan menentukan langkah-langkah kawalan risiko.

Penalti ... didenda tidak melebihi RM 500 ribu atau dipenjarakan selama tempoh tidak melebihi 2 tahun atau kedua-duanya



- 1. Most of best practices are common sense*
- 2. Common sense should become common practice, or else it becomes (LEGAL) DUTIES*

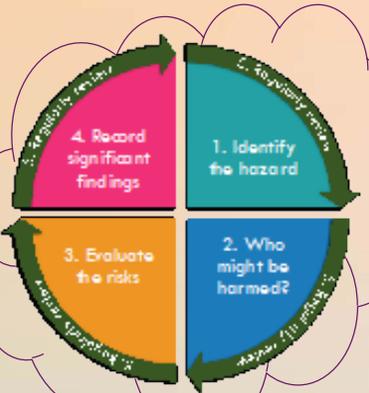


Project OSH risk assessment process

- Who is involved?
 - Client, designer, principal designer, principal contractor, contractor
 - a systematic management approach from 'cradle' to 'grave'
 - **foreseeable hazards**, risk information & risk control - general principles of prevention
- What are the objectives?
 - Protect OSH of people in construction, maintenance, cleaning, etc., and others who may be affected by their activities;
 - Reduce risks by '**safe design**' during construction and throughout the life cycle of the structure;
 - **Safe design** means the integration of control measures early in the design process to **eliminate** or, if this is not practicable, **reduce or control** risks to safety and health throughout the life of the structure being designed.



Project OSH risk assessment process



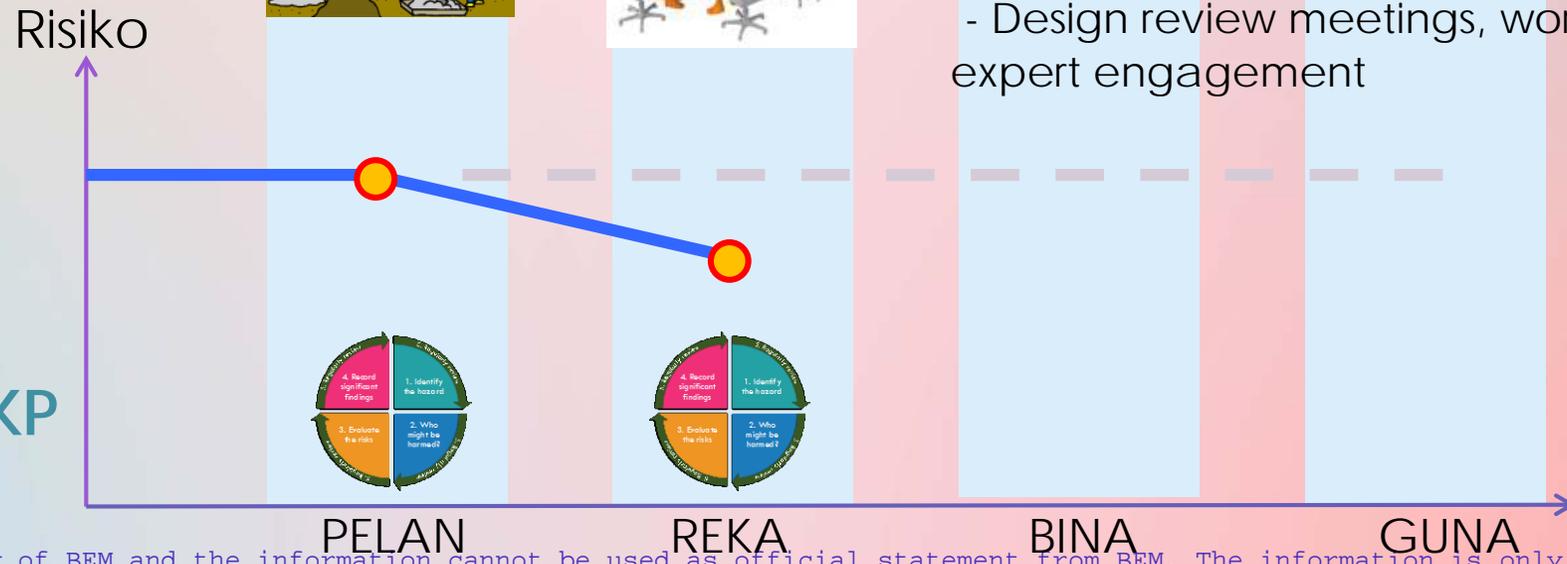
Client & Designer:

- Identify foreseeable design risks
- Eliminate or reduce them

All involved in project:

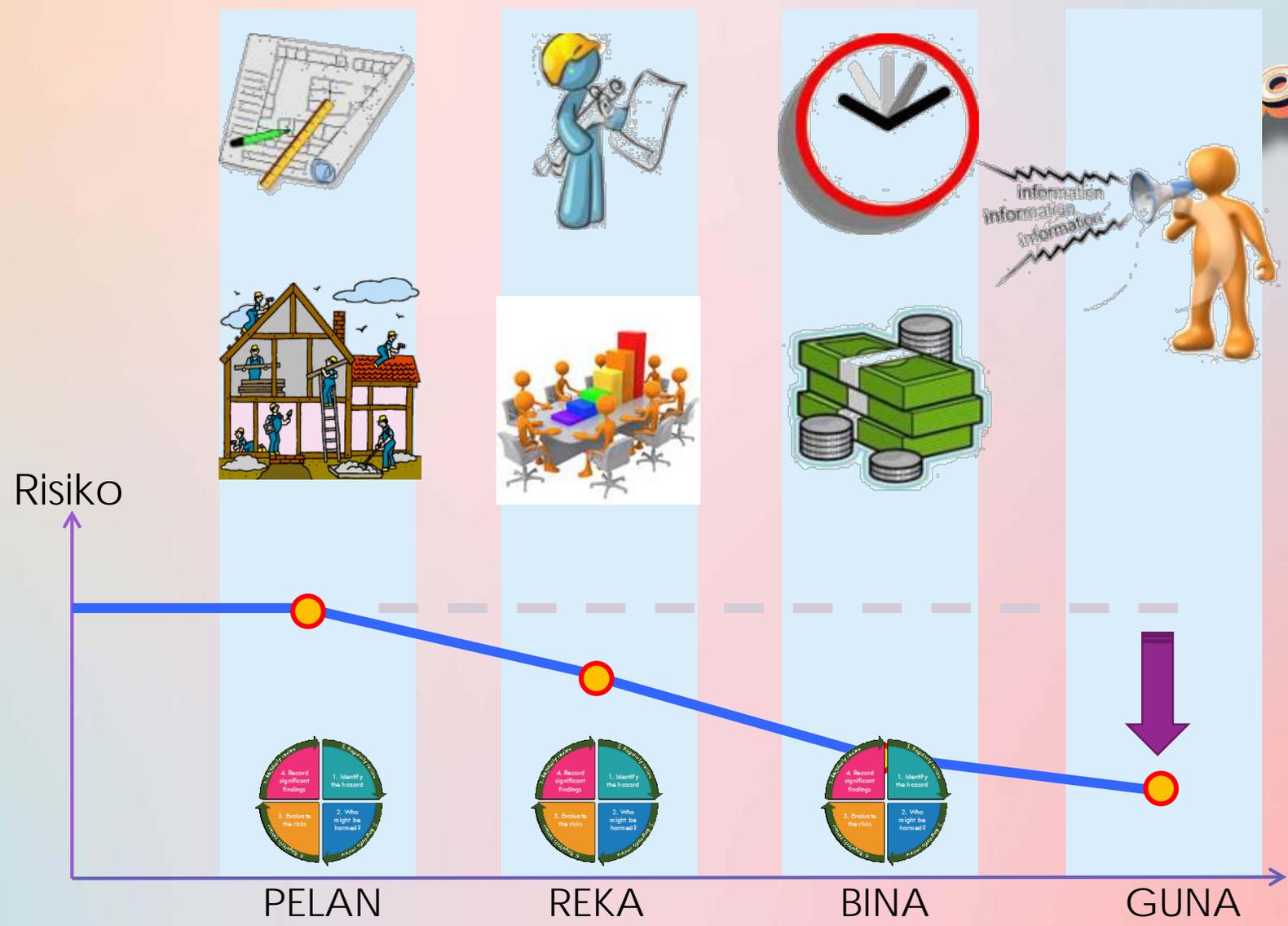
- Collectively review design & further eliminate or reduce any foreseeable design risks
 - Design review meetings, workshops, lit. review, expert engagement

OSHCIM ialah bekerjasama mengurus risiko KKP projek seawal mungkin



Project OSH risk assessment process

Pasukan projek bersama fokus dlm menghapuskan hazard & mengurangkan risiko kpd pekerja & persekitaran pekerjaan



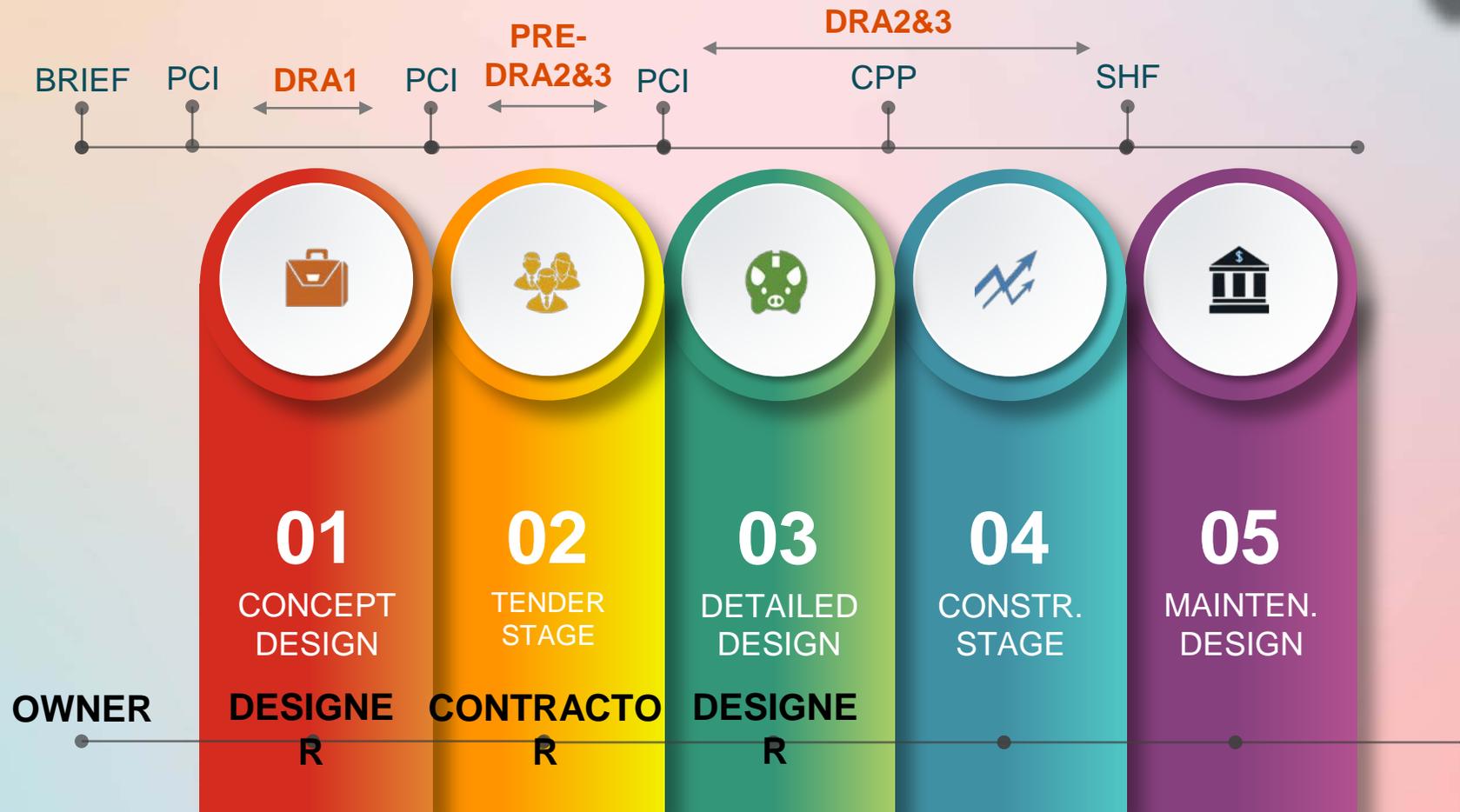


Project OSH risk assessment process conventional





Project OSH risk assessment process design & build





General Principles of Prevention

- will be introduced with Risk Assessment Regulations
- will be enforced with A1648



#1

Avoiding risks by asking if you can get rid of the problem (or hazard) altogether.

- *Move air conditioning plant on a roof to ground level, so that work at height is not required for either installation or maintenance.*
- Position a door away from a traffic route.
- *Design a roof with a high parapet to eliminate the risk of falls.*



#2

Evaluating the risks that cannot be avoided. Assess unavoidable risks so that control measures may be implemented to reduce risks to an acceptable level.

- *Work out whether the effort and expense of installing a fixed access system is appropriate if an area is only occasionally reached and the work can be done using a MEWP.*



2

Evaluating the risks

that cannot be avoided.

Assess unavoidable risks so that control measures may be implemented to reduce risks to an acceptable level.



#3

Combating the risks at source. Better to design out or minimize risks where practicable rather than leave them to be dealt with on site.

- Arrange for services to be isolated and diverted to where they will be away from the work area.

#4

Adapting the work to the individual, esp. design of workplaces, type of work equipment & choice of working & production methods, with a view, in particular, to reducing the health effects of monotonous work and work at a predetermined rate.

- *Provide workstations at an appropriate height.*
- *Position lighting so it can be accessed easily for maintenance*, such as by positioning bulkhead lights on landings and not halfway down staircases.





#5

Adapting to technical progress: consider new techniques or technologies. To maintain pace with technical progress in safety.

- *Specify self-cleaning glass.*
- *Prefabricate elements off site.*



#6

Replacing the dangerous with the non-dangerous or the less dangerous.

- *Switch to using a paving block that is lighter in weight.*
- *Substitute solvent-based products with water-based equivalents.*
- *Recycle tyre kerbs instead of using heavy concrete ones.*



#7

Developing a coherent overall **prevention policy** which covers technology, systems of work, organisation of work, working conditions, social relationships & the influence of factors relating to the working environment.

Set standards.

- *Specify that all blocks should be cut using block splitter techniques rather than mechanical cutting, which produces large amounts of harmful silica dust.*



#8

Giving **collective protective measures** priority over individual protective measures, and making provisions so that the work can be organised to reduce exposure to hazards.

- *Make provision for traffic routes so that barriers can be provided between pedestrians and traffic.*
- *Provide fixed edge protection (barriers) rather than running lines.*



#9

Giving **appropriate instructions** for workers.
Give workers appropriate information, instruction, training & supervision

- *Provide information on drawings or instructions, such as intended sequencing, hazards during any future cleaning, maintenance, alteration & demolition.*



More Good Practices...



RED, AMBER, GREEN (RAG) LISTS

Red Lists	Hazardous procedures, products and processes that should be eliminated from the project where possible.
	<ol style="list-style-type: none"><li data-bbox="333 491 2390 536">1. Lack of adequate pre-construction information (eg. asbestos surveys, details of geology, obstructions, services, ground contamination etc.). (DRA1)<li data-bbox="333 539 1116 585">2. Hand-scabbling of concrete (eg. 'stop ends'). (DRA2)<li data-bbox="333 588 2007 634">3. Demolition by hand-held breakers of the top sections of concrete piles (pile cropping techniques are available). (DRA3)<li data-bbox="333 636 1268 682">4. Specification of fragile roof lights & roofing assemblies. (DRA2)<li data-bbox="333 685 1684 731">5. Processes giving rise to large quantities of dust (eg. dry cutting, blasting etc.). (DRA2 & DRA3)<li data-bbox="333 733 1166 779">6. On-site spraying of harmful substances. (DRA2 & DRA3)<li data-bbox="333 782 1842 828">7. Specification of structural steelwork which is not purposely designed to accommodate safety nets. (DRA2)<li data-bbox="333 831 2193 876">8. Design of roof mounted services that require access (for maintenance etc.), without provision for safe access (eg. barriers). (DRA2)<li data-bbox="333 879 2379 982">9. Glazing that cannot be accessed safely. All glazing should be anticipated as requiring cleaning replacement, so a safe system of access is essential. (DRA2)<li data-bbox="333 985 2415 1088">10. Entrances, floors, ramps, stairs & escalators not specifically designed to avoid slips and trips during use & maintenance, including taking into account the effect of rain water & spillages. (DRA2)<li data-bbox="333 1090 2440 1193">11. Design of environments involving adverse lighting, noise, vibration, temperature, wetness, humidity & draughts or chemical and/or biological conditions during use & maintenance operations. (DRA2)<li data-bbox="333 1196 1600 1242">12. Designs of structures that do not allow for fire containment during construction. (DRA2)

RED, AMBER, GREEN (RAG) LISTS

Lack of adequate pre-construction information (DRA1)

- geotechnical & contaminated land surveys
- existing services locations (private & public)
- structural/ building safety reports
- survey reports for hazardous materials (eg lead, asbestos)
- survey reports for hazardous areas (eg confined spaces)
- survey reports for hazardous locations (eg fragile roof access)
- site access & other restrictions
- local environmental conditions & adjacent land uses
- neighbours (eg schools, petrol stations, supermarkets & major roadways)
- for occupied sites, proposed site rules (eg existing PTW systems)
- proximity to watercourses, transport systems, etc
- any history of previous damage (eg from fire or flood)
- other site history



RED, AMBER, GREEN (RAG) LISTS



Hazardous procedures, products and processes that should be eliminated from the project where possible.

1. Hand-scabbling of concrete (eg. 'stop ends'). **(DRA2)**
2. Processes giving rise to large quantities of dust **(DRA2 & DRA3)**

Entrances, floors, ramps, stairs & escalators not specifically designed to avoid slips and trips during use & maintenance, including taking into account the effect of rain water & spillages. **(DRA2)**



RED, AMBER, GREEN (RAG) LISTS

1. Demolition by hand-held breakers of the top sections of concrete piles (pile cropping techniques are available). **(DRA3)**
2. On-site spraying of harmful substances. **(DRA2 & DRA3)**
3. Processes giving rise to large quantities of dust **(DRA2 & DRA3)**



RED, AMBER, GREEN (RAG) LISTS

1. Specification of structural steelwork which is not purposely designed to accommodate safety nets. **(DRA2)**
2. Encourage the use of engineering controls (collective protection) to minimise the use of PPE. **(DRA3)**



Specification of fragile roof lights & roofing assemblies. **(DRA2)**

Glazing that cannot be accessed safely. All glazing should be anticipated as requiring cleaning replacement, so a safe system of access is essential. **(DRA2)**

Design of roof mounted services that require access (for maintenance etc.), without provision for safe access (eg. barriers). **(DRA2)**

RED, AMBER, GREEN (RAG) LISTS

RED, AMBER, GREEN (RAG) LISTS



Amber Lists	Products, processes and procedures to be eliminated or reduced as far as possible and only specified or allowed if unavoidable. Including amber items would always lead to the provision of information to PC.
	<ol style="list-style-type: none">1. Internal manholes & inspection chambers in circulation areas. (DRA2)2. External manholes in heavily used vehicle access zones. (DRA2)3. Specification of 'lip' details (such as trip hazards) at the tops of pre-cast concrete staircases. (DRA2)4. Specification of small steps (such as risers) in external paved areas. (DRA2)5. Specification of heavy building blocks (such as those weighing > 20 kgs). (DRA2)6. Large & heavy glass panels. (DRA2)7. Chasing out concrete, brick or blockwork walls or floors for the installation of services. (DRA2)8. Specification of heavy lintels. (Slim metal or hollow concrete lintels are better alternatives.) (DRA2)9. Specification of solvent-based paints & thinners, or isocyanates, esp. for use in confined areas. (DRA2)10. Specification of curtain wall or panel systems without provision for tying or raking scaffolds. (DRA2)11. Specification of a blockwork wall > 3.5 metres high using retarded mortar mixes. (DRA2)12. Site traffic routes that do not allow for one-way systems and/or vehicular traffic segregated from site personnel. (DRA2 & DRA3)13. Site layout that does not allow adequate room for delivery and/or storage of materials, including site-specific components. (DRA3)14. Heavy construction components which cannot be handled using mechanical lifting devices (because of access restrictions/floor loading and so on). (DRA2 & DRA3)15. On-site welding, in particular for new structures. (DRA2 & DRA3)16. Use of large piling rigs & cranes near live railways and overhead electric power lines or where proximity to obstructions prevents guarding of rigs. (DRA1 & DRA3)



1. Specification of heavy building blocks (such as those weighing > 20 kgs).
(DRA2)
2. Large & heavy glass panels. **(DRA2)**

1. Internal manholes & inspection chambers in circulation areas. **(DRA2)**
2. External manholes in heavily used vehicle access zones. **(DRA2)**

RED, AMBER, GREEN (RAG) LISTS

Including amber items would **always lead to the provision of information to PC.**



RED, AMBER, GREEN (RAG) LISTS

1. Site layout that does not allow adequate room for delivery and/or storage of materials, including site-specific components. **(DRA3)**
2. Heavy construction components which cannot be handled using mechanical lifting devices (because of access restrictions/floor loading and so on). **(DRA2 & DRA3)**
3. On-site welding, in particular for new structures. **(DRA2 & DRA3)**



Specification of curtain wall or panel systems without provision for tying or raking scaffolds. **(DRA2)**

Chasing out concrete, brick or blockwork walls or floors for the installation of services. **(DRA2)**

Including amber items would **always lead to the provision of information to PC.**

RED, AMBER, GREEN (RAG) LISTS



RED, AMBER, **GREEN** (RAG) LISTS

Green Lists	Products, processes and procedures to be positively encouraged.
	<ol style="list-style-type: none">1. Adequate access for construction vehicles to minimise reversing requirements (one-way systems & turning radii). (DRA2 & DRA3)2. Provision of adequate access & headroom for maintenance in plant room, & adequate provision for replacing heavy components. (DRA2)3. Thoughtful location of mechanical & electrical equipment, light fittings, security devices etc. to facilitate access, & placed away from crowded areas. (DRA2)4. Specification of concrete products with pre-cast fixings to avoid drilling. (DRA2)5. Specification of half board sizes for plasterboard sheets to make handling easier. (DRA2)6. Early installation of permanent means of access, & prefabricated staircases with hand rails. (DRA2 & DRA3)7. Provision of edge protection at permanent works where there is a foreseeable risk of falls after handover. (DRA2 & DRA3)8. Practical & safe methods of window cleaning (such as from the inside). (DRA2)9. Appointment of a temporary works co-ordinator (BS 5975). (DRA3)10. Off-site timber treatment if PPA- & CCA-based preservatives are used (boron or copper salts can be used for cut ends on site). (DRA2 & DRA3)11. Off-site fabrication & prefabricated elements to minimise on site hazards. (DRA2)12. Encourage the use of engineering controls (collective protection) to minimise the use of PPE. (DRA3)



RED, AMBER, **GREEN** (RAG) LISTS

Products, processes and procedures to be positively encouraged

Provision of adequate access & headroom for maintenance & for replacing heavy components. **(DRA2)**

Adequate access for construction vehicles to minimise reversing requirements. **(DRA2 & DRA3)**

Provision of edge protection at permanent works where there is a foreseeable risk of falls after handover. **(DRA2)**



RED, AMBER, **GREEN** (RAG) LISTS

Products, processes and procedures to be positively encouraged

Practical & safe methods of window cleaning (such as from the inside). **(DRA2)**

1. Off-site fabrication & prefabricated elements to minimise on site hazards. **(DRA2)**
2. Encourage the use of engineering controls (collective protection) to minimise the use of PPE. **(DRA3)**



- 1. Most of best practices are common sense*
- 2. Common sense should become common practice, or else it becomes (LEGAL) DUTIES*
- 3. Good practices in design is not that complex*



THANK YOU



Committed to Engineering Excellence

BOARD OF ENGINEERS MALAYSIA

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