

IEM

The Institution of Engineers, Malaysia



Federation of Engineering Institutions
of Asia and the Pacific (FEIAP)

How to improve the Safety of Temporary Works in Construction

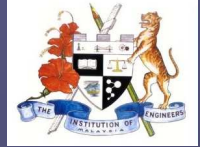


MYANMAR ENGINEERING SOCIETY (MES)

အင်ဂျင်နီယာစွမ်းအား ပြည်ထွန်းကား

Presented by:
Ir. Tan Yean Chin
President of IEM
Secretary General of FEIAP

13 Jan 2017



Contents

- What is Temporary Works
- Case Histories of Temporary Works Failures
- Legislations and policy guidelines
- BEM Position Paper on Responsibility and Accountability of Stakeholders in Construction Industry
- Role and Responsibility of Professional Engineer for Temporary Works in Construction
- Conclusions



What is building failure ?

“ behaviour not in agreement with the expected condition of stability, or as lacking freedom from necessary repair, or non-compliance with the desired use and occupancy of the structure “

Ir Dr Judin Abd Karim paper on Building failure - 1996



Responsibility of Failures

Hammurabi Code of 1950 BC

“ If a contractor builds a house for a man and does not build it strong enough, and the house which he builds collapse and causes the death of the house owner, then the contractor shall be put to death “

From : Ir Dr Judin Abd Karim's
paper on Building failure - 1996



Temporary Works in Construction

In the construction industry, the process and constructions involved in erecting the Permanent Works at site are classified as Temporary Works.

Norm has it that the Contractor is responsible for the construction of Temporary Works.



Case Histories of Temporary Works Failures

From Newspaper Cutting

3.7.2014 (Pudu Underpass)



① An aerial view of the sinkholes at the Jalan Pudu-Jalan Imbi intersection.

② Ongoing construction of the tunnel is believed to be the cause of the road to collapse.

③ Local authorities and government agencies at the site assessing the situation and controlling traffic.

④ Traffic has been diverted following the collapse of the tunnel.

– Photo by MUHAMAD SHAHRIL ROSLI and GLENN GUAN



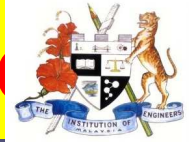
Rush hour chaos: One of the two sinkholes that appeared at the Jalan Pudu–Jalan Imbi intersection yesterday, disrupting traffic flow. – Photo by MUHAMAD SHAHRIL

The day the earth moved

Ongoing construction work on part of the Pudu Underpass project has caused the road above the tunnel to collapse leaving large holes at the intersection.

2 & 3

20.8.2014 (MRT Viaduct Deck toppled)



6 **NATION** The Star, WEDNESDAY 20 AUGUST 2014

Breach in work procedures

Initial probe shows safety regulations were not observed

By **NURBAITI HAMDAN**
and **D. KANYAKUMARI**
newsdesk@thestar.com.my

PETALING JAYA: Initial inquiry into the fatal worksite accident that killed three workers at Sungai Buloh suggests that there has been a breach of safe work procedure, said the project owner, Mass Rapid Transit Corporation Sdn Bhd (MRT Corp).

According to MRT Corp CEO Datuk Wira Azhar Abdul Hamid, upon talking to some workers at the site, there are indications that certain quarters had disregarded safety regulations.

"We are, however, still investigating as this site is under the jurisdiction of our subcontractor, Syarikat Muhibbah Perniagaan dan Pembinaan Sdn Bhd, and the exact details will be disclosed as soon as the investigations are completed," he said during a press conference at the MRT site located on land that used to belong to the Rubber Research Institute of Malaysia along Jalan Sungai Buloh, just across Kota Damansara.

Azhar said MRT Corp had always emphasised on safety to the point where its contractors often retort the organisation was "overdoing it", and that MRT Corp's requirement "wasn't a norm in the industry".

To that, Azhar argued that having workers die was "not the norm" either, and added that he would see through the investigations and ensure the deceased and their families get the justice they deserve.

Three Bangladeshi workers were killed when a concrete span weigh-

Recovery exercise: A crane being used to lift the concrete span as workers clear the debris to recover the bodies of the three Bangladesh workers.



ing 650 tonnes at the site collapsed at 8.30pm, pining them underneath.

The incident occurred while work to construct the parapet for the guideway, made up of 14 units of segmented box girders, was being carried out.

"We have spoken to the Bangladeshi High Commission and told them the bodies will be sent home as soon as the paperwork is done.

"For now, we have informed the families and told them to make the necessary arrangements to receive the bodies," he said.

The bodies of Mohammad Elahi Hossain, 27, Mohamad Faruk Khan,

38, and Mohammad Alauddin Mollik, 34, were all recovered yesterday.

Azhar said he did not wish to speculate how and why the workers were unable to escape in time.

"There is a lot of verification to be done and it might take as long as two weeks for all the details to be finalised," he said.

Operations at the site has been stopped and can only commence when authorities are satisfied with the safety standards on the site.

Bernama reported that Prime Minister Datuk Seri Najib Tun Razak has called for a full investigation into the incident.

"Shocked and saddened to about the MRT site accident, investigation must be carried immediately to ensure this happens again," he said in a TV post.

The last high profile accident involving the MRT was on June 24, a metal sheet pile being lifted at Dandar Damansara site fell moving car.

Though no one was hurt in incident, MRT Corp sacked the contractor and staff responsible other than barring the subcontractor from bidding for future MRT tracts.

CEO resigns over fatal MRT site accident

PETALING JAYA: In an unprecedented move, Mass Rapid Transit Corporation Sdn Bhd (MRT Corp) CEO

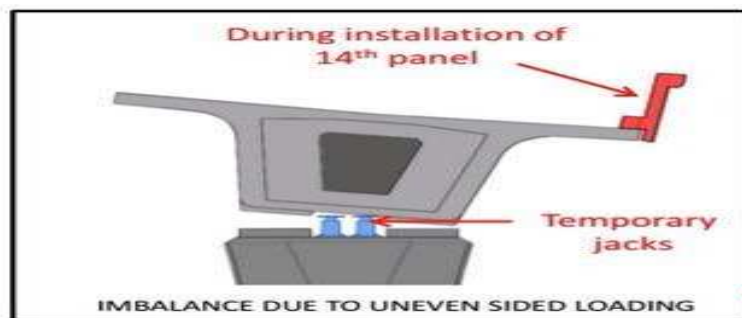
Azhar was appointed as the CEO on Sept 1, 2011, following the Government's decision to set up the

commission, he also served as chairman of the Malaysian Palm Oil Association, sits on the board of the Malaysian Palm Oil Board, and the Malaysian

his exit, he would continue through this case so that the fate of the deceased workers obtain



HOW IT HAPPENED?

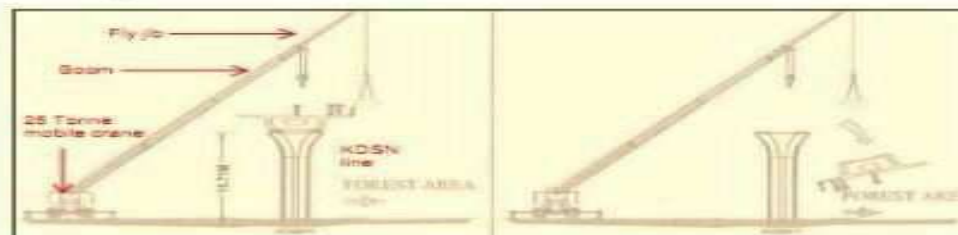


1. No shims
2. Sitting on a temporary jack
3. Parapet installation on one side

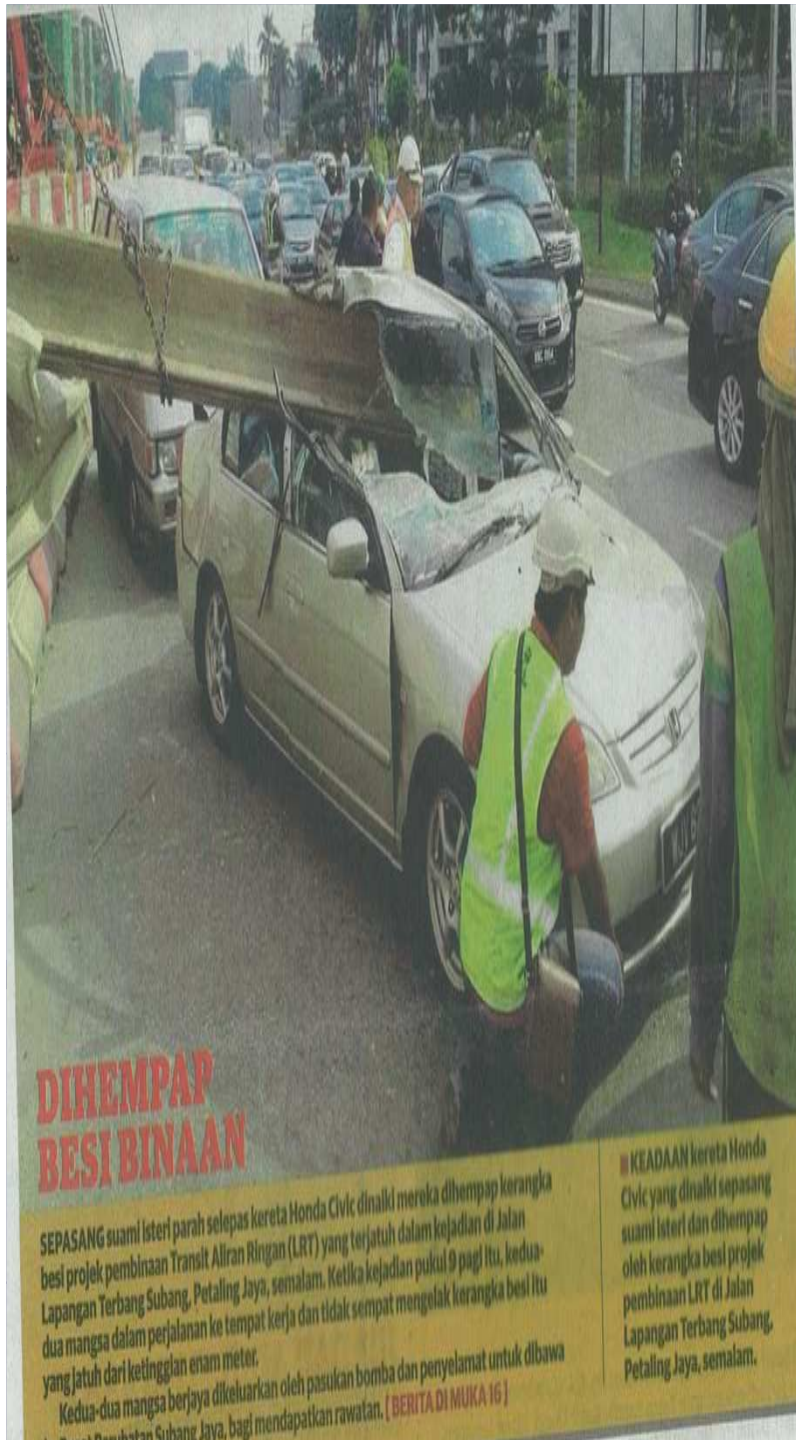


WHAT HAPPENED?

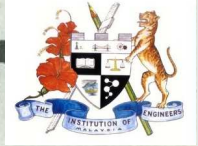
A SINGLE TRACK VIADUCT DECK UNDER CONSTRUCTION TOPPLED AND LANDED ON GROUND.



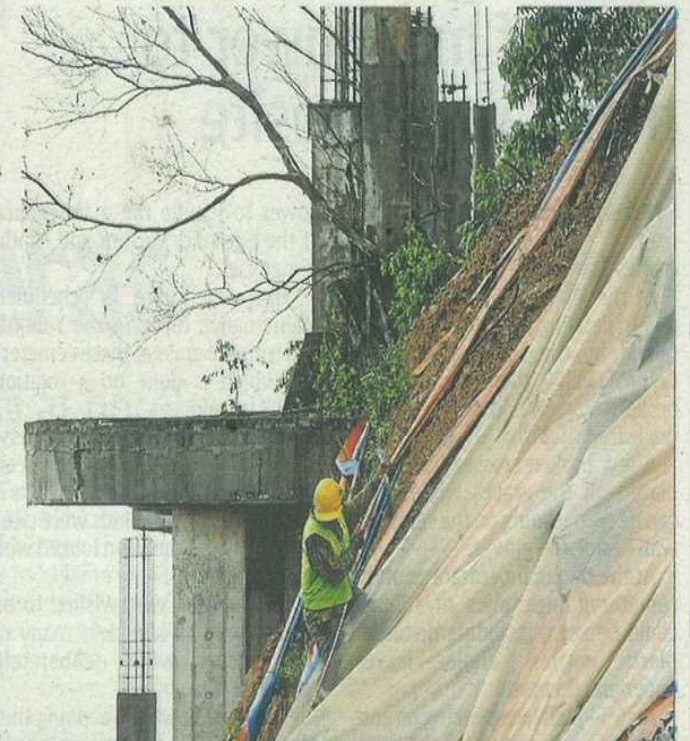
27.6.2014



Slope responsibility of landowner



Otherwise work in Bukit Gasing may cost council RM50mil, says MBPJ



For safety of residents: MBPJ has embarked on hill strengthening works in Jalan 5/64. The project should be completed within eight months.

By SHEILA SRI PRIYA
sheilasripriya@thestar.com.my
Photos by SAM THAM

THE Petaling Jaya City Council may have to spend RM50mil to strengthen several hillslopes in Bukit Gasing if the individual landowners fail to fulfil their responsibility.

Councillor Derek Fernandez pointed out the owners were legally

responsible to ensure their land was well maintained.

"There are about 37 plots of land here.

"The state should seize the land of irresponsible owners if they fail to look after the slopes on their properties," he said during a visit to Jalan 5/64 in Section 5, Petaling Jaya.

MBPJ has appointed contractors to strengthen two hill slopes in Jalan

5/64 and Jalan 5/66 following several landslides and soil erosion in the areas.

It is estimated that the works will cost RM4.5mil and RM8mil respectively.

The hill strengthening work in Jalan 5/64 will be completed by June next year.

Meanwhile, the council has banned all major development, termed Class Three and Four, in the

neighbourhood to prevent further soil erosion and landslides.

A landslide on May 5 in Jalan 5/64 uprooted trees, damaged several cars and cut off access to the area.

Bukit Gasing assemblyman Rajiv Rishyakaran commended the council for taking the action.

He said level the

"MBPJ should not have to strengthen these hillslopes using public funds.

"However, it is necessary to ensure the safety of those living and visiting the Bukit Gasing recreational area," he said.

21.10.2013

Two Indonesian workers crushed to death at JB

JOHOR BARU: Two Indonesian workers were crushed to death when a slab of wet cement floor collapsed on them at a supermarket construction site at Taman Gaya, Ulu Tiram here.

Known only as Asmawi, 27, and Aripin, 24, they were working on a cracked cemented floor at about 3.30pm on Saturday when tragedy struck.

Johor Baru South OCPD Asst Comm Zainuddin Yaacob said the site supervisor had instructed the two workers to repair a cracked beam on the first floor of the building.

"While repairing the crack, the wet concrete ceiling above the beam collapsed on top of them," he said, adding that they died at the scene of the incident.

Johor Fire and Rescue Department (operations) deputy assistant director Mohd Rizal Buang said a team of 24 firemen rushed to the scene after receiving a distress call at about 3.50pm.

"We had to use a crane and an excavator to retrieve the bodies which were trapped in a stack of



Deadly development: Fire Department personnel inspecting the scene of the deadly collapse in Ulu Tiram, Johor.

hardening cement.

"It took us almost six hours to find Asmawi's body among the huge pile of cement and another 10 minutes to free the body from the dried

cement stack," he said.

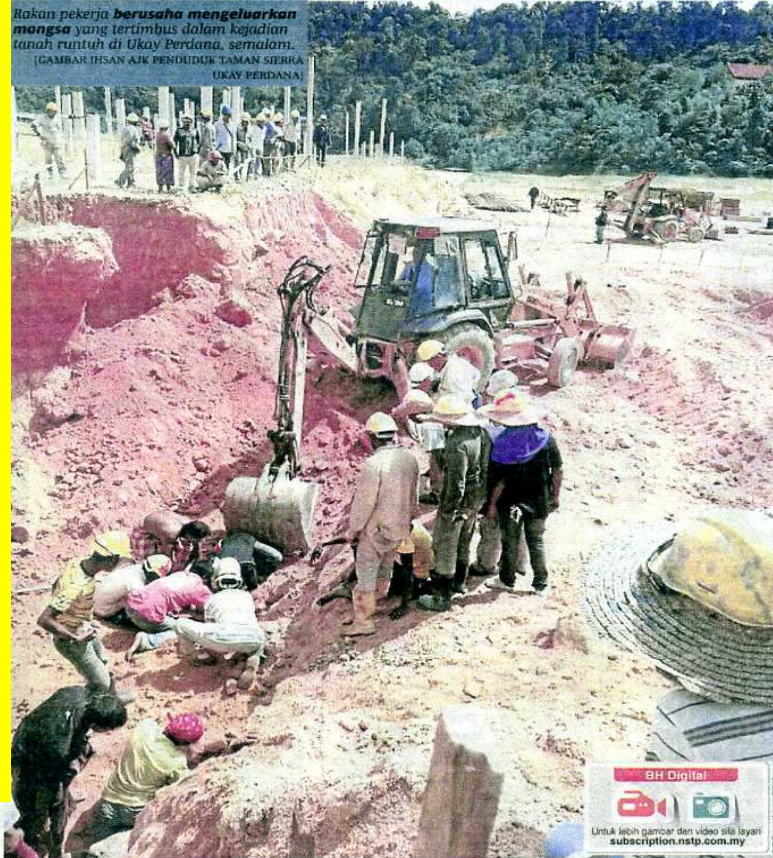
He said that Aripin's body was only found at about 12.50am and it took the firemen another hour to retrieve the body.

The department is investigating the cause of the incident while the victims' bodies had been sent to the Sultanah Aminah Hospital for a post-mortem.

3.7.2013
(Temporary
Excavation
causing 3
deaths)

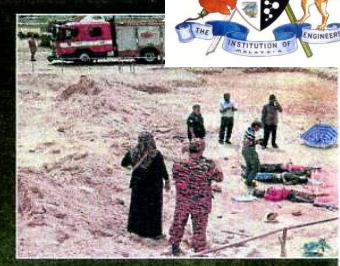


Rakan pekerja berusaha mengeluarkan mangsa yang tertimbus dalam kejadian tanah runtuh di Ukay Perdana, semalam.
[GAMBAR IHSAN AJK PENDUDUK TAMAN SIERRA UKAY PERDANA]



Kronologi Tanah Runtuh

⌚ 11.25 pagi: kejadian tanah runtuh
⌚ 11.29 pagi: Jabatan Bomba dan Penyelamat menerima maklumat kejadian
⌚ 11.35 pagi: seorang mangsa berjaya diselamatkan oleh rakan sekerjanya
⌚ 11.50 pagi: jentera



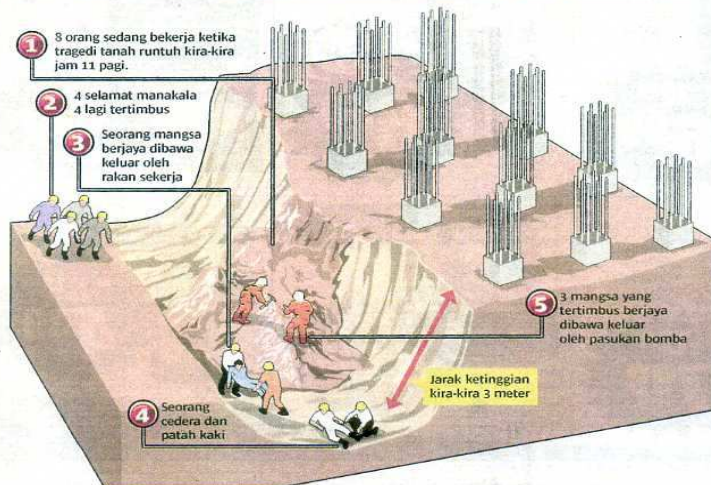
Tiga buruh asing maut tertimbus

» Tebing runtuh ketika mangsa sedang menjalankan kerja penyelenggaraan

Oleh Hardi Effendi Yaacob, Safeek Affendy Razali, Fitri Nizam dan Muhammad Mustakim Ramli
bhnews@mediaprima.com.my

■ Hulu Klang

Tiga pekerja binaan mati tertimbus, manakala seorang lagi cedera dalam kejadian tanah runtuh di sebuah taman perumahan baru di Ukay Perdana.

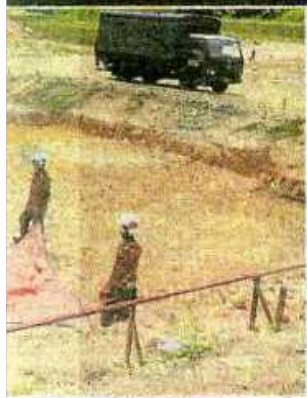


Lokasi kejadian tebing runtuh yang mengorbankan tiga pekerja warga asing di tapak perumahan mewah Taman Sierra Garden, Ukay Perdana, semalam.

'Nasib baik rakan sempat tarik saya'

Ampang: "Saya rasa bumi seperti bergegar sebelum terperosok ke dalam lubang dan ditimbus tanah," kata pekerja warga Myanmar, Zaw Ko Reya, 25, yang terselamat dalam kejadian tanah runtuh di Taman Sierra Ukay, Ukay Perdana, di sini semalam.

Katanya, ketika kejadian dia bersama tujuh rakan senegaranya sedang bekerja di bawah tebing lot perumahan baru itu se-



bomba dari Balai Ampang tiba di lokasi kejadian
 @ 12.30 tengah hari: mayat dua mangsa ditemui tertimbus
 @ 12.40 tengah hari: mayat mangsa ketiga berjaya dikeluarkan
 @ 01.30 petang: operasi dan menyelamat ditamatkan



Antara waris yang hadir **mengenal pasti mayat** tiga pekerja binaan maut di Ukay Sierra, Ukay Perdana.



27.7.2009 (Lorong Gelugor – Basement Excavation)



NEW STRAITS TIMES MONDAY, JULY 27, 2009



There is development on one side of the Lorong Gelugor cave-in, which occurred near the houses with blue roofs. — NST pictures by Ahmad Ibrahim Mohd Noor

Lorong Gelugor caves in

■ By Alang Bendahara
alang@nst.com.my

KUALA LUMPUR: A portion of Lorong Gelugor, near Jalan San Peng, caved in about 6pm on Saturday.

A couple of hours before, some residents of 22 units of Public Works Department (PWD) and City Hall quarters began to leave their homes after noticing cracks widening in the ground.

None was hurt as they came out of their houses.

Most were allowed to return home by midnight except for 18 families.

None of the houses collapsed, although cracks appeared in some of them.

The 18 families were put up at the nearby Phoenix Hotel.

Their accommodation was paid for by the developer of Kenanga Wholesale City, a 19-storey business complex being built in the vicinity.

PWD deputy director-general II Datuk Mohd Noor Yaacob

Stop-work order on next-door developer



Work to clear the site of the cave-in has started.



PWD deputy director-general II Datuk Mohd Noor Yaacob says PWD and City Hall workers living near the cave-in will have to move

into our cars and parked them away from the houses.

"Cracks kept appearing in the road from the time con-



MONDAY JULY 27, 2009

CAVE-IN SCARE

Part of Lorong Gelugor, near Jalan San Peng in Kuala Lumpur, caved in on Saturday forcing the evacuation of residents of 22 units of Public Works Department and City Hall quarters. None of the houses collapsed, although cracks appeared in some of them. Evacuees have been put up at a nearby hotel.

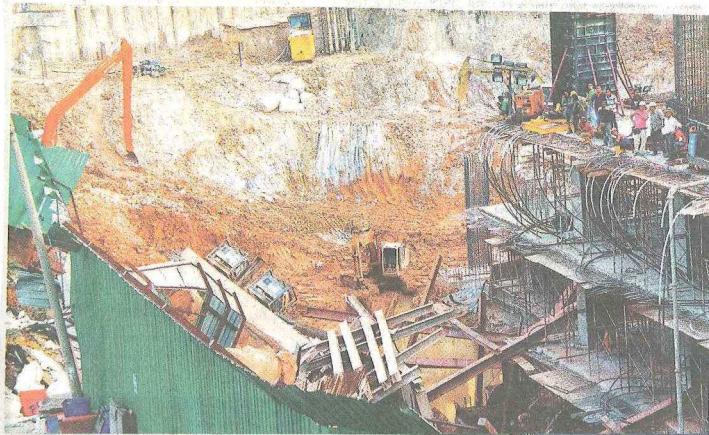
> P10

何清園地陷

驚心大窟窿



一線之危 当局封锁地陷的主要地方，以免有好奇的公众趋前查看而发生意外。



满目疮痍

地陷现场满目疮痍，所幸没有造成人命伤亡。



觸目驚人

地陷的地方部分路段坍塌，让人触目惊心。

■ 相關文見第2版／詳文見全國版

5.6.2013 (Bridge Ramp Falseworks collapse – 1 dead)

REPORTS BY LEE KENG FAY, ADRI DURI ZULKIFLI, KALBANA PERUMBANAYAGAN, MELISSA BRUNY CHOW, PREDEEP NAMBIAR, BALVIN KAIR AND RAHMAN KHANJULIKAL



The collapsed ramp of the second Penang Bridge which buried a car and two motorcycles yesterday evening.

Section of bridge link falls onto Penang expressway and causes massive traffic jam

By CAVINA LIM, IAN MCINTYRE, ANTHONY TAN, ALEX TENG and JOSEPHINE JALLEN
newsdesk@thestar.com.my

GEORGE TOWN: Four people were feared killed when a section of the ramp connecting the Tun Dr Lim Chong Eui Expressway to the second Penang bridge in Batu Maung collapsed.

The section, which fell onto at least one lane of the expressway, was believed to have buried two passing cars and a motorcycle under its debris.

Police said initial information revealed that the four victims in a car were feared dead.

Batik Pulau deputy OCPD Supt Lal Fah Hin confirmed that a car was found smashed.

Penang deputy police chief Senior Asst Comm Datuk Abdul Rahim Jaafar said three people were injured. The incident, which occurred during rush hour at 7pm yesterday, caused a massive traffic jam.

Hundreds of rescue workers, including firemen, voluntary fire-fighters and Civil Defence Department personnel, were removing the rubble.

At press time, a motorcyclist had been pulled out of the rubble. He

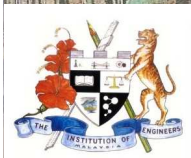


Isnap me for a video on the search and rescue operations

Bridge ramp collapses

Just three months from its official opening, tragedy hit the second Penang bridge when a section of a ramp linking it to an expressway collapsed. It is feared that four people may have been killed.

> See report on Page 4



1 dead, 3 injured

SECOND BRIDGE HORROR: Ramp under construction in Batu Maung, Penang, collapsed at 7.15pm yesterday

- Rescue team finds body in a car, three others feared dead
- Scaffolding gave way during pouring of concrete
- Two foreigners and local woman sent to Penang Hospital

29.5.2009 (Jaya Supermarket Demolition – 7 deaths)

THE STAR, FRIDAY 29 MAY 2009

Reports by RASHITHA A. HAMID, YENG AI CHUN, BEH YEN HUI, M. KUMAR and TAN KARR WEI. Photos by AZAHAR MAHFOF, GLENN GUAN, AHMAD IZZRAFIQ, MOHD FAIHAN and MOHD SAHAR MISNI

Jaya Supermarket collapses



Once an icon: The old Jaya Supermarket building that was once a landmark in Petaling Jaya is now reduced to a rubble after it collapsed at about 5pm yesterday.

Two workers killed, one feared dead, four others still trapped

PETALING JAYA: One of the city's earliest landmarks, Jaya Supermarket, collapsed while demolition work was going on, killing two Indonesian workers.

Two bodies were recovered at 6.44pm and 10.25pm and another worker was feared dead.

Two other workers were pulled out alive at about 5.45pm and 6pm, while four more are still trapped beneath a tangle of steel and rubble after the building collapsed at about 5pm yesterday.

The five-storey portion of the building collapsed right to the basement, where the car park was located. A 10-storey office block at the other end of the building was not affected.

Selangor Fire and Rescue Department director Soiman Jahid said 50 firemen rushed to the scene after receiving a distress call at 5.08pm.

The number of rescue personnel was later increased to about 150 with the police, Civil Defence Department and Petaling Jaya City Council joining in.

The two injured victims, Suriono, 31, and Salleh, 45, were sent to the University Malaya Medical Centre.

Petaling Jaya OCPD Asst Comm Arjunaidi Mohamed said only one body had been identified, that of 28-year-old Maskor.

"The search-and-rescue operation will continue until all workers are accounted for," he told reporters at the site.

The workers were part of the more than 80 crew who were demolishing the building.

The 35-year-old Jaya Shopping Centre, which housed a supermarket and many outlets, was closed on Feb 6, 2008. The new owners of the building planned to demolish and rebuild it on the site.

Selangor Menteri Besar Tan Sri Khalid Ibrahim, urged the public not to go near the area as it would hamper search-and-rescue efforts.

Works Minister Datuk Shaziman Abu Mansor said the Public Works Department is ready to offer assistance in equipment and manpower to help with the search and rescue.

"We are also willing to help investigate why the building collapsed," he said.

When asked if the overloading of machinery on the upper level of the building was the cause of the collapse, he said it could be one possibility but could not say anything until the investigation is completed.

A worker, Andi, who was on the fifth floor of the building, was taking a break with nine others when the incident happened.

"I was sitting when I heard a loud sound. Then, the floor started tilting and we just ran for our lives. We rushed to the other end of the building. We are so lucky to be alive," said the 30-year-old who had been working on the construction site for 20 days.

Rojak seller Faizal Md Yusof, who operates from a van just opposite the building, saw the building shake and collapse.

"I saw six cranes falling down along with the building. I just left my van and ran for my life," he said.

Housing and Local Government Minister Datuk Seri Kong Cho Ha said the Fire and Rescue Department would work together with the police to probe into the cause of the collapse.

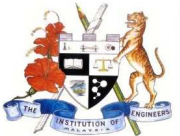
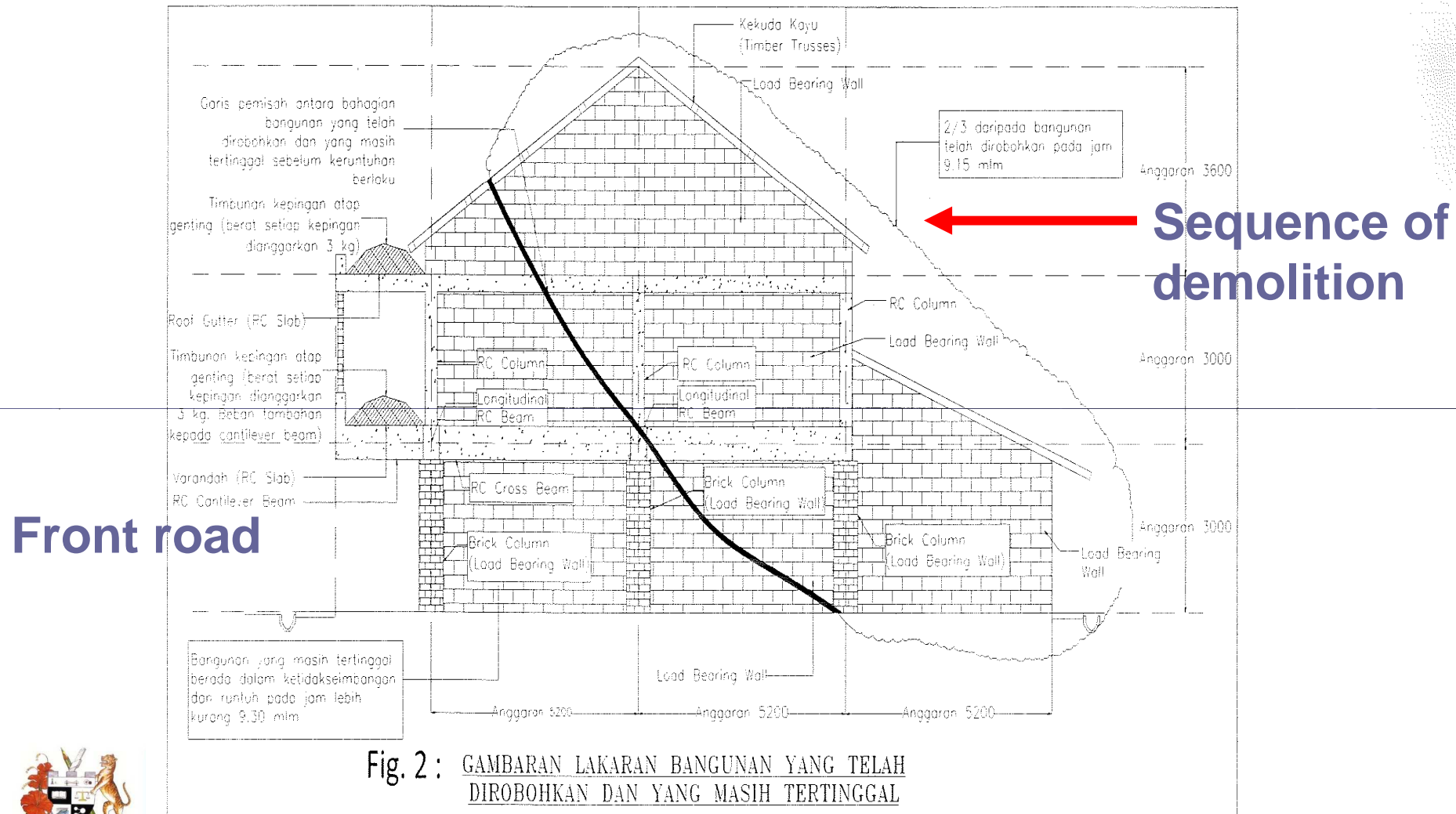
When met at the emergency ward of the hospital, rescued worker, Salleh told Bernama he was trapped in the rubble for more than an hour.

Suffering from a fractured right leg and arm, the father of four, who started work at the project just three days ago, said he was working on the ground floor of a four-storey building when the structure collapsed.

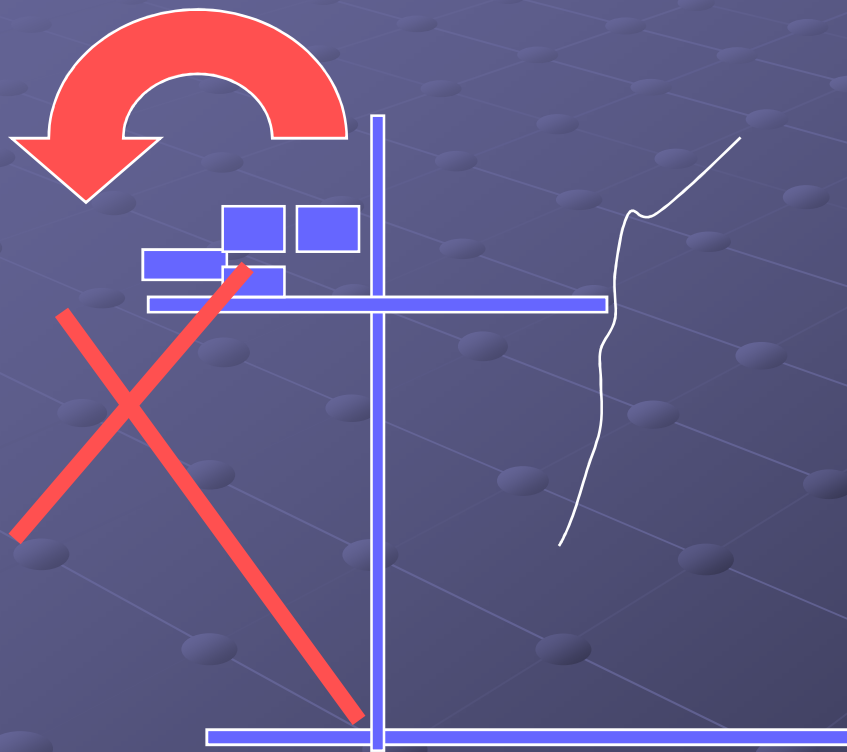
See N34 10
For more pictures



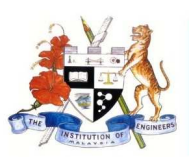
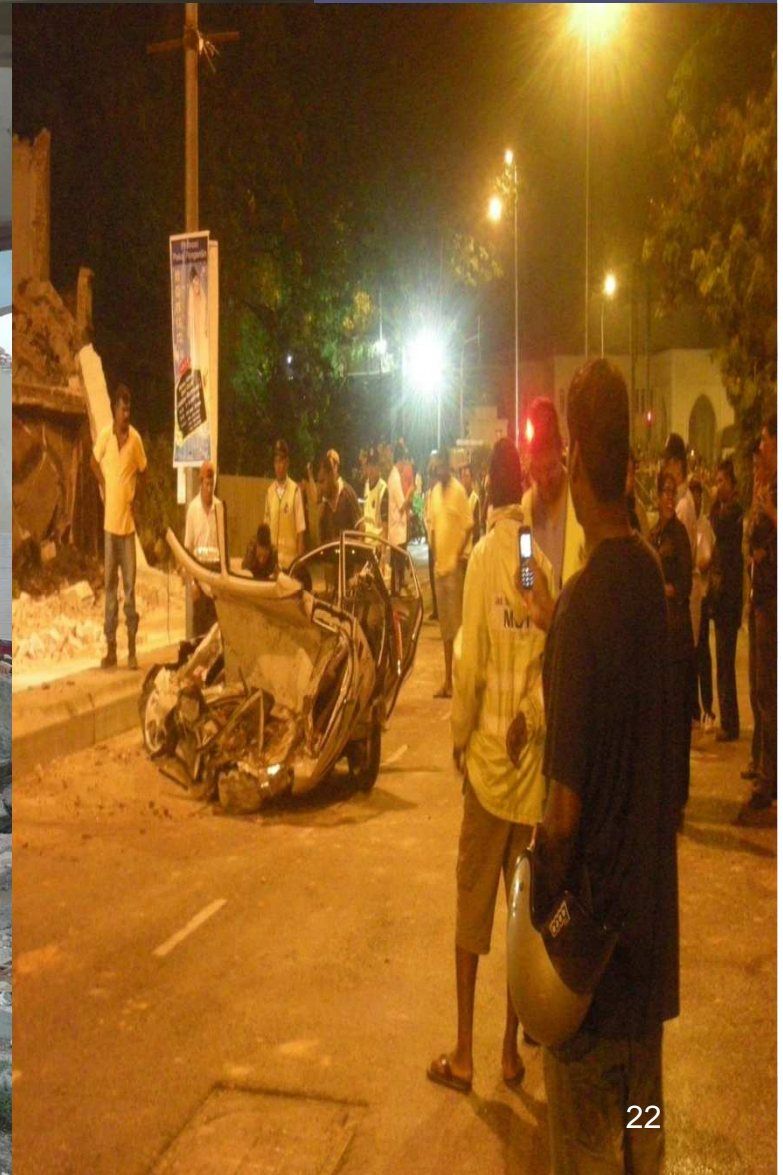
Ipoh shophouse demolition mishap causing 2 deaths of passing by motorists - 2009



Ipoh shophouse – cantelever collapse



Ipoh shophouse demolition mishap causing 2 deaths of passing by motorists - 2009



21.3.2008 (Bridge under construction collapses)



All that remains of the bridge being constructed over Sungai Kilim in Langkawi, Kedah. — NST picture by Hamzah Osman

Bridge under construction collapses

LANGKAWI: A bridge being constructed here to connect Sungai Kilim and Gua Kelawar collapsed suddenly on Wednesday afternoon.

The near 80 per cent complete concrete bridge, which was 40m long and 6m wide, crumbled and sank into Sungai Kilim about 2pm.

The bridge was off-limits to users and no one was hurt in the incident.

Its construction began two years ago, funded by the Langkawi Development Authority (Lada). Losses were estimated at RM200,000.

State Works Committee chairman Datuk Nawawi Ahmad said initial investigations showed that cracks had appeared at the foundation of the bridge two days before it collapsed.

"The design was faulty and materials

used were not according to standards approved by the Works Ministry.

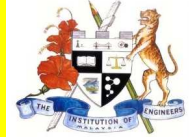
"Investigations are on-going," he said after visiting the scene yesterday.

Also present were Lada technical manager Abdul Manaf Majid and public relations manager Ramizi Hassan.

Nawawi, the Kuah state assemblyman, directed local authorities to submit a full report to the State Executive Council.



16.3.2008 (Collapsed during concreting – 9 hurt)



THE STAR, MONDAY 17 MARCH 2008 **NATION** N33

Nine hurt in site collapse

Workers fall after structure gives way

KUCHING: Nine foreign workers were injured after part of the building structure of a multi-million ringgit international hotel-cum-shopping mall project at Jalan Bukit Mata here collapsed.

The workers, one of whom suffered a broken arm, were thrown to the ground when the structure they were standing on gave way at 4pm on Saturday.

Ambulances rushed the injured workers to the Sarawak General Hospital where most of

them were given outpatient treatment for cuts and bruises on their bodies.

An eyewitness said that the structure collapsed as the workers were pouring mixed concrete on part of the first floor of the building.

The cause of the incident is being investigated.

Some 25 workers, most of them foreigners and aged between 25 and 35, were working on the project when the incident occurred.

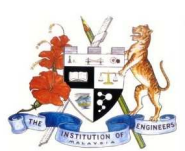


Massive clean-up job: Workers clearing the debris after part of the building structure collapsed in Kuching yesterday.

Jan 2007 (Granite Slab crushing down – 2 deaths)

REPORTS BY KULDEEP S. JESSY, DHARMENDER SINGH, ANDREW SAGAYAM, MARC LOURDES AND TAN KOK KEAN

Two die in scaffolding mishap



Workers and passers-by looking up at part of the collapsed scaffold after the 12.30pm mishap which killed two workers.

Granite slabs come crashing down

KUALA LUMPUR: Two men were killed and 12 others injured when an upper-level scaffolding with several granite slabs collapsed and hit them.

Police said the scaffolding could have collapsed from the weight of the slabs, each weighing about 50kg.

The tragedy occurred at 12.30pm yesterday at the 5ha construction site of the Pavilion Kuala Lumpur, a residential cum boutique hotel project, in Jalan Bukit Bintang here.

The dead are 52-year-old Malaysian Liew Wan Chew and Myanmar national Boi Nei Tang, 35.

It is believed that the two were in a lift outside the second level of the building when were hit by the slabs, which fell 15m from the seventh level.

Twelve slabs, each weighing about 50kg, were said to have fallen from a platform on the scaffolding.

The falling slabs also injured 12 workers

who were on the ground floor. Four of them are in serious condition.

The injured have been identified as Balraj Singh, 21, Pretap Singh and Arjan Singh both 22, Aman Singh, 23, Kala Singh and Gurbachan Singh, both 24, Salam Khan, 25, Subash Kumar, 26, Gurnam Singh, 30, Jamuna Prasad, 33, Rampal Singh, 37 and Kashmeer Singh, 40.

Except for Salam who is from Bangladesh, the rest are from Punjab, India.

At press time, Balraj Singh, Gurbachan Singh, Subash Kumar, Salam Khan, Arjan Singh, Rampal Singh and Kashmeer Singh were still warded in Kuala Lumpur Hospital.

Dang Wangi OCPD Asst Comm Mohammad Zulkarnain said the police have classified the case as sudden death.

When met at the Kuala Lumpur Hospital mortuary, Lim's wife, who declined to be named, demanded action to be taken against those responsible.

Deaths the second fatal incident in five months

KUALA LUMPUR: The death of two workers from falling granite slabs at the Pavilion Kuala Lumpur project site was the second fatal accident in five months. A stop-work order has been issued on the project.

Human Resources Minister Datuk Seri Dr Fong Chan Onn said a worker died in August last year after he was hit by a piece of wood that fell from a scaffolding.

"The fact that there had been two accidents within five months shows some degree of non-compliance or a lapse in the system," he told reporters after inspecting the accident site and a briefing by developer Pavilion Kuala Lumpur Sdn Bhd yesterday.

Dr Fong said an immediate stop-work order had been issued on the residential cum boutique hotel project.

"The scaffolding may have given way due to overloading," he said.

During the briefing, Pavilion executive director Y.S. Liew said the project was just six months away from completion.

He said the workers had been installing tiles on the outer part of the building when the incident occurred.

In a faxed statement, Pavilion and its subcontractor Putra Perdana Construction Sdn Bhd expressed regret over the incident and extended their condolences to the families of the deceased workers.

July 2005 (Collapse during Bridge Construction)

Meru-NKVE interchange collapse

- Nine workers injured, passing car damaged

“There were what sounded like two loud explosions, then the two sections

CRASHED”

■ By Arman Ahmad, V. Shankar Ganesh and R. Anbu

SHAH ALAM, Sun. — Hundreds of tonnes of concrete crashed onto the Klang-bound lanes of the New Klang Valley Expressway (NKVE) when a section of a flyover under construction collapsed.

The collapse at 1.40pm today injured nine foreign construction workers working on top of the section, which fell five metres to the ground. The flyover is part of a 7.5-km interchange

TURN TO PAGE 6, COL 1



• NST pix by Fathil Asri



COLLAPSE OF A SECTION OF THE MERU LINK FLYOVER

'TWO BANGS AND THEN CRASH!'

Workers recount their close brush with death

By FADHAL ILAHI ABD GHANI

SHAH ALAM: Construction workers at two Meru Link flyovers heard two loud "bangs", before part of a flyover came crashing down on them yesterday.

The incident took place at

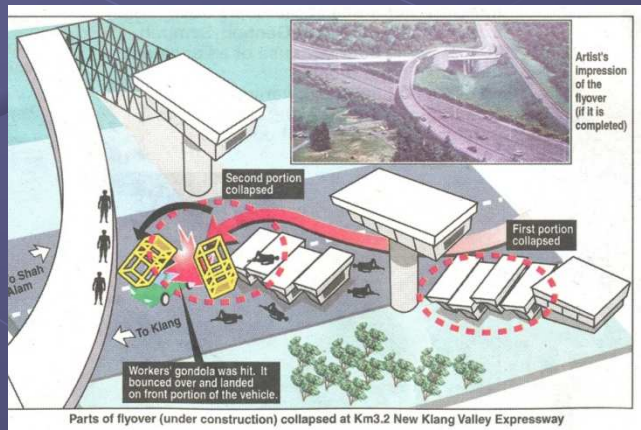
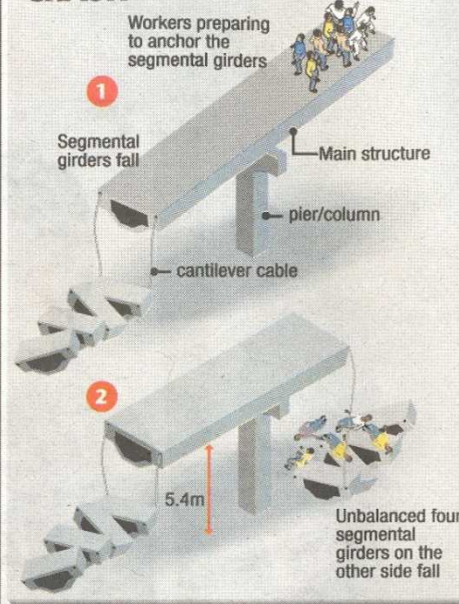
Mahmod said he saw a black Honda Jazz dodge the collapsing flyover. A yellow gondola used by workers hit the left side of the car.

"The cage bounced and hit the front of the car, damaging



MANGLED WRECK: A section of the collapsed flyover and the gondola of the NKVE-Jalan Meru Link flyover

MERU-NKVE INTERCHANGE CRASH

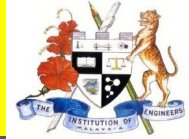


FIRST AID: The injured being treated by emergency workers. — NST pictures by Fathil Asri



HEAVE-HO: Workers trying to prop up the collapsed bridge at the NKVE.

Jan 2001 (Scaffolding Collapses)



Scaffolding collapses

Malay mail Jan 10, 2001

Three cars damaged,
massive traffic
jams after incident



RIGHT:
Work to
dismantle
the
collapsed
structure
carried
on at
night

BESIDES the developer, only one villager incurred huge losses when the scaffolding of a nine-storey apartment hit the ground last night.

The incident, which happened about 5pm yesterday, damaged three cars belonging to a villager and caused massive traffic jams along the narrow Kampung Rumah Panjang Seri Permai road leading to Taman Puchong Perdana.

A team from the Subang Jaya Municipal Council (MPSJ) which was on its way to check a nearby night market, had no choice but to make a temporary 'diversion' from their duties, as their services were needed elsewhere.

An enforcement officer told *The Malay Mail* that team members were on their way to the night market when they saw the scaffolding fall.

"There was a strong wind and we saw the 20-metre-high metal scaffolding fall," said the MPSJ officer.

"It was like watching giant pieces of dominoes fall piece by piece - like a chain reac-



By AZLAN
HARUN

tion - before hitting the power cables, causing an explosion. It also damaged three cars parked nearby.

"As there were huge crowds gathering at the scene, we had no other choice but to take control of the situation by advising the public to keep their distance.

Congestion

"We also helped to direct the traffic to ease the congestion there."

Husin Haji Osman, 48, owner of the damaged cars, said he would approach the developer to claim for damages.



ABOVE:
The
fallen
structure
in
Puchong

HUSIN: To
claim
damages
from
developer

Salim Razali, 37, who has been staying in the area for the past nine years, said this is the first time that such a thing had happened there.

He said the developer apparently did not adhere to proper safety procedures in erecting such a high scaffolding for a nine-storey building.



Legislations and policy guidelines

Act



- Occupational Safety and Health Act 1994 (Act 514)
- **Factories and Machinery Act 1967 (Act 139)**
- Factories and Machinery (Notification, Certificate of Fitness and Inspection) Regulations, 1970
- **Factories and Machinery (Building Operations & Works of Engineering Construction) (Safety) Regulations, 1986 (BOWEC)**
- Registration of Engineers Act 1967 (Revised 2007)

Legislations regulating the various phases along the construction supply chain in relation to causes of failure

	Item	Property development supply chain
a	Land conversion	National Land Code
b	Planning permission	Town and Country Planning Act,(Act 172)
c	Building plan approval	Street, Drainage and Building Act (Act 133), UBBL, earthworks By-Laws, Electricity supply Act, Water Service Act, Sewerage Service Act, Solid waste management & public Cleansing Act, Telecommunication Act, Fire service Act,



Legislations regulating the various phases along the construction supply chain in relation to causes of failure

d	Procurement	Contract Act 1950
e	Construction	Act 133, UBBL, E/works bylaws, OSHA, CIDB
f	Building delivery	Act 133, UBBL
g	Extension & renovation works	Act 133, UBBL, Act 172, Fire Service Act
h	Periodical Inspection	Act 133, UBBL
i	Demolition	Act 133, OSHA



Act 133 – Street, Drainage and Building Act, 1974

Sec 95: Protection of the State Authority and officers from personal liability

“ the state authority, local authority and public officer of local authority **shall not be subject** to any action, claim, liability or demand what-so-ever arising out of any building in accordance of this act..”



Uniform Building By-Laws 1984

Bylaw 258 – **Failure to buildings**

(5) Notwithstanding that any **plan, drawing or calculation** has been approved by the local authority, the **responsibility for the failure** of any building shall *prima facie* lie with the **person who submitted** such plan, drawing or calculation.



Legislature review :

- Highland Towers collapse in 1993
- Amendment in Street, Drainage & Building Act , 1974, Act 133 in 1995 :
 - Sec 70B : Order to **review safety and stability** in the **course of erection of building** :
 - the building
 - the foundation of the building
 - the surroundings

The review shall be undertaken by a **qualified person** **than the qualified person who prepared** and certified the plans, calculations, particulars, documents or reports submitted to local authority



Act 133 – Street, Drainage and Building Act, 1974

Clause 71 :-

- Where any building or part of a building fails in the course of construction or after completion etc. and such failures is due to;
- Misconstruction or lack of proper supervision during construction
- Misdesign or miscalculation; or
- Misuse

The *person responsible* shall be liable on conviction to a fine not exceeding Rm500,000 or to imprisonment for a term not exceeding 10 years or to both.



BEM Position Paper on Responsibility and Accountability of Stakeholders in Construction Industry





BEM directive :

Prepare a paper to identify the **issues and weakness** in the construction industry supply chain in respect to **failure of buildings and fatal site accidents** and propose recommendations



BEM Responsibility and Accountability of Stakeholders in Construction Industry

BEM formed a **working group** called
“ WG on Responsibility and accountability of
Stakeholders in Construction Industry”

Chairman: Ir Tan Yean Chin , PPC chairman

- | | |
|--------|--------|
| - IEM | - MBAM |
| - KPKT | - DOSH |
| - ACEM | - PAM |
| - CIDB | - LAM |
| - PSDC | - BEM |



- “ WG on Responsibility and accountability on Construction Industry”

TOR includes:

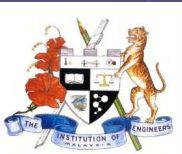
- stakeholders involved at every stage of development (supply chain)
- relevant laws & policies
- study possible causes of failure and recommendations
- literature reviews of past cases of building failures



● Scope of Review

Stakeholders responsible :

- Developer / project proponent
- Planner
- Engineers
- Site supervisors
- PTD (Land officer)
- Architect
- Contractor
- Tradesman
- Local authority



● Supply Chain of Construction Industry

1. Project inception
2. Land conversion
3. Planning approval
4. Building Plan approval
5. Procurement process
6. Construction ← Covered in this Presentation
7. Building delivery (CFO/CCC)
8. Maintenance and Management / COB
9. Periodical Inspection
10. Demolition



BEM Responsibility and Accountability of Stakeholders in Construction Industry

Stakeholders responsible

- **Developer** / owner
- Architect
- **Contractor**
- Planner
- **Engineer**
- Tradesmen
- **Site Supervisor**
- Land Officer
- Local Authority

Failure of Building

Supply chain of property development

- Project conception
- Land conversion
- Planning permission
- **Building plan**
- Procurement
- **construction stage**
- **Building delivery (CFO/CCC)**
- **Maintenance & Management**
- **Periodical Inspection**
- **Demolition**



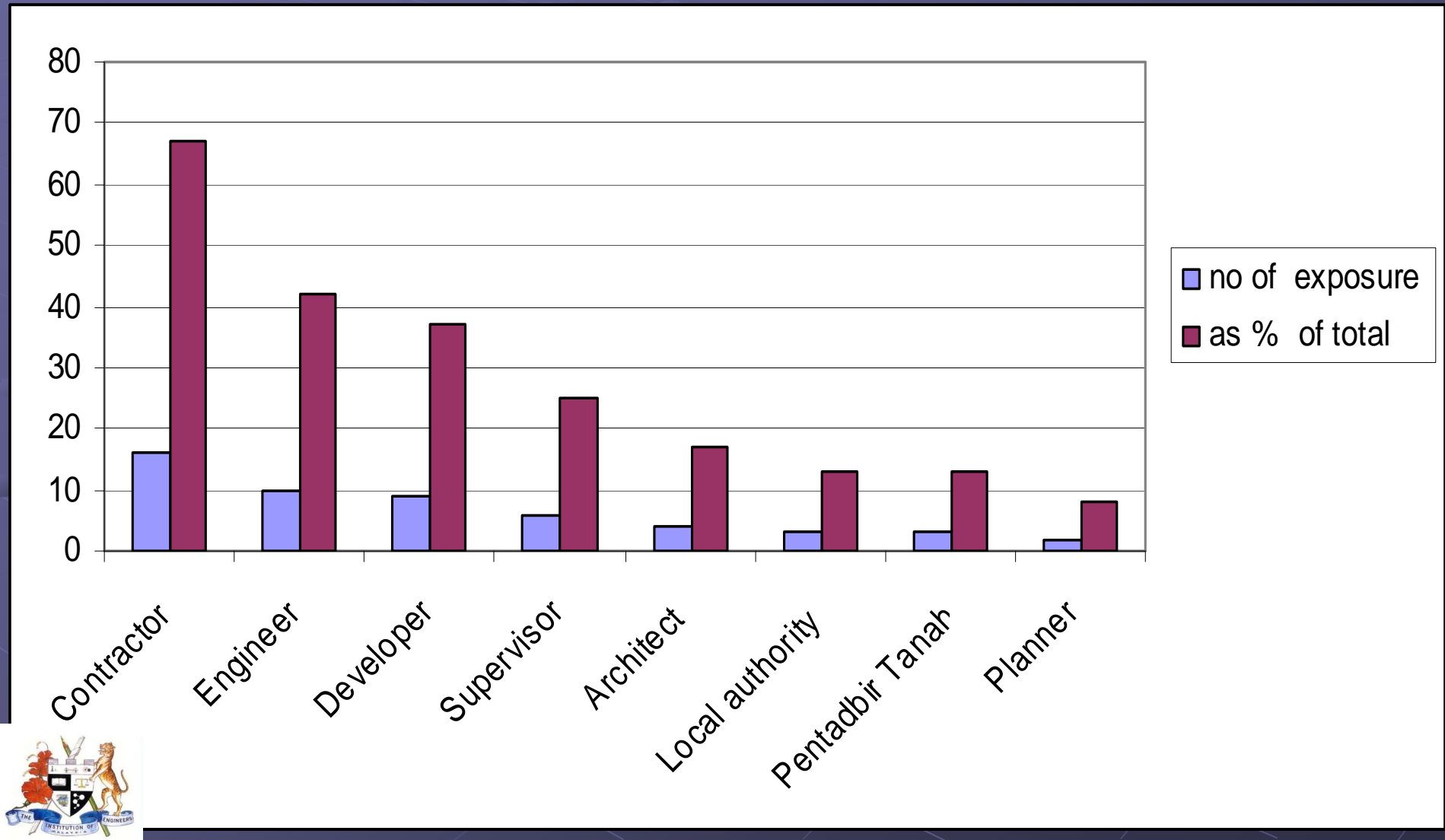
BEM Responsibility and Accountability of Stakeholders in Construction Industry

Number of exposure to causes by stakeholders along the supply chain

stakeholder	no of exposure	as % of total
Contractor	16	67
Engineer	10	42
Developer	9	37
Supervisor	6	25
Architect	4	17
Local authority	3	13
Pentadbir Tanah	3	13
Planner	2	8
Other agency	2	8

BEM Responsibility and Accountability of Stakeholders in Construction Industry

Number of exposure to causes by stakeholders along the supply chain



Findings of Common causes of failure during Construction stage

- a) Incompetent site supervisor
- b) Insufficient site supervisors (SS)
- c) **Temporary works** overseen by incompetent contractor/supervisor or without engineer's input for works involving structural input
- d) Removal of consultant's scope of service in construction stage
- e) Contractor fraudulent act resulting in inferior product
- f) Inferior quality of building materials used
Incompetent tradesmen used



Common causes of building failure

● Construction stage

Recommendation :

- a) **Regulate Site Supervisors (SS)** in the Act or regulation to carry responsibility and accountability. Set some **entry requirement for SS** depending on the category of SS in relation to the size and complexity of the project.
- b) set a minimum **ratio of SS against size** and complexity of the projects and categories of SS.



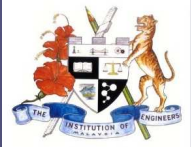
Common causes of building failure

● Construction stage (Continue)

Recommendation :

- c) review existing guidelines on **temporary works** in respect to stability and hazard to public. Identify any gap in the guidelines and enhance enforcement.
- d) amend CIDB Act to make key personnel of contractor (eg director) **personally responsible** on negligence and fraudulent act resulting in inferior product

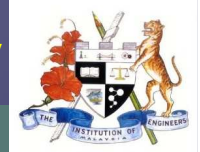




Strategic Plan to minimize / mitigate failure

7 strategic plans :

1. General awareness of construction safety
2. Strengthening role of regulatory authority especially local authority
3. Ensuring quality and independence of Engineers
4. Upgrading competency of supervisors
5. Review Code of ethic of professionals
6. Clearer delineation of responsibility of certain 'structure' drawing between architect and engineer
7. Enhance accountability of contractor



Strategic Plan to minimize / mitigate failure

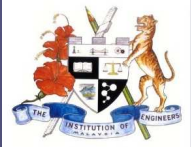
Strategic plan 4:

Upgrading competency of consultant's resident site supervisors

3. To amend UBBL on all Form G except G2 to require relevant consultant's site supervisor/s to sign on the relevant Form Gs that he has supervised the project and that he takes responsibility on the portion of works he is connected with. (amendment to CIDB Act)

Note : New amended REA (2015), BEM will register Inspector of Works (IOW)

4. To amend CIDB ACT to make it a statutory requirement for site supervisor (both contractor's and consultant's) to be registered with CIDB. No one shall employ any deregistered site supervisors unless the registration has been reinstated.

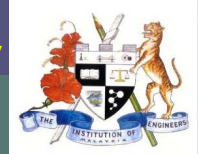


Strategic Plan to minimize / mitigate failure

Strategic plan 7:

Enhance accountability of contractor

1. To amend CIDB Act to allow CIDB to act against the **director and Site/Project Manager** found responsible for the failure of a building with **punitive action** such as fine and suspension from any construction activity within a specified period.



Strategic Plan to minimize / mitigate failure

Strategic plan 7:

Enhance accountability of contractor

2. To introduce QBS (Quality Based System) process for the appointment of contractors and the use of 2 envelope systems of to **technical and financial system** evaluate bidders for the projects. For **government projects**, greater transparency system should be practiced whereby representatives from relevant organisations such as MBAM, ACEM, IEM or PAM be **invited to sit on the tender board**. The tender bids and successful bidders should be displayed for public viewing.

Strategic Plan to minimize / mitigate failure of building

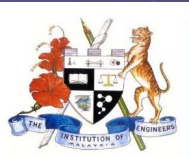
Strategic plan 7:

Enhance accountability of contractor

3. contractor shall engage Professional Engineer to design, endorsed and supervise all temporary works on site. Temporary works shall be given the same due respect in terms of safety.
4. all temporary works endorsed by Professional Engineers and submitted to DOSH shall be constructed strictly according to the submitted drawings.



Role and Responsibility of Professional Engineer for Temporary Works in Construction

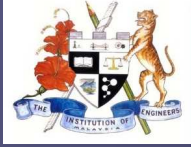


Although **Temporary Works** are mainly the **Contractor's responsibility**, it is however important that **Professional Engineers** involved in the project either as Owner, Consultant or Contractor must play a role in ensuring its safety.

The design of **Temporary Works** shall be given the **same respect** as due to the design of **Permanent Works** by Professional Engineers.



BOWEC



Factories and Machinery (Building Operations and Works of Engineering (Construction) (Safety) Regulations 1980 or BOWEC, certain design of Temporary Works requires the certification by the Professional Engineer, among these are:

- Regulation 28(1) (General Requirements)

“Formwork and reshores shall be certified structurally safe by a Professional Engineer and shall be properly braced or tied together so as to maintain position and shape.”

● Regulation 30(5) (Concrete Work)

“Where the formwork structure is designed by a Professional Engineer, he shall be responsible for the supervision of the construction and the stability of such structure”.

● Regulation 43(2) (Catch platforms)

“Such platform shall be designed by a Professional Engineer and certified for safety prior to erection.”

● Regulation 75 (Design and drawings of scaffolds to be approved)

“(1) Every metal tube scaffold exceeding 40 metres in height and every other scaffold exceeding 15 metres in height shall be constructed in accordance with the design and drawings of a Professional Engineer. All other metal tube scaffolds shall have their designs and drawings approved by the Chief Inspector.

(2) A copy of the design and drawings of the structure shall be submitted to the Chief Inspector for his records prior to the erection of the structure.

(3) A copy of the design drawings certified by the Professional Engineer shall be made available at the worksite for inspection by an Inspector.”

BOWEC



● Regulation 112 (Stability of structures)

“Where there is any question of stability of structures adjoining or over areas to be excavated, such structures shall be supported where necessary by underpinning, sheet piling, shoring, bracing or other means made or erected according to the design of a Professional Engineer to prevent injury to any person.”

● Regulation 116(1) (Trench excavation)

“Pilings, shoring and bracing used in trench excavation to protect employees against falling or sliding materials shall be of adequate strength. Where the trench is to be excavated exceeds 4 metres in depth, such protection shall be constructed in accordance with the design and drawings of a Professional Engineer.”

● Regulation 124 (Piling)

“Where there is any question of stability of structures adjoining areas to be piled, such structures shall be supported where necessary by underpinning, sheet piling, shoring, bracing or other means in accordance with the design of a Professional Engineer to prevent injury to any person.”

- BEM is drafting :-

“Guidelines on the Role and Responsibility of Professional Engineers for Temporary Works in Construction”

as a guide to all professional engineers involved in temporary works.

Proposed Classification of Temporary Works

- The Temporary Works is classified into three main classes, namely :

Class 1 : Minor Temporary Works

Class 2 : Major Temporary Works

Class 3 : Temporary Works that form part of Permanent Works



Class 1 : Minor Temporary Works



- Minor Temporary Works class 1 are temporary works that when subject to any failures, defects or losses of serviceability, **would unlikely** affect public and workers safety and life. Other than those already listed below, the Consultant and Contractor shall discuss and itemize the temporary works for each project prior to construction.
- Class 1 Minor Temporary Works can be **designed and supervised by Contractor or engineer who is not a professional engineer** subject to compliance with other relevant guidelines, laws and Act (e.g. DOSH, etc.).

Examples of Class 1 : Minor Temporary Works

- 1) **Excavation or Trenching** shallower than 1.5m in all direction with no stockpiling of materials adjacent to the excavation.
- 2) **Temporary Cut** slopes (excluding those in soft clay) **not more than 5m high** and **gentler than 27 degrees**.
- 3) **Temporary Fills** of Soil and rock that are backfilled to form a bund, embankment or platform with **not higher than 1.5m**.
- 4) **Scaffolding / Falseworks** that are **lower than 3m high** supporting low load and with **no public or workers beneath it**.



Class 2 : Major Temporary Works



- Are Temporary Works that when subject to any failures, defects or losses of serviceability **would likely affect public and workers safety and life.**
- Carry similar level of risk to life as permanent works, shall be given same respect on safety as that of Permanent Works.
- Shall be designed, endorsed and supervised by a Professional Engineer (PE) registered with BEM.
- Owner and Consultant shall state and specify clearly in the tender and contract document to the Contractor that the Contractor shall get PE to design, endorse and supervise.
- It is the responsibility of the Consultant (submitting person/qualified person) to the Local Authorities or other Government agencies (e.g. JKR, etc.) and as designer of Permanent Works, to ensure the Contractor comply with these requirements to safe guard public interest and safety.

Examples of Class 2 : Major Temporary Works

- 1) **Scaffolding / Falseworks** : Scaffolding / Falseworks covers any form of construction methods and materials used to support the construction of structure / buildings and for pouring of concrete or machineries or for workers. The works includes supply, installation, maintenance, ensuring of foundation and structural stability, and the removal of the scaffolding.
- 2) **Temporary Excavations**: Temporary excavation into soils or rocks. E.g. excavation for pile caps, excavation for retaining wall, trenches etc. Necessary retaining wall system or support system can be employed.
- 3) **Temporary Cut Slopes**: Soil or rock slopes that are excavated temporarily to form temporary slopes.



Examples of Class 2 : Major Temporary Works

- 4) **Temporary Fills** : Soil and rock fills that are backfilled to form a temporary bund, embankment or platform **higher than 1.5m**.
- 5) **Demolition Works** : Demolition or removal of any obstruction and old construction works which can be either man-made or natural.
- 6) **Pre-stressing Works** : Works required to form pre-stressed structural elements.
- 7) **Crane foundation**: The design and construction of the foundation to support a static tower crane.
- 8) **Temporary strutting and bracing for excavations** : The temporary strutting and bracing used at site to support the retaining wall for excavation.

Examples of Class 2 : Major Temporary Works

- 9) **Temporary ground anchors** : Temporary ground anchors used at site to support the temporary and permanent retaining wall for deep excavations or for cut slopes or excavations.
- 10) **Load Testing of Foundation and Buildings** : Includes setting up of system for load testing such as kentledge, ground anchors, soil nails, steel beams, truss or concrete blocks, reaction system, jacking system, etc.
- 11) Temporary structures and works that when subject to any failures, defects or loss of serviceability could affect public and workers safety and life.



Class 3 : Temporary Works that form part of Permanent Works

- Temporary Works that form part of Permanent Works are temporary works that are hazardous to life in which any failure, defect or loss of serviceability **would seriously affect** the public and workers' safety and life.
- Works that form part of the Permanent Works (e.g. **basement retaining wall, top down construction, temporary cut slopes that later become part of the permanent slopes, tunneling, etc.**).
- Carry similar level of risk to life as permanent works, they shall then be given the same respect in regards to safety as Permanent Works.
- Shall be designed, endorsed and supervised **by the Consultant**, who is the submitting person (qualified person) to the Local Authorities or other Government agencies (e.g. JKR, etc.).

Examples of Class 3 : Temporary Works that form part of Permanent Works

- 1) **Scaffolding / Falseworks that form part of the Permanent Works** : Scaffolding / Falseworks that form part of the Permanent Works covers any form of construction methods and materials used to support the construction of structure / buildings and for pouring of concrete or machineries, for workers and public. The works including supply, installation, maintenance, ensure foundation and structural stability, and removal of the scaffolding.
- 2) **Cut Slopes (that form Permanent Slopes)** : Soil or rock slopes that forms the Permanent slopes.
- 3) **Strengthening measures of slopes (that form Permanent Slopes)** : soil nails, ground anchors, rock strengthening measures for permanent slopes and retaining walls.

Examples of Class 3 : Temporary Works that form part of Permanent Works

- 4) **Retaining Wall** : all types of permanent retaining wall (e.g. rubble wall, crib wall, gabion wall, reinforced concrete wall, reinforced soil wall, sheet pile wall, soldier pile wall, contiguous bored pile wall, secant pile wall, diaphragm wall, barrette wall, etc.) that also function during temporary stage.
- 5) **Strutting and bracing for excavations that form part of the Permanent Works**: The permanent strutting and bracing used at site to support the retaining wall for excavation.
- 6) **Permanent Embankment, Bund or Fill**: For permanent embankment, bund and fill.



Examples of Class 3 : Temporary Works that form part of Permanent Works

7) Ground Treatment that form part of the Permanent Works :

Ground treatment works (e.g. stone columns, excavate and replace, prefabricated vertical drains, piled embankment, embankment construction stages) that form part of the Permanent Works.

8) Temporary structures and works that form part of the Permanent Works, that when subject to any failures, defects or loss of serviceability could affect public and workers safety and life.



Role of PE on Temporary Works

The Professional Engineers who are entrusted with the design of the Temporary Works shall ensure the following:

- ✓ He must practice within the discipline of engineering he is registered with BEM.
- ✓ He must only practice on works that he has the necessary experiences and competence to safeguard public safety and interest.
- ✓ A Professional Engineer with Practicing Certificate in force can be engaged by Contractor or Owner to design, endorse and supervise the Temporary Works of Class 2 and Class 3.

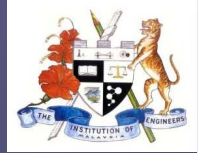


Role of PE on Temporary Works

(Cont')

- ✓ He shall design and supervise the Temporary Works to the relevant standards, code of practice and good engineering practice.
- ✓ There shall be adequate numbers of qualified and experienced Professional Engineer's representatives at site (Temporary Works Site supervising personnel) to supervise the Temporary Works full time. This supervisory staffs are responsible to the Professional Engineer who design and endorse the Temporary works. These supervising staff shall be independent from the Contractor's staff in carrying out the Temporary Works





Role of PE on Temporary Works

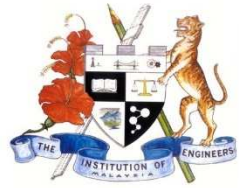
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- ✓ No physical works shall be allowed on the Class 2 and Class 3 temporary works unless all the design which include but are not limited to construction drawings, specifications, method statements and construction procedures that had been properly endorsed and approved by Professional Engineers, are in place, and supervision team are ready at site.
- ✓ It is the responsibility of the Consultant who is the submitting person (qualified person) of the project to the Local Authorities to ensure that the project comply with the guidelines on temporary works. Any temporary works of Class 2 and Class 3 which does not have proper documentations (e.g. drawings, specifications, method statement, etc.) or proper full time supervision and inspection, the works shall not be carried out at site.

CONCLUSIONS

1. Safety of Temporary Works is very important.
2. Contractor is the key stakeholder responsible for Safety of Temporary Works.
3. Professional Engineer (PE) shall be entrusted to design, endorse and supervise Temporary Works that could affect public and workers safety.





IEM

The Institution of Engineers, Malaysia



Federation of Engineering Institutions
of Asia and the Pacific (FEIAP)

THANK YOU



MYANMAR ENGINEERING SOCIETY (MES)

အင်ဂျင်နီယာစွမ်းအား ပြည်ထွန်းကား

By

Ir. Tan Yean Chin

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