

ENG3004

Safety & Health Dimension

Safety problem: Tower crane failure (September 2022)



July 2007

Feature

Lesson learnt from tower crane accident on 10 July 2007

[< Back](#)

By Ir Joseph CHI

A tower crane used on a demolition site in Causeway Bay collapsed suddenly on 10 July 2007, causing the death of two workers and injuries to a number of others. While the causes of the accident are still under investigation, the tragic accident is in fact not the first one related to the use of tower crane.

There are three main stakeholders in the construction industry, namely the developer, consultant, and contractor. In addition, various government departments act as the law enforcement bodies to ensure that construction works are carried out in compliance with relevant legislative requirements.

The lack of adequate and appropriate legislative requirements in the implementation of a contractor's safety management system is considered to be one of the root causes of the many accidents occurring in Hong Kong's construction industry every year. For instance, in terms of the safe use of tower cranes, there are no statutory requirements governing the qualification of workers involved in the erection and demolition of a tower crane, nor statutory requirements that require those workers to be properly trained before undergoing this kind of work.

In addition, the government has been regularly criticised by stakeholders for lacking an effective and pragmatic policy for overseeing the healthy growth of the industry. The government has been for many years criticised for encouraging (in a subtle manner) the "lowest price takes the bid" policy in the construction industry.

This notorious policy results in cut-throat competition among contractors and consultants and has been identified as the cause of many problems in the construction industry. Contractors tend to focus on putting in low prices when bidding for a construction contract. Likewise, consultants tend to focus on tendering lower consultancy fees when bidding for a consultancy contract. As a result, less qualified and less experienced workers are employed by contractors and sub-contractors to carry out construction works.

Similarly, less experienced professionals are deployed by consultants on site to supervise the construction works, some of which are very complex and risky in nature. Contractors that win the bids are generally considered by the industry to deliver a lower quality product, prone to take higher risk in carrying out construction works, slower in completing the works and involved in more claims, etc. Likewise, winning consultants are generally considered



Mobile Cranes

Code of Practice for Safe Use of Mobile Cranes

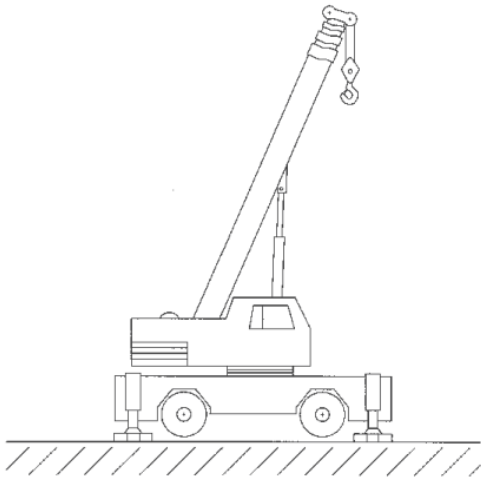


Fig. 1d - Wheel-mounted crane



https://www.oshc.org.hk/eng/main/hot/lifting_operation/

Safety problem: Gas Safety (氣體安全)

- On 11 April 2006, leakage was found on a medium pressure ductile iron (MP DI) pipe (中壓墨鐵喉管滲出) underneath Jordan Valley North Road in Ngau Tau Kok.
- A town gas explosion subsequently occurred inside Wai King Building (偉景樓), which is about 25 metres (m) away from the point of leakage.
- The gas explosion incident has caused two fatalities and nine injuries (兩死九傷), and damage of varying degrees to the property and utilities of Wai King Building.



Accelerated Replacement of Towngas Pipelines (加快更換煤氣喉管)

- Ductile Iron (DI) pipes (墨鐵喉管) are still in service for gas distribution network in various parts of the world such as the USA, European Union, Singapore and Japan.
- These pipes, with protective coatings (保護塗層), meet international safety standards and should last for 50 years under normal circumstances. Since the 1990s, HKCG has gradually phased out laying of DI pipes and introduced new polyethylene (PE) pipes (聚乙烯喉管) for underground distribution network to enhance gas safety. The PE pipes are free from ferrous corrosion problem (金屬性銹蝕), and possess enhanced quality of pipe joint and better resistance to ground subsidence (抵禦地陷帶來的損壞) .



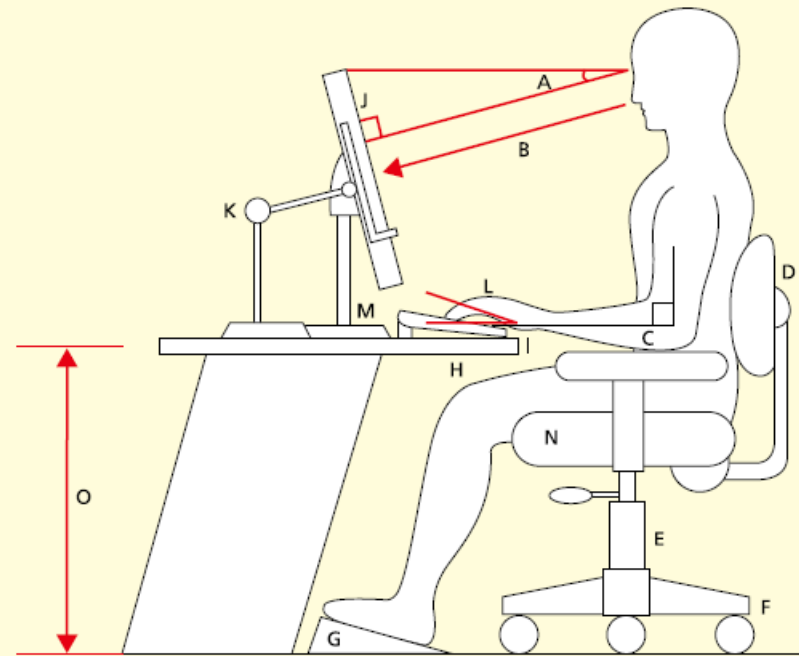
Gas pipes 氣體管道 polyethylene (PE) pipes



Fact behind Building Collapse in Shanghai 2009



Health problem: Display Screen Equipment



- A. First line of screen at about or just below the eye level
- B. Comfortable viewing distance (350-600mm)
- C. Forearm and arm at about right angle
- D. Adjustable back rest height and inclination
- E. Adjustable seat height so that user can be able to rest his/her thighs on seat pad and feet can rest on the ground
- F. Firm base of chair with smooth castors for easy movement
- G. Firm Footrest if required
- H. Adequate leg clearance
- I. Adequate wrist support
- J. Screen at right angle to line of sight
- K. Adjustable document holder
- L. Wrist kept slightly inclined
- M. Screen support adjustable for rotation and titling
- N. Rounded or scrolled edge seat pad
- O. Adjustable table height preferable

Definition of Accident

Any undesired event that results in **harm** to people, **damage** to property, or **loss** to process



Risk Assessment

What is HAZARD?

What is RISK?

HAZARD = RISK?

dangerous condition or source

- HAZARD is the POTENTIAL for a substance/
equipment/plant/process to cause ADVERSE
EFFECTS
- RISK is the LIKELIHOOD of an ADVERSE
EFFECT occurring in a particular situation



Hierarchy of Risk Control Measures

A hierarchy of control

1. **Elimination** – This involves the complete **removal** of that hazard
2. **Substitution** – This involves the **replacement** of hazardous substance/process/equipment by less hazardous one of similar nature



Hierarchy of Risk Control Measures

3. Engineering Control

- ✓ Isolation ← e.g. sound barrier to noisy machinery
- ✓ Segregation ← moving people away from the danger
- ✓ Local exhaust ← e.g. Exhaust pipe
- ✓ Ventilation – Natural ventilation, forced ventilation

4. **Administrative Control** – reduces the exposure to the hazard by administration means such as **job rotation**, **rest** breaks, etc.

5. **Personal Protective Equipment** – the use of personal protective gears and clothing ← e.g. helmet, mask



*How to **assess the risks** in your workplace*

Follow the five steps

1. **Identify** the hazards
2. Decide **who** might be harmed and **how**
3. Evaluate the **risks** and decide on precaution
4. **Record** your findings and **implement** them
5. **Review** your assessment and **update** if necessary

Source: <https://www.hse.gov.uk/simple-health-safety/risk/index.htm>

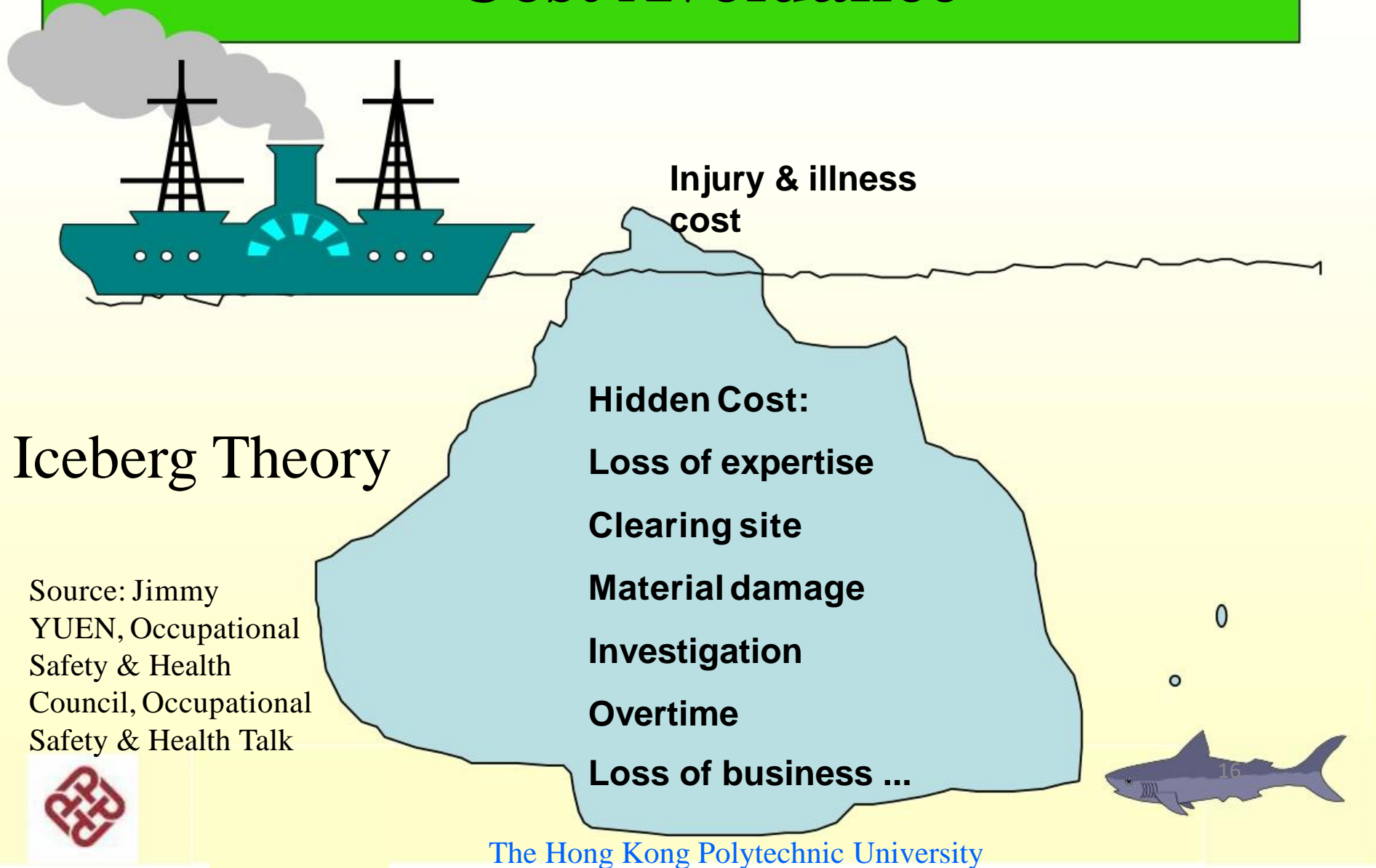


Hazards

- Physical hazards ← noise, vibration, asbestos and radiation
- Chemical hazards ← toxic gas
- Biological hazards ← food / water hygiene
- Ergonomic hazards ← fatigue
- Fire
- Electricity
- Mechanical
- Slip/fall
-



Cost Avoidance



The contributions of OSH Council in enhancing safety culture in Hong Kong

Stage 1
(1955 ~)

Workplace Precautions
(machine guarding, local exhaust)



Stage 2
(1989 ~)

Risk Control Systems
(Risk Assessment, Permit to Work)



Management system

Stage 3
(1999 ~)

OSH-MS Arrangement
(OSH-MS and Audit)



The contributions of OSH Council in enhancing safety culture in Hong Kong

www.labour.gov.hk/eng/legislat/contentB3.htm

Workplace Precautions:

Stage 1 1955~

(1) Factories and Industrial Undertakings Ordinance (Chapter 59)

Applies to **industrial undertakings**, i.e. factories, construction sites, catering establishments, cargo and container handling undertakings, repair workshops and other industrial workplaces

(2) Factories and Industrial Undertakings Regulations (Chapter 59)

Prescribe detailed **safety and health standards** on work situations, plant and machinery, processes & substances



The contributions of OSH Council in enhancing safety culture in Hong Kong

Risk control systems:

Stage 2, 1989~

Section 6 A and 6B of the Factories and Industrial Undertakings Ordinance (Chapter 59)

- Impose general **duties on proprietors and persons employed** with regard to the safety and health at work in industrial undertakings
- General duties of proprietors are to ensure, so far as is reasonably practicable, the safety and health at work of all persons employed by him
e.g. The **proprietor must provide** machinery, equipment, appliances and the system of work that are, so far as is reasonably practicable, **safe and without risks to health**



Occupational Safety & Health Dimension

Stage 3, 1999~

OSH-MS Arrangement:

Factories and Industrial Undertakings (Safety Management) Regulation

- Proprietors or contractors of certain industrial undertakings are required to develop, implement and maintain in respect of the undertakings a safety management system which contains 14 key process

elements

<https://www.labour.gov.hk/eng/public/os/smr/appendix2.html>

- They are also required to have the system regularly audited or reviewed

1. Safety Policy
2. Safety Organisation
3. Safety Training
4. In-house Safety Rules
5. Inspection Hazardous Conditions
6. Personal Protection Program
7. Accident /Incident Investigation
8. Emergency Preparedness
9. Evaluation, Selection and Control of Subcontractors
10. Safety Committees
11. Job Hazard Analysis
12. Safety Promotion
13. Process Control Program
14. Health Assurance Program



Mandatory Basic Safety Training

- The Factories and Industrial Undertakings Ordinance amended in 1999 to provide for **Mandatory Basic Safety Training**
- 1-day safety course to all workers in the **construction** and **container handling** industries
- Training courses **approved by Labour Department**
- **Certificate** will be issued upon satisfactory completion of the training
- Half-day **refresher course** to revalidate the certificate every 3 years



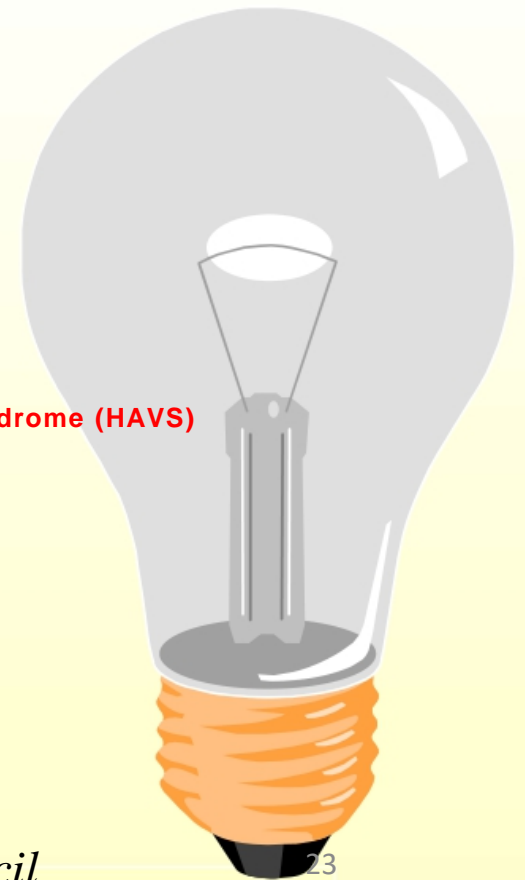
Mandatory Basic Safety Training

- Mandating safety training for workers engaged in operating **high-risk plant** and **machinery** and hazardous work **processes**
- **Crane** operators, persons working on **suspended working platforms** and in **confined spaces**, etc.
- Extended to operation of **loadshifting machinery**, gas **welding** and **flame cutting** work



Physical Hazards



- Lighting (head aches/eyestrain)
- Heat (heat stroke/cramp)
- Noise (deafness)
- Vibration (white finger) ← hand-arm vibration syndrome (HAVS)
- Radiation (cancer)
- Pressure (decompression sickness, the 'bends') ← Diver's disease



Source: Jimmy YUEN, Occupational Safety & Health Council



Chemical Hazards

- Acids/Alkalis (dermatitis/eye injury)
skin disease 
- Metal mercury/lead poisoning)
- Non-metal (cyanide)
- Gases (CO)
- Organic compounds
- Dust  particulate

Source: Jimmy YUEN, Occupational Safety & Health Council



24



Biological Hazards

- Animal-borne (anthrax)
- Human-borne (AIDS)
- Vegetable-borne (farmers lung) A disease caused by an allergy to the mold in certain crops.
- Air-con (legionnaire disease)



Source: Jimmy YUEN, Occupational Safety & Health Council

25



Ergonomic Hazards

- Over exertion ← applying too big force
- Manual handling ← affecting muscle, joints, nerve
- Musculo-skeletal disorders
- Work stress



Source: Jimmy YUEN, Occupational Safety & Health Council

26



Others

- Fire/explosion
- Electricity
- Slip/fall
- Mechanical
 - entanglement
 - friction/abrasion
 - cutting
 - shearing
 - stabbing/puncturing
 - crushing
 - drawing-in ← to machine
 - fluid injection
 - ejection
 - impact



Safety Handbook:

https://www.oshc.org.hk/oshc_data/files/books/2016/CB1300E.pdf

27



Case Study:

On the evening of January 13th, 2012, the cruise industry was forever changed after the modern, family cruise ship, the Costa Concordia collided with rocks and sank off the coast of Italy. The thought of a modern cruise ships, catering to families and couples on a romantic Mediterranean getaway, would be able to sink like she did, is truly unfathomable. Let's break down what happened from start to finish and check out the true story of modern histories most famous ship disaster.

1. Inside the Costa Concordia Disaster

<https://www.youtube.com/watch?v=QInuFYRZwPw>

2. The Story Of The Costa Concordia

<https://www.youtube.com/watch?v=EgTOq-2acT0>

3. Costa Concordia: What happened

<https://www.bbc.com/news/world-europe-16563562>

4. Italy's Costa Concordia wreck 'to be moved in June'

<https://www.bbc.com/news/world-europe-25687451>

5. Salvaging the Costa Concordia

<https://www.bbc.com/news/world-europe-19962191>