

The Safety Case Regime for Major Hazard Installations



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Presentation Outline

28 Sep 2011 Refinery Fire

Operationalising the Safety Case Regime

The Safety Case Regime

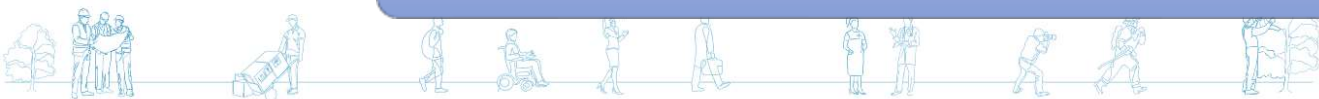
- Major Hazards Dept (MHD)
- Workplace Safety and Health (Major Hazard Installations) Regulations 2017

What is a Safety Case?

- Driving continual improvement through ALARP
- Safety Case Assessments by MHD
- Managing Fire & Explosions Risks to ALARP in Safety Cases

Path Forward

MOM's Reports on Fires & Explosions



28 Sep 2011 Refinery Fire

- 32-hr fire
- Open de-oiling of naphtha (*highly flammable petroleum product*)
 - ✓ From a 24" pipeline through a pump house
 - ✓ Naphtha drained from pipeline into trays
 - ✓ Naphtha vapours in the open, resulting in a mixture of flammable vapours in air.
- A plastic tray (*i.e. non-conductive*) collected drained naphtha
 - ✓ When accumulated static charges come into contact with any good conductor, charges are instantaneously transferred
 - ✓ Sudden energy surge could generate a spark, sufficient to ignite naphtha vapours in air.
- A vacuum truck was nearby, collecting naphtha out of the trays.



Operationalising the Safety Case Regime



One of BOI's recommendations:
Adopt differentiated risk management approach
 Place more controls on top-tier hazardous plants with greater focus for high risk work activities that could result in significant loss of containment.



* Board of Inquiry



Operationalising the Safety Case Regime



Managing Major Hazard Installations (MHI): MOM will adopt a Safety Case regime where MHI operators will need to integrate all their Safety, Health and Environment protocols onsite, and demonstrate to regulators that they have managed their risks to as low as reasonably practicable. We will introduce a set of MHI Regulations under the Workplace Safety and Health Act to effect the Safety Case regime. A National MHI Regulatory Office will be set up in 2016 to better coordinate Safety Case assessments, inspections and investigations.



Operationalising the Safety Case Regime



Reaching everyone for active citizenry @ home

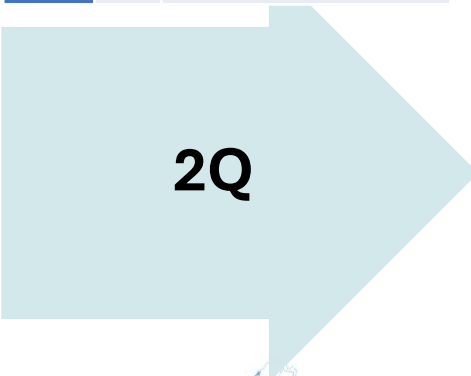
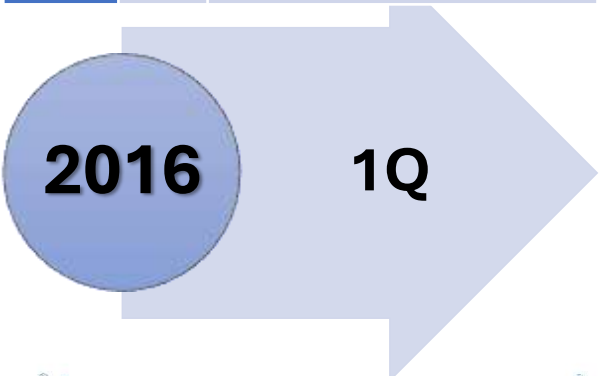
Home > Participate > Public Consultation > Public Consultation on the Proposed WSH Major Hazard Installations Regulations

PUBLIC CONSULTATION ON THE PROPOSED WSH (MAJOR HAZARD INSTALLATIONS) REGULATIONS



Jan	4-31	WSH (MHI) Regulations – REACH Portal Consultation
Feb	23	MHI Leadership Forum
	26	1 st Safety Case Consultants' Dialogue

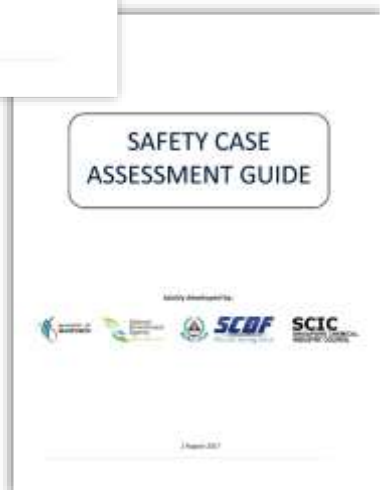
Apr	26	1 st Safety Case Knowledge-Building Session
	30	Launch Safety Case Technical Guide for MHI industry consultation



Operationalising the Safety Case Regime



Sep	1	MHD officially established, taking over SRMC's functions
	16	<ul style="list-style-type: none"> • Safety Case Technical Guide finalised • Safety Case Assessment Guide released

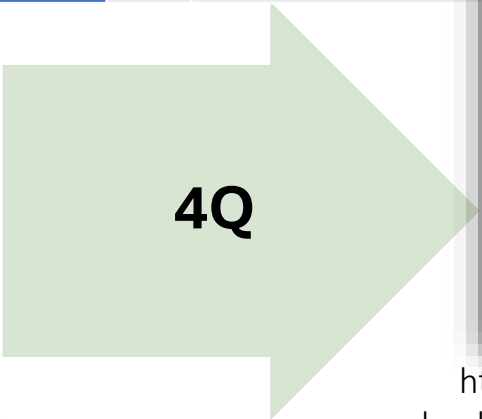
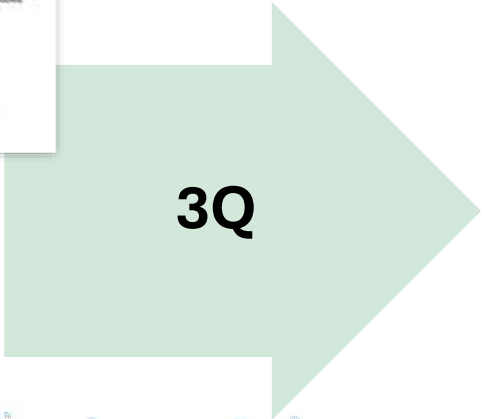


Oct	5	SCIC-MOM Dialogue
	20	<ul style="list-style-type: none"> • MHI Symposium • Launched MHD's website
	21	Commenced Safety Case Clinics
Nov	14	Self-assessment forms sent to workplaces, to determine MHI status
	16	PE (Chem) prescribed under PE Board
	24	Establish MHD's list of Safety Case Training Providers

Application for PE Registration

- ▶ Application for PE Registration
 - ▶ Civil Engineering
 - ▶ Electrical Engineering
 - ▶ Mechanical Engineering
 - ▶ Chemical Engineering

2016



<http://www.mom.gov.sg/workplace-safety-and-health/major-hazard-installations/building-capability>

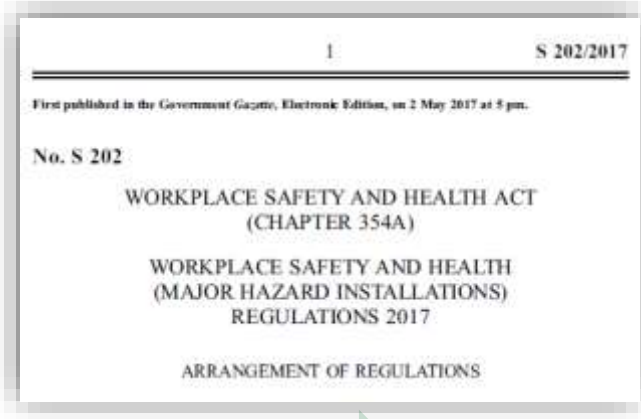
A Great Workforce A Great Workplace



Operationalising the Safety Case Regime



- SCIC x MHI industry x Regulator forum, for sharing best practices & collabs
- Senior representation from MHIs, MOM, NEA & SCDF



2017

**Inaugural Strategic Committee meeting
18 Apr**

**Engaging MHIs that are also EMA Gas Licencees
20 Feb**

**Gazette of WSH (MHI) Regs
2 May**

**MHD receives 1st Safety Case
1 Sep**



Information and guides to help you prepare and organise information for your safety case.

At a glance



<https://www.mom.gov.sg/workplace-safety-and-health/major-hazard-installations/preparing-for-safety-case>

Related documents

- [Safety case revision form](#)  **Sep 2017**
- [Safety case technical guide](#)  **16 Sep 2016**
- [Safety case assessment guide](#)  **1 Aug 2017**
- [Safety case Electrical, Control & Instrumentation \(EC&I\) aspects](#) 
- [ALARP demonstration guidelines: Single scenario risk tolerability target and adequacy of barriers](#) 
- [FAQ for ALARP demonstration guidelines](#) 
- [Guidelines on safety instrumented systems in Major Hazards Installations](#) 
- [Guidelines on managing human factors in Major Hazards Installations](#) 
- [Key Findings from Safety Case Assessment Intervention Plans](#) 

Feb 2018

Mar 2020

Oct 2020

Jul 2022

Aug 2022



The Safety Case Regime



- The Safety Case regime is the regulatory instrument that provides holistic and integrated regulatory oversight of Major Hazard Installations (MHIs) across regulatory agencies (MOM/NEA/SCDF).
- MHIs shall identify major hazard accident scenarios, **demonstrate** that adequate and reliable barriers have been put in place to reduce risks to as low as reasonably practicable (ALARP).
- The consequences of catastrophic MHI accidents will not only affect the lives of workers and the public, but also Singapore's economy and image as a leading energy and chemical hub.

Major Hazards Dept (MHD)

- MHD administers the Safety Case regime for MHIs, to reduce the risks of major accidents to ALARP and limit the consequences of major accidents
 - Receive and assess Safety Cases from MHIs
 - Conduct onsite verification of Safety Cases
- MHD also conducts investigations into major accidents and other chemical process-related incidents, to uncover root causes and rectify systemic deficiencies
- As a joint-agency department that ensures WOG outcomes and a single regulatory front led by MOM, MHD comprises officers from MOM, NEA, and SCDF, to:
 - Oversee workplace safety and health matters in MHIs
 - Engage and outreach to MHIs
 - Plan and coordinate multi-agency work.



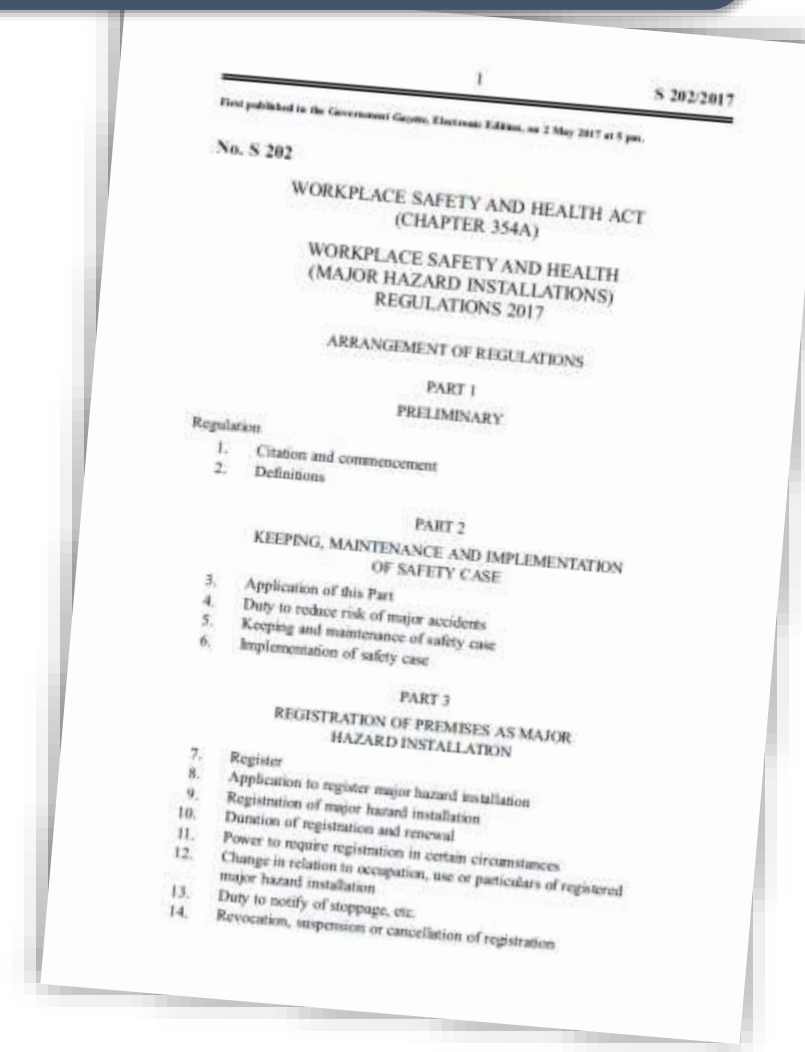
Effecting the Safety Case Regime through the Workplace Safety and Health (MHI) Regulations

Keeping, maintenance and implementation of Safety Case

Registration of premises as an MHI

Duties of Occupier of Registered MHI

- Safety Case
- Notification and Reporting
- Provision of Information



What is a Safety Case?

A Case which an MHI makes to the regulators, setting out how risks from major accidents hazards can be reduced to ALARP*, ensuring safe operations in a sustainable manner

* ALARP: As Low As Reasonably Practicable

A **Safety Case** includes details of:

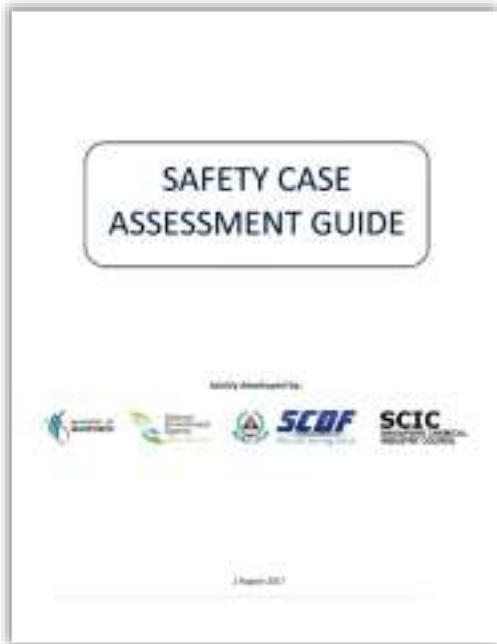
- ✓ *Hazard identification process*
- ✓ *Identification of hazards with the potential to cause major accidents*
- ✓ *Evaluation of major accident risks*
- ✓ *System/procedures put in place to control them*
- ✓ *Measures to limit major accident consequences*

MHIs to **convince** regulators that the strategy for managing safety is satisfactory, through robust reasoning backed by evidence, using the **ALARP** principle



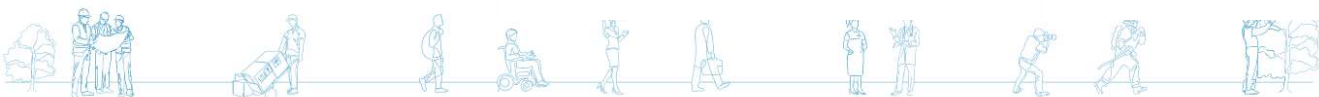
What is a Safety Case?

Co-developed with MHI industry representatives, in partnership with SCIC



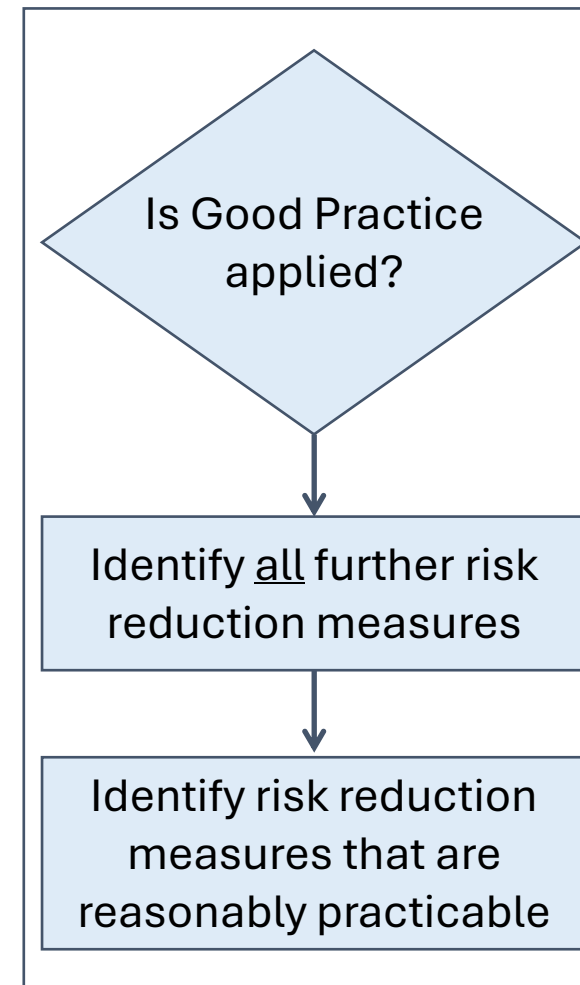
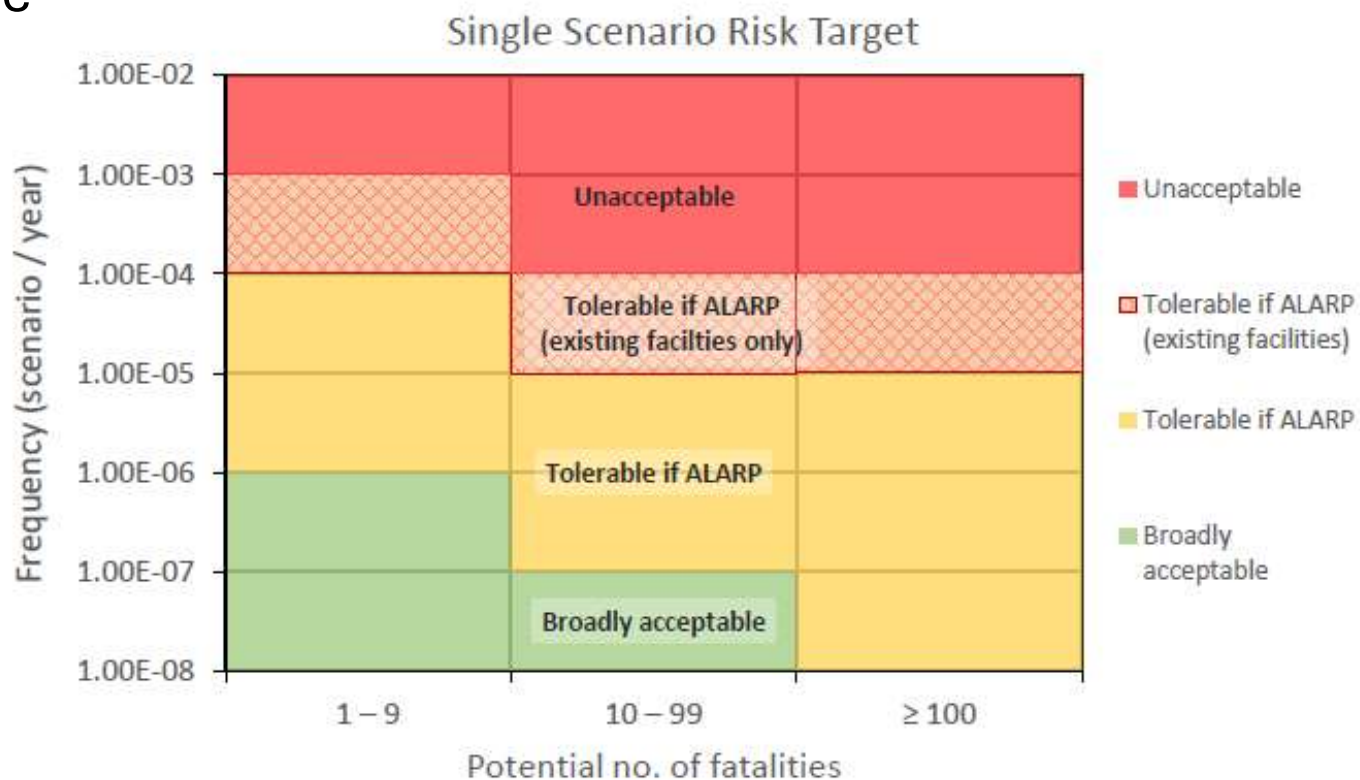
Key Safety Case Components

- Descriptive**
Information about MHI
- MAPP & SHMS**
Focus: major accident prevention
- Predictive**
Identify major accident hazards & quantify risks
- Process Safety**
- Mechanical Integrity & Assurance**
- Electrical, Control & Instrumentation**
- Human Factors**
Safety critical task, roles and design
- Emergency Response**
Incorporating domino impacts
- ALARP**
Gap analysis & Demonstration



Driving Continual Improvement through ALARP

- **ALARP demonstration** is a **new concept** to non-MHIs
- Demonstrations that risks identified from major hazards are reduced to **ALARP** is the **key feature** of the Safety Case Regime



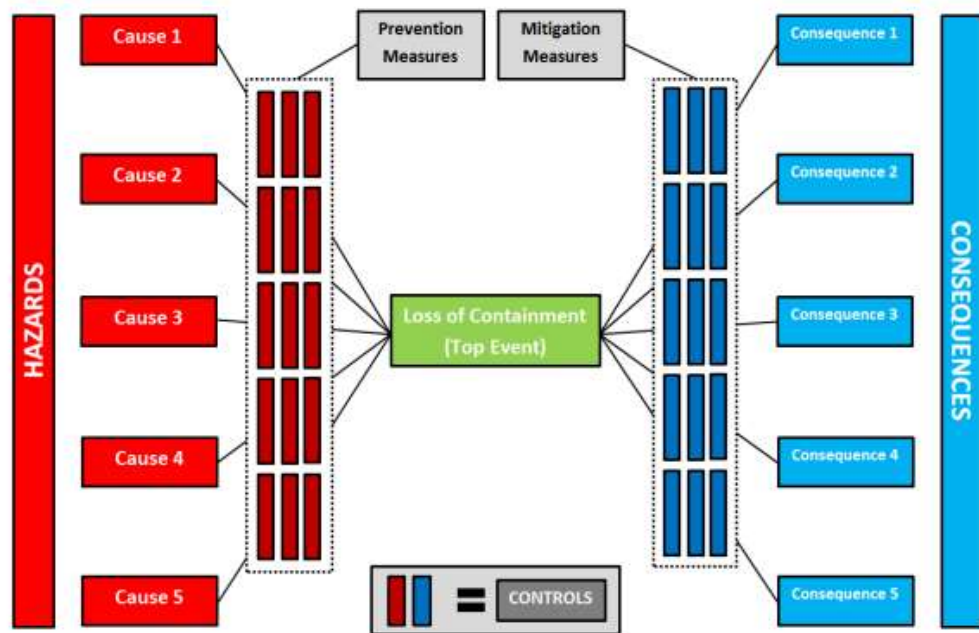
Safety Case Assessments by MHD

Key scope of assessment:

Adequacy	Sufficient layers to reduce risk against a set criteria
Robustness	Gaps are minimised or eliminated to prevent any abnormal event

Safety Case requires MHIs to:

- Establish clear link between barriers (measures) and Safety Critical Events (SCEs)
- Demonstrate how each measure contributes to reducing risk to ALARP



Safety Case Observations by MHD

1st cycle, Sep 2017 to Mar 2023

Positive Observations

- Good understanding of Safety Case assessment criteria
- Good understanding of MHI's operations
- Safety & Health Management Systems in place include process safety management

Common Gaps Observed

- Insufficient information to make necessary demonstration
- Lack of supporting documents to substantiate demonstration
- High reliance on corporate directives for control measures adopted, lack of full understanding of design basis



Managing Fire & Explosions Risks to ALARP in Safety Cases

- Identify foreseeable threats or initiating events that, without interventions or barriers, could lead to fires & explosions
 - Losses of containment (LOCs) of flammables
 - E.g. runaway reaction, poor integrity of primary containment, overfills
- Ensure adequate, independent and effective barriers are assessed against risk criteria
- Demonstrate ALARP, for example:
 - Safety of reaction chemistries and the basis of safety relied upon to ensure safety for a reactor
 - Adequacy and sufficiency of pressure relief arrangement for a given vessel, equipment, or system
 - An appropriate maintenance regime is established for plant and systems

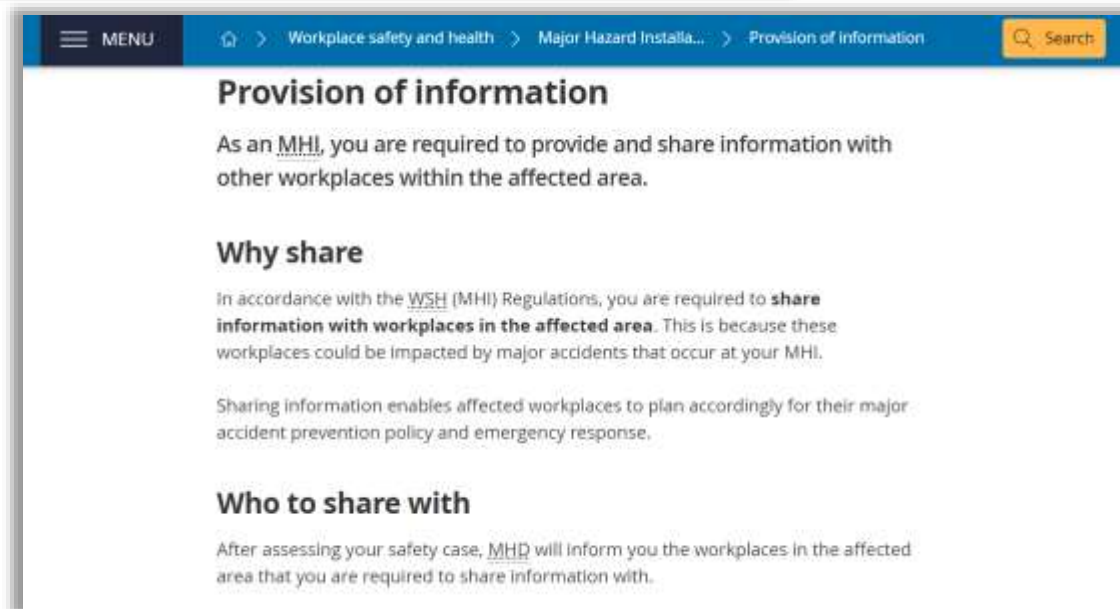


Path Forward – Info Sharing among MHIs

Key principle:

Share relevant and pertinent info wrt recipient

- Share harm footprints from an MHI's latest approved QRA, including footprint distances and a map showing affected areas
- For fire or explosion scenarios: 20kW/m², 4kW/m², 2psi, 1psi and Lower Flammability Limit (LFL) harm footprints
- For toxic scenarios: Nature and effects of toxic hazards



MENU

Workplace safety and health > Major Hazard Installa... > Provision of information

Provision of information

As an **MHI**, you are required to provide and share information with other workplaces within the affected area.

Why share

In accordance with the **WSH (MHI) Regulations**, you are required to **share information with workplaces in the affected area**. This is because these workplaces could be impacted by major accidents that occur at your MHI.

Sharing information enables affected workplaces to plan accordingly for their major accident prevention policy and emergency response.

Who to share with

After assessing your safety case, **MHD** will inform you the workplaces in the affected area that you are required to share information with.



Partnering SCIC to roll out a pilot in 4Q24, before implementation in phases



MOM's Reports on Fires & Explosions

 > Workplace safety and health > WSH reports and statistics

Inquiry Committee Report

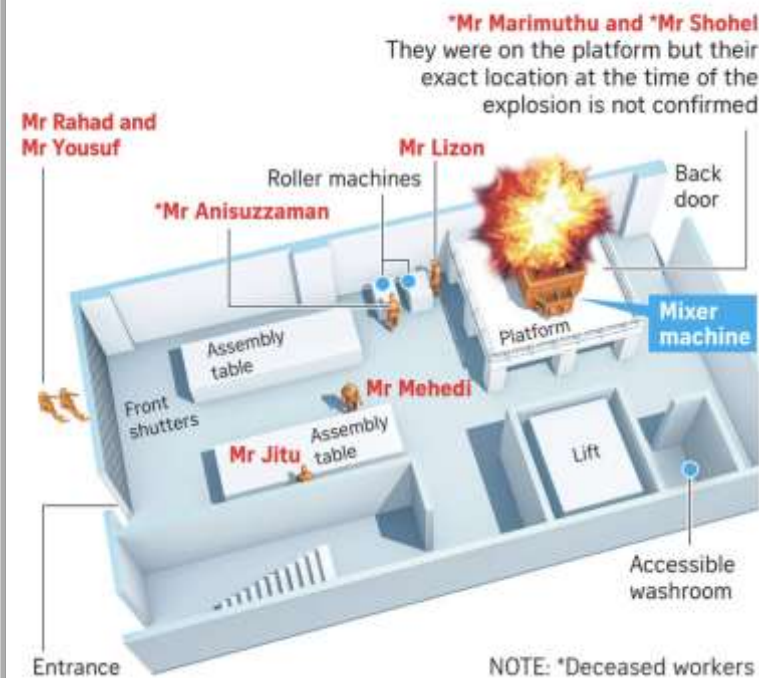
Download:

- Stars Engrg Inquiry Committee Report Part 1 
- Stars Engrg Inquiry Committee Report Part 2 Annex I 
- Stars Engrg Inquiry Committee Report Part 2 Annex II 
- Stars Engrg Inquiry Committee Report Part 2 Annex III 
- Stars Engrg Inquiry Committee Report Part 2 Annex IV 



<https://www.mom.gov.sg/workplace-safety-and-health/wsh-reports-and-statistics>

Where the workers were



MOM's Reports on Fires & Explosions



Learning reports

Fatal fire at LPG filling facility - LR - 2020/01

Workplaces handling flammable materials, including LPG, must implement effective risk control measures to prevent fire and explosions.



<https://www.mom.gov.sg/-/media/mom/documents/safety-health/learning-reports/learning-report-fatal-fire-at-summit-gas.pdf>



Thank You!

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