



Major Hazard Emergency Preparedness:

What FSMs need to manage

Derek Christopher Tan
Senior Consultant
ERCM Consultancy Pte Ltd

Derek Christopher Tan MScRM, MIFireE, IAAI-CFI, CSFSM, GDWSH, WSHO, AMBCI, ACLP

- > 30 years of experience as Practitioner & Trainer of Fire Safety, EHS, ERCM, and BCM

Operational and Training Experience (SCDF)

- Director (Assistant Commissioner), Fire Safety Department
- Commander, Marine Division
- Chief Fire Investigator, Fire Investigation Unit
- Commander, Changi Fire Station 2nd CD Division

Industrial Contributions

- Lecturer, Singapore Institution of Safety Officers (SISO) Academy
- MOM registered Workplace Safety and Health Officer
- Certified Senior Fire Safety Manager
- Certified Fire Investigator
- Member, Institution of Fire Engineers
- Certified Business Continuity Professional



Key Sharing Points

- Major accident scenarios in major hazard installations
- Legal and other requirements for emergency response
- The 4 Ps of effective emergency response management

Major Hazard Installations - "MOM Safety Case"



=> SCDF CERT Classification – Tier 1 Petroleum & Flammable Material Premises

The Safety Case Regime



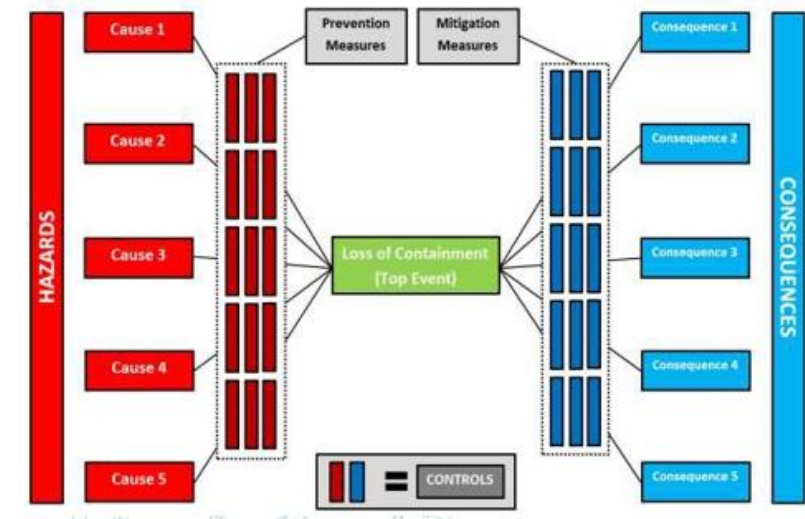
- Regulatory instrument that provides holistic and integrated regulatory oversight of Major Hazard Installations (MHIs) across regulatory agencies (MOM/NEA/SCDF).
- MHIs shall identify major hazard accident scenarios, **demonstrate** that adequate and reliable barriers have been put in place to reduce risks to as low as reasonably practicable (ALARP).

*Source: MOM (MHD) Slides

Major Accident Scenarios in Oil, Petrochemical, Energy and Chemicals (OPEC) Industry

“major accident” means an occurrence that —

- (a) arises from one or more uncontrolled events, including a major emission, fire or explosion;
- (b) involves one or more dangerous substances in the course of any operation or work being carried out within a major hazard installation; and
- (c) results in death, serious harm or a substantial number of persons requiring medical attention, whether or not within the major hazard installation;



Effective Emergency Response Management

- Emergency preparedness and response in Singapore is not governed by one single law, but by overlapping and mutually supporting legislation:

- **SCDF** → **Fire, medical & HAZMAT emergencies (FSM)**
- **MOM** → **Health & safety and major accident scenarios (WSHO)**
- **NEA** → **Environmental pollution and toxic release incidents (HS Storage Licensee)**

- FSMs are expected to integrate compliance in all three into a single, workable emergency response management system and not manage them in silos



Legal and Other Requirements

- **Fire Safety Act 1993 (SCDF), Workplace Safety & Health Act 2006 (MOM) and Environmental Protection & Management Act 1999 (NEA)**
- Fire Safety (Petroleum and Flammable Materials) Regulations 2008
- WSH (Major Hazard Installations) Regulations 2017
- WSH (General Provisions) Regulations 2007
- EPM (Hazardous Substances) Regulations 2008
- SS 651: 2019 Safety & Health Management System for the Chemical Industry
- *Responsible Care*[®] under the Singapore Chemical Industry Council (SCIC)

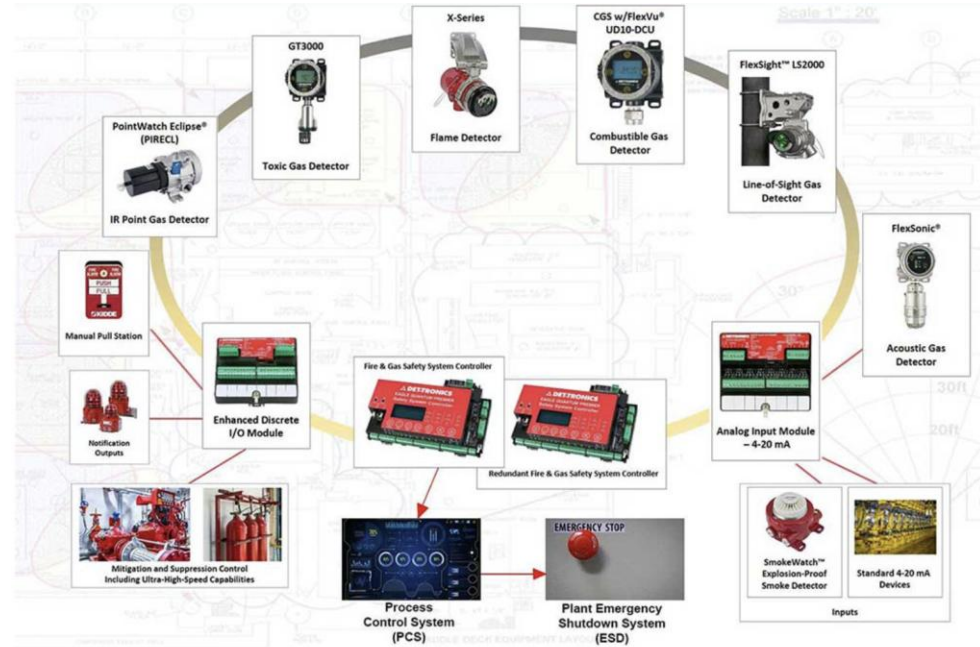
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GENERAL GUIDELINES FOR EMERGENCY RESPONSE PLAN

For (Company's Name) at (Company's Address)

This emergency response plan is developed by (Company's Name) and is to be handed over to SCDF responders in times of emergencies

(Name of Author)
(Appointment)
(Date of Issue)

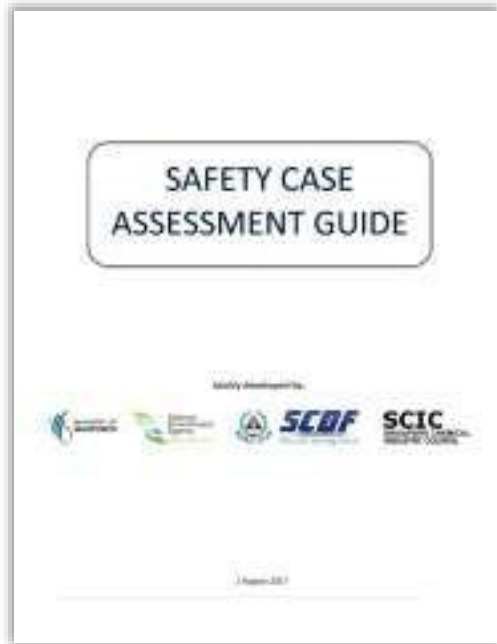


NATIONAL CERT STANDARD

| | CLASSIFICATION OF CERT PREMISES | MINIMUM TRAINING | MINIMUM EQUIPPING | | | | BASIC TASKING |
|------------------------------|---------------------------------|--|---|---|-----------|---|--|
| | | | PPE ¹ | MITIGATION | FIRST AID | COMMUNICATION | |
| P&FM Premises | Tier 1 P&FM | WSQ Respond to Fire & Hazmat Emergency (3 days) CERT First Aider Course (1 day) | <ul style="list-style-type: none"> Chemical suits² Rubber gloves² Rubber boots² Firefighting suit Firefighting helmet Goggles / Face shields Firefighting gloves Firefighting boots Breathing apparatus | <ul style="list-style-type: none"> HazMat absorbents² Leak sealing devices² Overpack drums² Fire extinguishers (appropriate class) Firefighting nozzles & hoses | | | <ul style="list-style-type: none"> Contain HazMat leaks² Prevent spread of HazMat² & fires Activate HazMat² & fire protection systems Contain and mitigate incipient stages of HazMat² & fire incidents Perform first aid, CPR & use AED Implement In-Place Protection Conduct mass evacuation Assist emergency responders |
| | Tier 1 HRI | Public & Industrial premises with FSM and classified as High Risk Installations by SCDF | WSQ Respond to Fire Emergency in Buildings (2 days) CERT First Aider Course (1 day) | <ul style="list-style-type: none"> Fire retardant coveralls Safety helmets Goggles / Face shields Safety gloves Safety boots Breathing apparatus | | <ul style="list-style-type: none"> First aid kit Foldable stretcher Casualty Blanket (Optional) AED | <ul style="list-style-type: none"> Loud hailer Walkie-talkie¹ |
| Fire Safety Manager Premises | Tier 2 | Public & Industrial premises with FSM and storing 5 or less metric tons of P&FM ² | <ul style="list-style-type: none"> Fire retardant coveralls Safety helmets Goggles / Face shields Safety gloves Safety boots | <ul style="list-style-type: none"> Fire extinguishers (appropriate class) Fire Blanket | | | <ul style="list-style-type: none"> Contain and mitigate incipient stages of fire incidents Perform first aid, CPR & use AED Implement In-Place Protection Conduct mass evacuation Assist emergency responders |
| | Tier 3 | Public & Industrial premises with FSM | WSQ Respond to Fire Incident in Workplace (1 day) CERT First Aider Course (1 day) | <ul style="list-style-type: none"> Fire retardant coveralls Safety helmets Goggles / Face shields Safety gloves Safety boots | | | |

Requirements of a Safety Case

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



Key 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

Scenario-Specific Emergency Plans (SSEP)

Develop SSEPs for specific sites and specific risks within boundary limit

Include in ERP (3.2.3.2 and Annex E) and used for internal CERT training

- Site and scenario specific
- Pre-planning
- Quick reference
- Checklist for responders

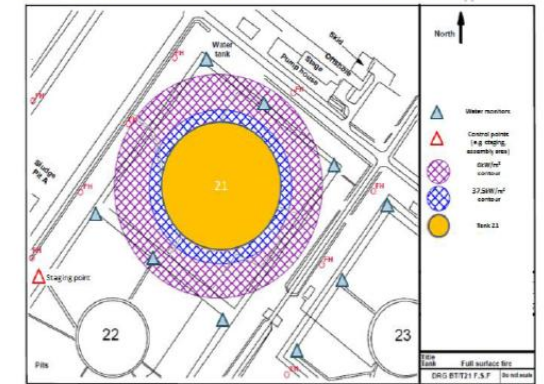
ANNEX E1

Example of Scenario-Specific Emergency Plans

| Emergency plan for: | | Description of the type of fire or emergency anticipated | | |
|--|--|---|---|---|
| Strategy: | | The major accident mitigation strategy which states the overall objectives to prevent escalation and bring the incident under control | | |
| Immediately | Actions | Equipment | Resources | Comments |
| Usually control room or site personnel who will notify relevant authorities and companies, alert, shutdown and evacuate etc. | Logical step-by-step actions which are required according to the incident type and location. Typically, alarm, evacuation, shut down, informing etc. | What equipment are required to carry out the actions? Valves or devices to isolate. | Can be CERT, fire wardens, FSM etc. | As required. |
| 1st response | Actions | Equipment | Resources | Comments |
| May be CERT and/or 3 rd party fire brigade. | Sizing up of incident. Logical step-by-step actions necessary to isolate the fuel, or carry out initial incident control actions. | Fixed equipment systems installed on-site. Portable fire equipment for initial control. Any water or foam monitors required. Appropriate PPE etc. | Any foam concentrate required. The anticipated water demand for the incident. Fire hose/nozzles required. The number of hose will be based on the hydrant locations and fire vehicles used. The fire vehicles from CERT or 3 rd party fire brigades. | As required. |
| 2nd response | Actions | Equipment | Resources | Comments |
| Linking up with SCDF. Site personnel may be required to do other tasks at this stage. | Logical step-by-step actions necessary to control and mitigate the incident. | Fixed equipment systems installed on-site. Any water /foam monitors required. | Resources available to assist SCDF operations: e.g. foam concentrate and water supply | Foam applied at pertinent application rate etc. |
| Ongoing potential hazards Any known hazards that will be present because of the anticipated fire either from flame impingement or radiated or conducted heat. Also consider any explosion possibility. | | | | |
| Other issues Any other issues, e.g. personnel safety, gas releases, public exposure. | | | | |

ANNEX E1

Example of Hazard Effects Map for Scenario-Specific Emergency Plans

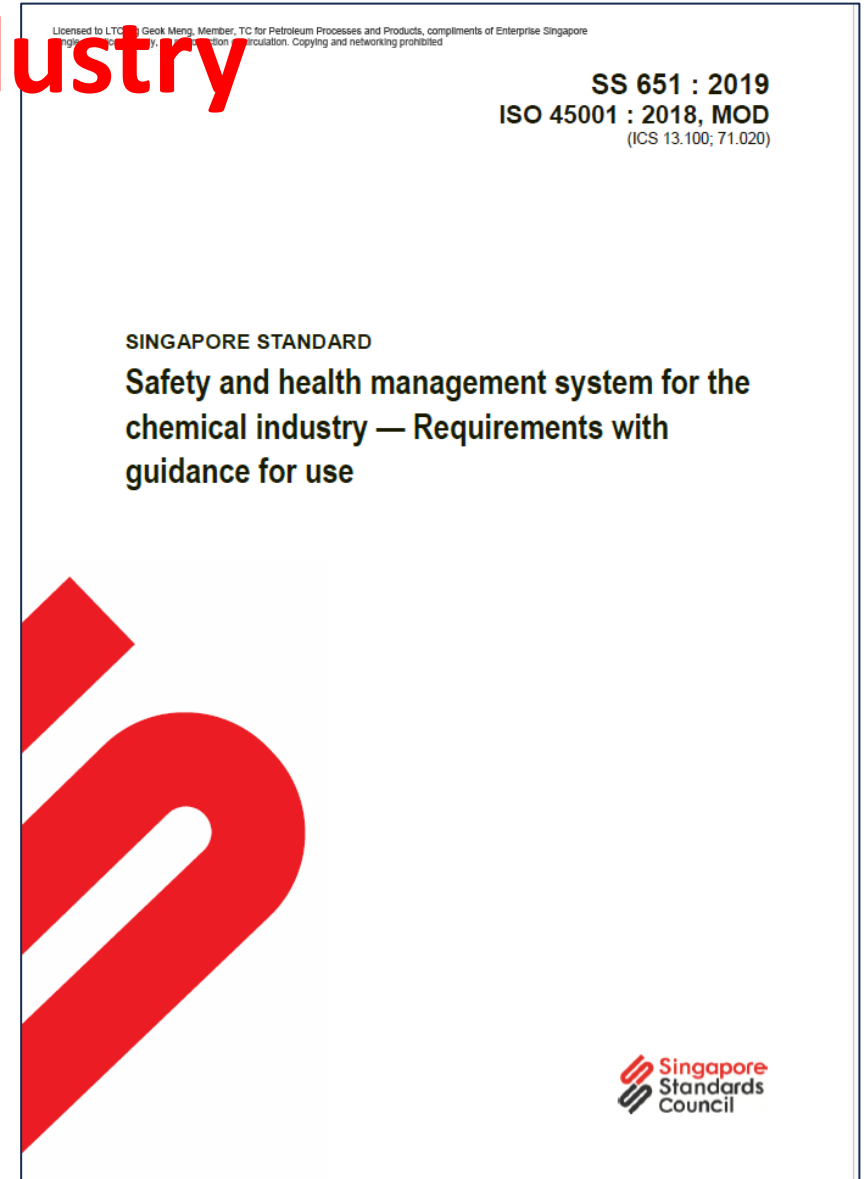


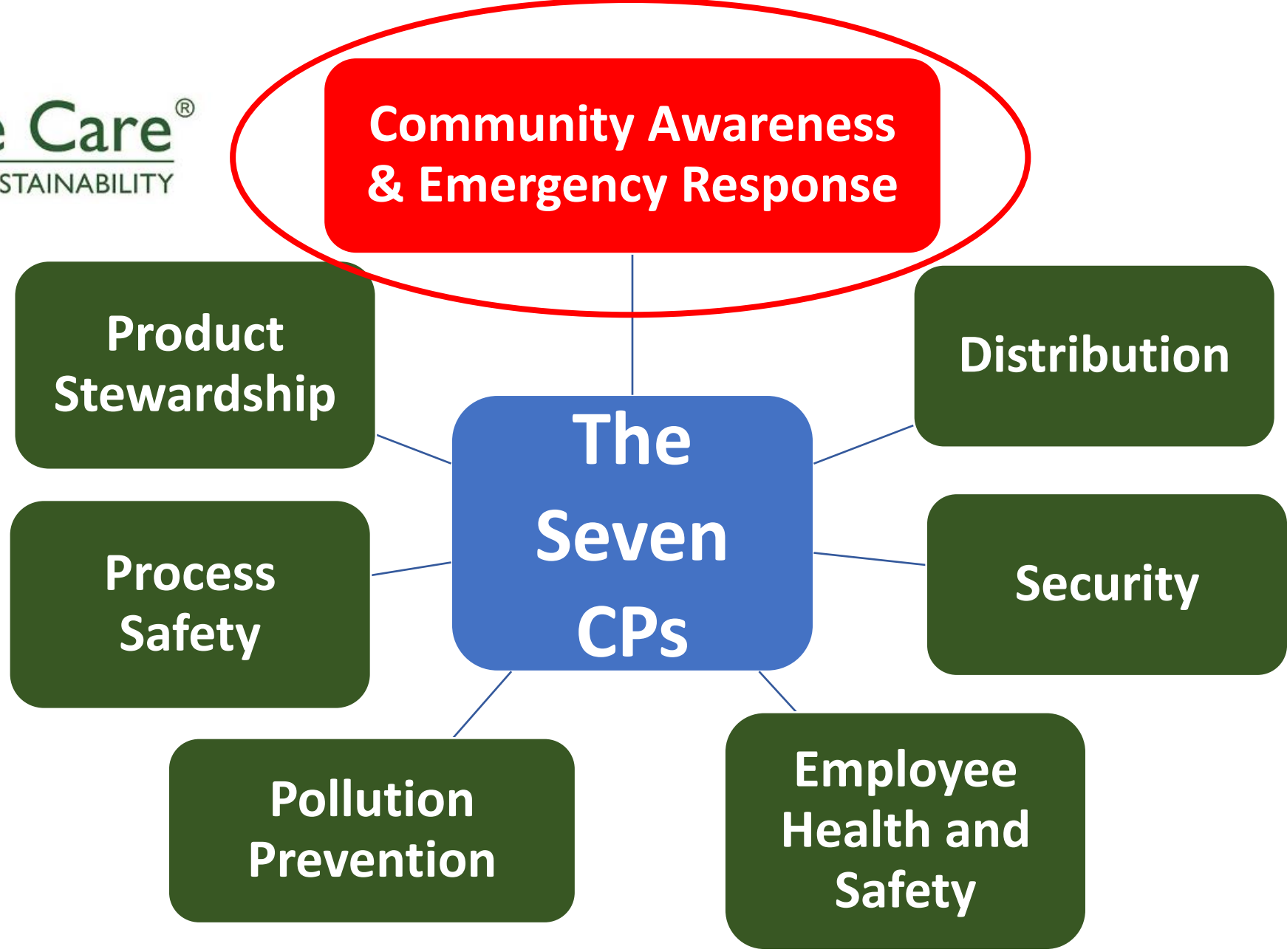
SS 651: 2019 Safety & Health Management System for the Chemical Industry

8.2 Emergency preparedness and response

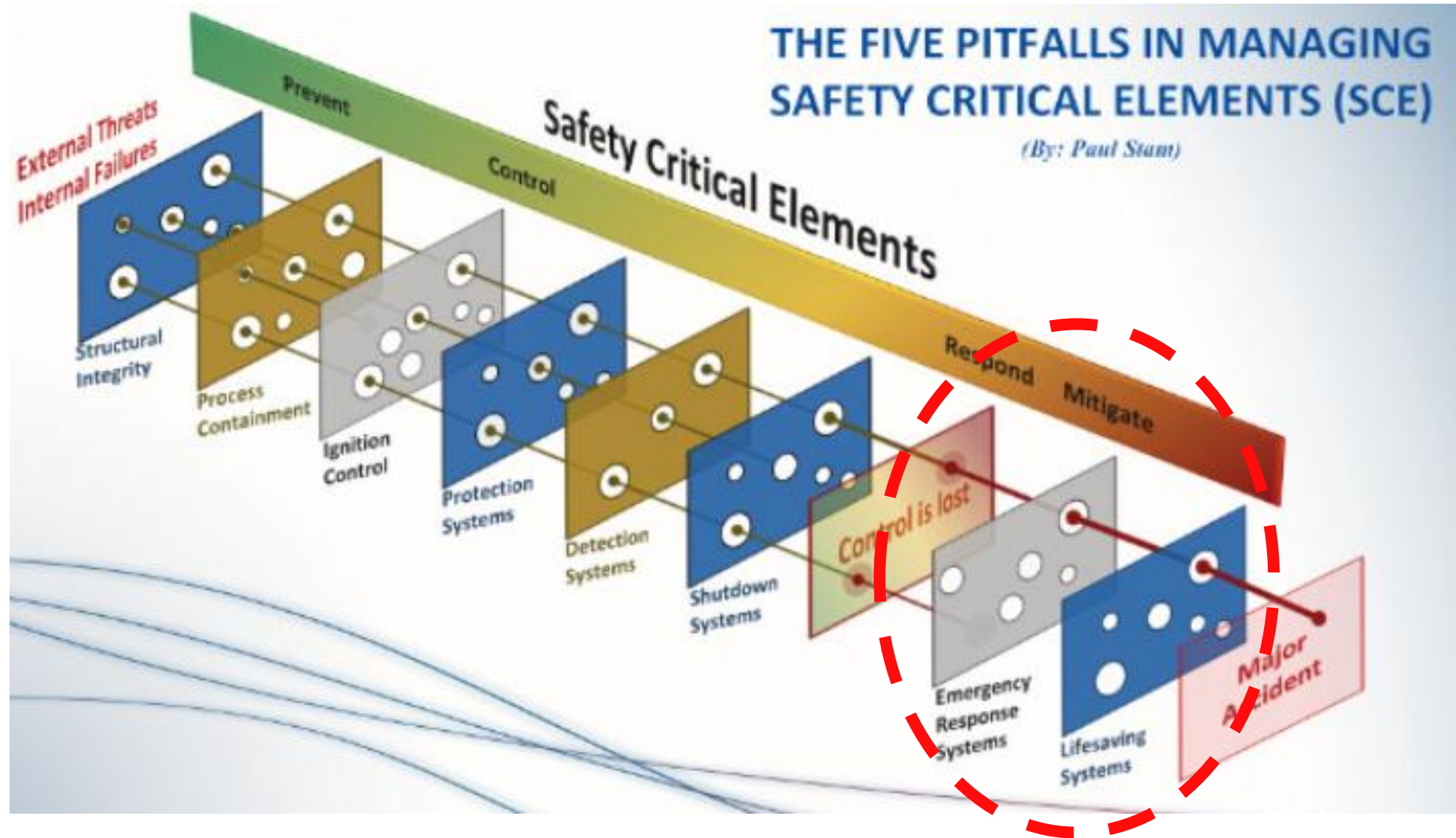
The organisation shall establish, implement and maintain applicable processes needed to prepare for and respond to potential emergency situations, as identified in 6.1.2.2, including:

- a) establishing of a planned response to emergency situations, including the provision of first aid;
- b) provision of training for the planned response;
- c) periodic testing and exercising the planned response capability;
- d) evaluating the performance and, as necessary, revising the planned response, including after testing and, in particular after the occurrence of emergency situations;
- e) communicating and providing relevant information to all workers on their duties and responsibilities;
- f) communicating relevant information to contractors, visitors, emergency response services, government authorities and, as appropriate, the local community;
- g) taking into account the needs and capabilities of all relevant interested parties and ensuring their involvement, as appropriate, in the development of the planned response.

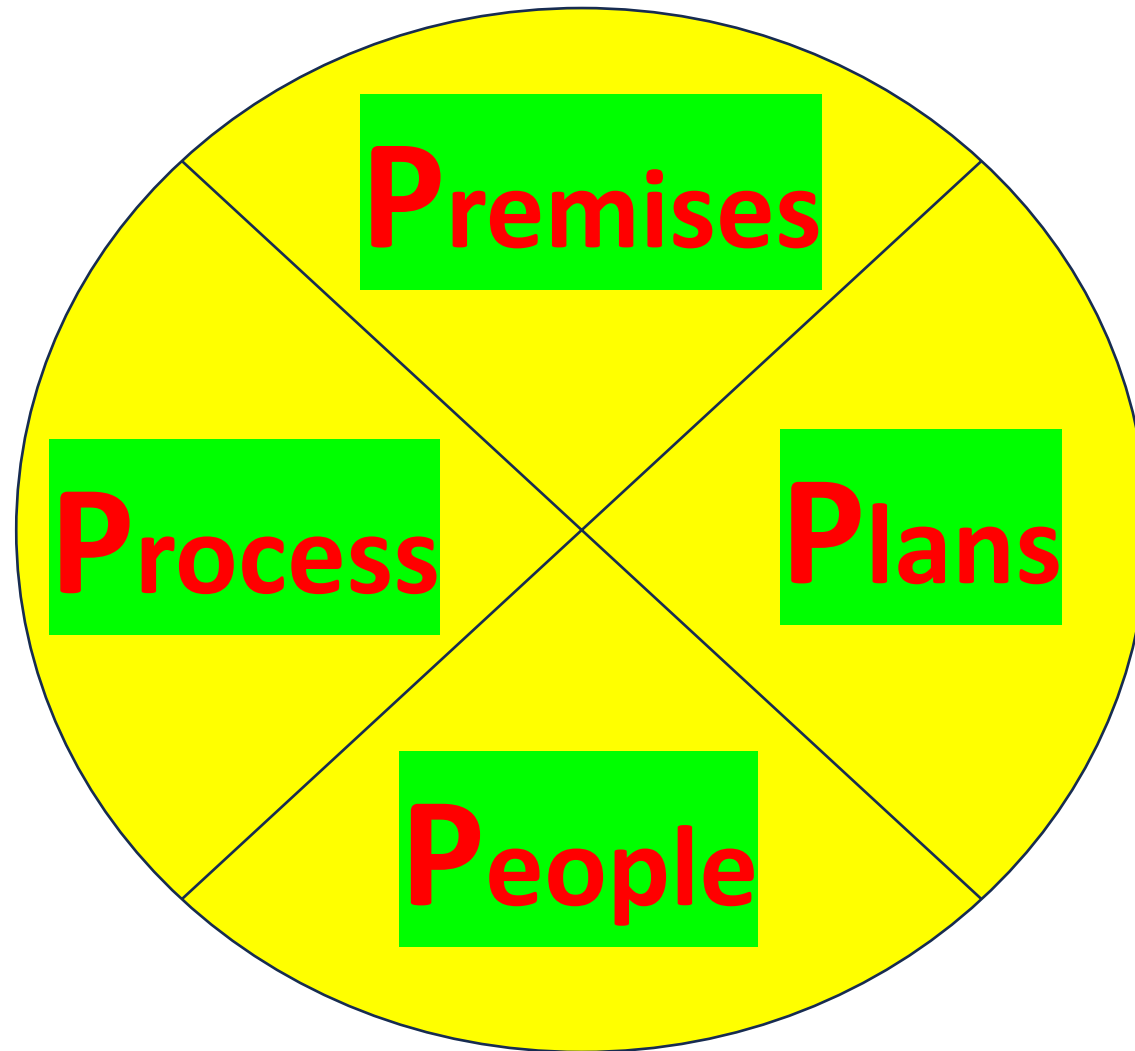




Last Line of Defence.....



Key Takeaway – “The 4 Ps” of Preparedness

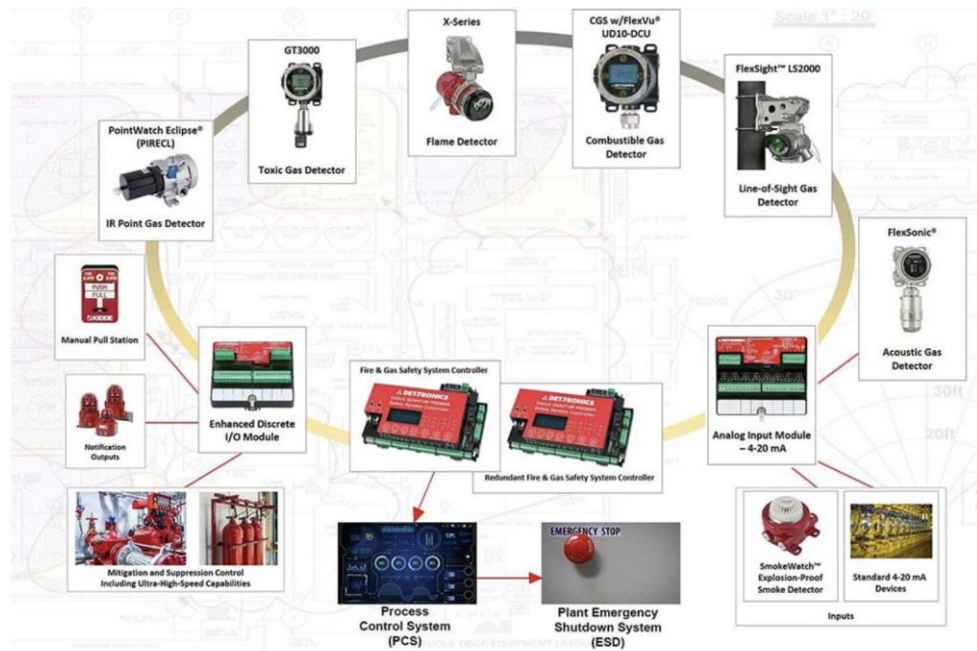


“The 4 Ps” of Preparedness

- **Premises** => Well Maintained Premises Detection and Protection Systems
- **Plans** => Well prepared ERP and Safety Case SSEPs
- **People** => Well equipped and trained FSM and emergency response organisation / CERT
- **Process** => Integrated Emergency Response Management System

The First P - PREMISES

- Maintain premises detection and protection systems well to deal rapidly with *all* documented **Scenario Critical Events** and **Major Accident Scenarios** in Safety Case and ERP



- Leakage detection and emergency alarms
- Fire detection systems
- Flame / fire suppression systems
- Foam discharge systems
- Deluge spray systems
- ESD and ROSOV functions
- Safety instrumented functions

The Second P - PLANS

- Validate ERP regularly and exercise/drill CERT according to the requirements stipulated under both the **SCDF CERT Audit checklist** and **MOM Safety Case Assessment Guide – Appendix H – ‘Emergency Response Assessment Criteria and Guidance’**



Appendix H – ‘Emergency Response Assessment Criteria and Guidance’

| Technical Criterion | Guidance |
|--|--|
| Equipment and Systems Installed to Limit Consequence of Major Accidents | |
| <p>9.1 The safety case shall describe the fixed equipment and systems installed on plant that limit or mitigate the consequences of major accidents and how these equipment or systems affect how an emergency is mitigated.</p> | <p><u>To meet this criterion</u>, the safety case shall show basic information, which should include:</p> <ul style="list-style-type: none"> a) the fixed equipment or systems available; b) a description of such equipment and systems; c) how these equipment or systems affect how a major accident is mitigated; d) list of relevant regulations, standards and codes of practices have been followed; and e) the manual intervention required. |
| Organisation, Arrangements and Provisions for the Alerting and Intervening in the Event of a Major Accident | |
| <p>9.2 The safety case shall describe the organisation, arrangements and provisions for the alerting and intervening in the event of a major accident to provide evidence that the necessary control measures have been taken on-site.</p> | <p><u>To meet this criterion</u>, the safety case shall show basic organisational information, which should include the functions of key posts and groups with duties in the emergency response. The following information on the organisation for alerting and intervening in the event of a major accident should be included:</p> <ul style="list-style-type: none"> a) the arrangements for informing individuals on-site, neighbouring installations, where relevant: <ul style="list-style-type: none"> (i) to the nature of the alarms and the plant conditions required to activate them; and (ii) the initial actions required both on-site and off-site in response to alarm warnings. b) the arrangements and conditions for alerting and mobilising: <ul style="list-style-type: none"> (i) individuals or groups with defined responsibilities under the emergency response plans, including essential personnel on-site and off-site; (ii) the emergency services (e.g. SCDF); (iii) neighbouring installations, which may be affected by the off-site effects from the major accident or where mutual aid agreements exist; and (iv) external agencies. c) the arrangements for controlling and limiting the escalation of accidents on-site, including: |

The Third P - PEOPLE

Site Main
Controller



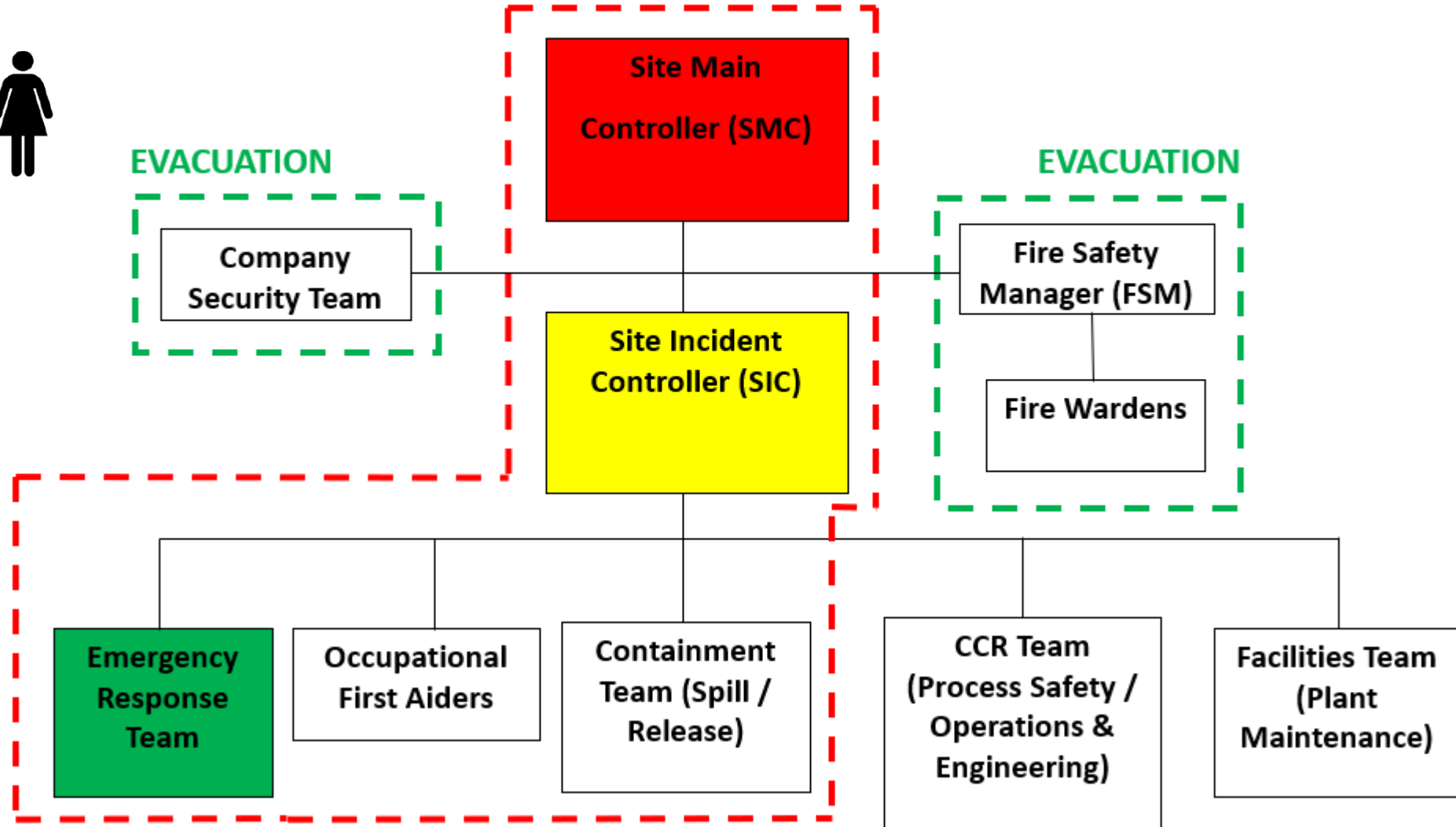
Site Incident
Controller



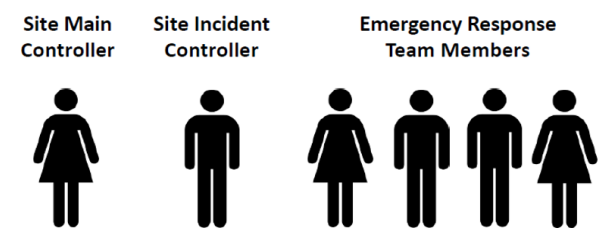
Emergency Response
Team Members



INCIDENT MANAGEMENT



The Third P - PEOPLE



- Conduct refresher training for CERT based on **fire risk assessments, major accident scenarios** and **incident management** / command and control

| Premises | Tier 1 P&FM | Tier 1 HRI/Tier 2/Tier 3 |
|----------------------------|---|--|
| Re-certification programme | All CERT members (SIC and ERT) must attend once annually | Not required |
| Refresher training | Not mandatory as CERT members must attend the re-certification programme. However company can still conduct additional trainings for the CERT members. | Training for the CERT members can be conducted internally or externally. |

The Third P - PEOPLE

- Maintain CERT equipping and acquire suitable PPE to deal with your most flammable and toxic chemical(s) based on their SDSes



| NATIONAL CERT REGULATION EQUIPPING Company Emergency Response Team (CERT) | | | |
|--|---|---|--|
| PPE - Personal Protective Equipment - TIER 1 | | | |
| FIRE FIGHTING SUIT EN469-2005, o/w: Fire Helmet, EN843-2008 Fire Glove, 659-2003 Fire Boots, EN15090-2006 | SCBA, TYPE 2 EN137:2006 | CHEMICAL SUIT Level A Gas-Tight / Level B | HAZMAT EQPT Sorbent Soil Kit Over Pack Drum |
| PPE - Personal Protective Equipment - TIER 2 / 3 | | | |
| FIRE RETARDANT GARMENT NOMEX 111A | HELMET o/w VISOIR & Neck Curtain | SAFETY GLOVE Fire Resistant Cut Resistant Level 5 (Allergy-free) | SAFETY BOOTS Fire & Chemical Resistant |
| MITIGATION / FIRST AID / COMMUNICATION | | | |
| FIRST AID KIT | LOUD HAILER | FOLDABLE STRETCHER | AED |
| FIRE BLANKET | FIRE EXTINGUISHER | DIVIDER BREACH FIRE HOSE | FIRE NOZZLE |

- Reference relevant sections:
 - Section 5: Firefighting Measures
 - Section 6: Accidental Release Measures
 - Section 8: Exposure Controls / Personal Protection

| SAFETY DATA SHEET | | |
|---|---|----------------|
| Revision: 3.0 Date: 14 April 2021 | | Naphtha |
| ACCORDING TO OSHA HCS (29 CFR 1910.1200) | | |
| SECTION 1: IDENTIFICATION | | |
| Product Identifier | Product name: Naphtha Synonym(s): Light Naphtha, Japan Open Spec Bonded Naphtha, SNG Naphtha, Light Cat Naphtha, Sweet Virgin Naphtha (SVN), Debutanized Naphtha, Atmospheric Naphtha (DAN), HCU Light Naphtha, Light CR Gasoline, Full Range Cracked Naphtha, Full Range Hydrocracked Naphtha, Full Range Reformed Naphtha, Light Chemical Treated Naphtha, Light Cracked Naphtha, Light Hydrocracked Naphtha, Light Hydrotreated Naphtha, Aviation Alkylate Naphtha | |
| CAS Number | 8030-30-6 | |
| Other means of identification | None | |
| Relevant identified uses of the substance or mixture and uses advised against | Identified Use(s): Fuel Component, Refinery Intermediate Stream Uses advised against: Anything other than the above. | |
| Details of the supplier of the safety data sheet | Supplier: Vitol Inc. 2925 Richmond Ave, 11th Floor Houston, TX 77099 (713) 230-1000 713-230-1185 E-mail: (competent person) SD@HCU@vitol.com | |
| Emergency telephone number | Emergency Phone No.: Chemtrec: US/Canada: 1-800-424-9300 (24h) Mexico: 800 681 9531 (24h) | |
| SECTION 2: HAZARDS IDENTIFICATION | | |
| Classification of the substance or mixture in accordance with paragraph (d) of 29 CFR 1910.1200 | | |
| Physical hazards Flammable Liquid, Category 2 | Aspiration hazard, Category 1 Skin Corrosion/Irritation, Category 2 Eye Irritation, Category 2B Specific target organ toxicity — single exposure, Category 3 (Narcotic effects) Carcinogen, Category 1B Germ cell mutagenicity, Category 1B Reproductive toxicity, Category 2 Specific target organ toxicity — repeated exposure, Category 2 Hazardous to the aquatic environment, Acute, Category 2 Hazardous to the aquatic environment, Chronic, Category 2 | |
| Health hazards | | |
| Environmental hazards | | |
| Label elements | Hazard Pictogram(s): | |
| Signal Word(s) | DANGER | |
| Page: 1 of 9 | | |

NATIONAL CERT STANDARD

| | | CLASSIFICATION OF CERT PREMISES | MINIMUM TRAINING | MINIMUM EQUIPPING | | | | BASIC TASKING |
|------------------------------|-------------|--|--|---|---|---|--|--|
| | | | | PPE ¹ | MITIGATION | FIRST AID | COMMUNICATION | |
| P&FM Premises | Tier 1 P&FM | Premises storing more than 5 metric tons of Petroleum & Flammable Material | WSQ Respond to Fire & Hazmat Emergency (3 days) CERT First Aider Course (1 day) | <ul style="list-style-type: none"> Chemical suits² Rubber gloves² Rubber boots² Firefighting suit Firefighting helmet Goggles / Face shields Firefighting gloves Firefighting boots Breathing apparatus | <ul style="list-style-type: none"> HazMat absorbents² Leak sealing devices² Overpack drums² Fire extinguishers (appropriate class) Firefighting nozzles & hoses | | | <ul style="list-style-type: none"> Contain HazMat leaks² Prevent spread of HazMat² & fires Activate HazMat² & fire protection systems Contain and mitigate incipient stages of HazMat² & fire incidents Perform first aid, CPR & use AED Implement In-Place Protection Conduct mass evacuation Assist emergency responders |
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| | Tier 2 | Public & Industrial premises with FSM and storing 5 or less metric tons of P&FM ² | CERT First Aider Course (1 day) | <ul style="list-style-type: none"> Fire retardant coveralls Safety helmets Goggles / Face shields Safety gloves Safety boots | <ul style="list-style-type: none"> Fire extinguishers (appropriate class) Fire Blanket | | | |
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MINIMUM REQUIREMENTS

¹A minimum of 5 sets of PPE are required, for 1 SIC and 4 ERT members. ² If applicable.
 CERT classification for diesel only FSM premises with underground diesel storage tanks will be in tier 3 and premises with aboveground diesel storage tanks will be in tier 2*
 There should be periodic medical checks to ascertain the fitness health and safety of CERT equipped with BA sets*
 *(These provisions may not be applicable to all premises)

The Fourth P - PROCESS

- Develop and maintain an ***integrated* Emergency Response Management System** (ERMS) to deal with ALL your worst case scenarios holistically

- System to cover:
 - Defensive firefighting and boundary cooling
 - Snatch rescue/casualty management and prompt evacuation or In-place protection (IPP)*
 - Toxic release containment and consequence mitigation
 - Joint operations with SCDF and other regulatory authorities
 - Plant isolation and emergency site shut down
- Focus on **efficient site evacuation** and **escalation prevention**

** based on SMC/SIC impact assessment*

“An effective FSM does not manage emergency preparedness by regulator — but by effective scenario response, integrated plans, and capable people.”

Thank You....



christophertan@ercmconsultancy.com

Upcoming New Courses...

CERT EMERGENCY RESPONSE FOR EV, BESS & SOLAR PV SYSTEMS

COURSE OBJECTIVE

- To provide participants with essential knowledge and response strategies to manage Photovoltaic (PV) Panels, Battery Energy Storage Systems (BESS), and Electric Vehicle (EV) fire incidents safely

COURSE OUTLINE

- Introduction to PV, BESS and EV Fire Risks
 - Overview PV Systems, BESS and EVs
 - CERT roles and limitations
- EV Fire Fundamentals and Response
 - Battery fire behaviour and hazards
 - Scene size-up, isolation, and safety measures
- PV Systems and BESS Fire Fundamentals and Response
 - PV and BESS hazards and fire considerations
 - Safe approach, shutdown principles, and roof safety
- Incident Management and Escalation
 - Communication and coordination with SCDF
 - Post-incident considerations
- Case Studies/ Scenario Discussion
 - Lesson learnt from real incidents

COURSE AUDIENCE

- CERT Members
- Fire Safety Managers
- Fire Wardens
- Safety Personnel
- Facilities and Operations Staff

CERTIFICATION

Participants will receive an e-certificate of participation

CONTACT US

Call/ Whatsapp **88747878**
Email inquiry@ercmconsultancy.com

