

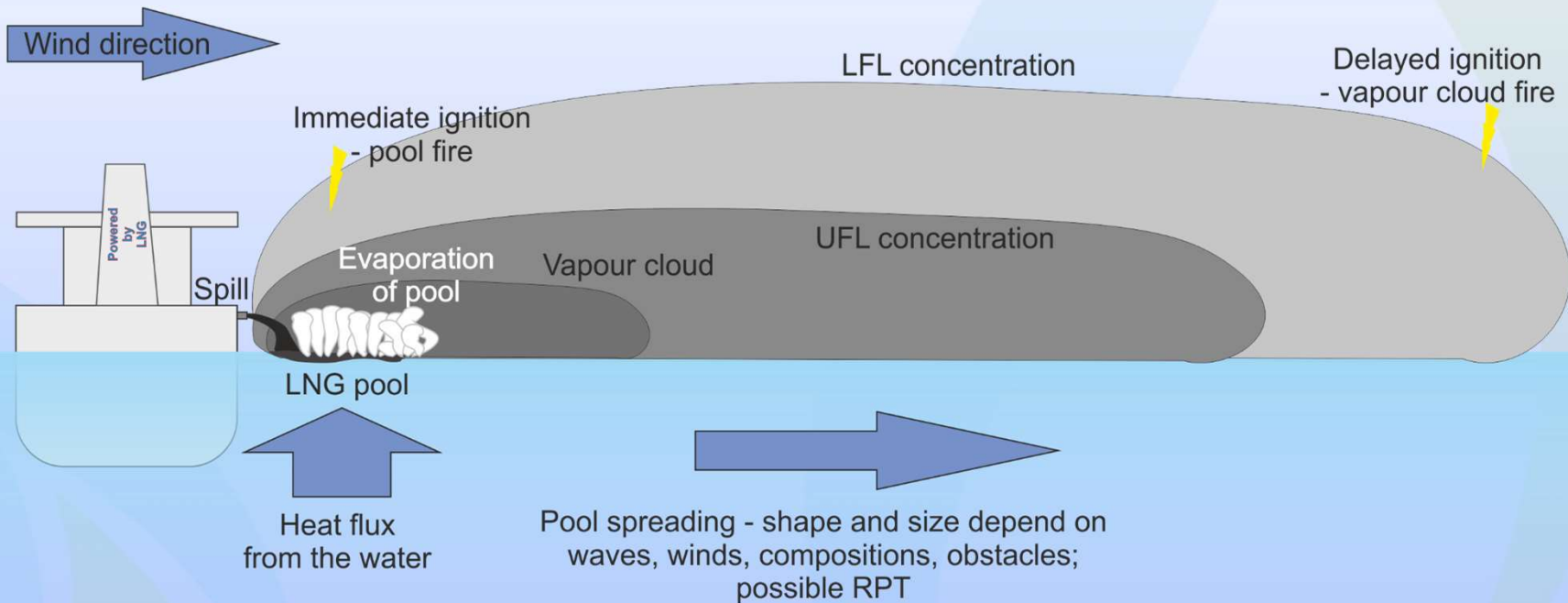
# MB 04: CARRY OUT FIREFIGHTING OPERATIONS ON A SHIP SUBJECT TO THE IGF CODE

# Fire categories

FIRES MAY BE BROADLY CATEGORISED AS FOLLOWS:

- Minor fires at pump glands, pipe flanges and relief valves
- Fires from confined liquid pools
- Fires from unconfined spillages
- Fires in confined space

# Possible fire scenarios when LNG is spilled on water



# FIRE

## **Fighting LNG fire:**

- Fire-fighting plan
- Dry powder
- Water
- CO<sub>2</sub>
- Fire-fighters protection

## **Fire-fighting plan:**

- Well prepared
- Avoid 'hit and run' tactics
- Consider controlled burning
- Cool down surroundings

# Dry Powder

1. Use all possible dispensers
2. Causes the flame to go out almost at once
3. No cooling effect
4. Avoid direct pressure of powder jets on to the surface of LNG
5. Kick-back effect

Dry powder system



*source: Danfoss SemCo Fire protection Manuals*

# Water

1. NEVER hit LNG fire directly with water
2. Cool down surrounding bulkheads and decks.
3. No water to be mixed with burning LNG.
4. Essential for protecting steel work

Firefighting boats



source: LNG Masterplan for Rhine-Main-Danube, ver1.0 , April 2015

# CO<sub>2</sub>

## CO<sub>2</sub> extinguisher system used for closed areas

high-pressure carbon dioxide displaces



source: *Pacific maritime magazine*, 2016

# FIRE-FIGHTERS PROTECTION

1. Full PPE
2. Approach the fire with Water spray jets
3. Consider weather conditions

Minimum number of Firefighter's outfits required:

Total cargo / bunker capacity	Number of outfits
5000 m <sup>3</sup> and below	4
Above 5000 m <sup>3</sup>	5



# Firefighter's outfit consist of:

1. One set of breathing apparatus:
  - self-contained compressed air-operated
  - min capacity 1,200 l free air
  - incorporating full face mask
2. Full PPE
3. Rescue line with belt
4. Torch/lamp

# GENERAL PROCEDURE FOR FIGHTING LNG FIRES

1. Isolate the source of leak
2. Sound the alarm
3. Fire fighters teams on stand-by
4. Use dry powder
5. Stand-by for re-ignition

# LNG FIRE-FIGHTING AGENTS

- Water spray systems
- Dry chemical powder
- Gas smothering systems (CO<sub>2</sub> or N<sub>2</sub>)

# WATER SPRAY SYSTEMS

Requirements for WATER SPRAY SYSTEMS on a LNG tanker:

- Location of water spray nozzles
  - each tank liquid and vapor dome
  - at the midships manifold
  - on the compressor house
  - on the forward bulkhead of the accommodation block
  - and around the midships cargo control room if applicable
- Spray nozzles are fed from an independent water pump and line system
- Cross connected with the ship's fire main

# DRY CHEMICAL POWDER

Requirements for DRY CHEMICAL POWDER on gas tankers:

- Follow Manufacturer's instructions
- Clear dry powder hose with N<sub>2</sub> after each use
- Use at max rate
- Attack the fire down-wind direction
- Avoid direct impact of powder jets on pool surfaces or leaks

# GAS SMOTHERING SYSTEMS

Requirements for GAS SMOTHERING SYSTEMS on gas tankers:

- CO<sub>2</sub> and nitrogen are the most efficient agent for fighting liquid and vapor fires
- Lower the oxygen content
- Reduced the boil-off rate

# FIRE IN THE MACHINERY

## REQUIRED SAFETY ACTIONS AT FIRE DETECTION IN THE MACHINERY SPACE:

- alarm
- automatic shutdown of main tank valve
- automatic shutdown of gas supply to machinery space containing gas-fueled engines
- Ventilation Stop and Fire Damper Close (either automatic or simple action')

# REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM (cont.1/6)

## Fire alarm system

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graph TD; A[Fire alarm system] --> B[FIXED:]; A --> C[SMOKE DETECTORS:];
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### FIXED:

- fuel storage hold spaces
- ventilation trunk for fuel containment system below deck,
- other rooms of the fuel gas system

### SMOKE DETECTORS:

- alone not sufficient for rapid detection of a fire



# REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM

(cont.2/6)

## REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM:

1. Gas sampling piping system for toxic gases
2. Continuous gas detection type with immediate response
3. Gas detection equipment requirements
  - each sampling head located sequentially at intervals not exceeding 30 min
  - individual sampling lines from sampling heads
  - no sampling pipes in non-hazardous spaces

## EXCEPTION:

1. Fully enclosed steel cabinet with automatic SHUT DOWN system
2. Steel sample pipes in forward bulkhead

# REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM

(cont.3/6)

4. Flame arrester and a manual isolating valve for Non-hazardous space gas sampling lines
5. Audible and visible alarm:
  - on the navigation bridge
  - at control station(s)
  - at the gas detector readout location
6. Gas detection equipment for flammable products:
  - inerted hold spaces and interbarrier spaces measuring gas concentrations of 0% to 100% by volume

# REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM

(cont.4/6)

7. Alarms activated when:  
**VAPOUR CONCENTRATION BY VOLUME REACHES  
THE EQUIVALENT OF 30% LFL IN AIR**
8. For membrane containment systems:
  - Gas content analyzed individually from primary and secondary insulation spaces
  - For other spaces:
    - Alarms activated when the vapor concentration reaches 30% LFL
    - Safety functions shall be activated before the vapor concentration reaches 60% LFL
    - The crankcases of internal combustion engines that can run on gas shall be arranged to alarm before 100% LFL

# REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM

(cont.5/6)

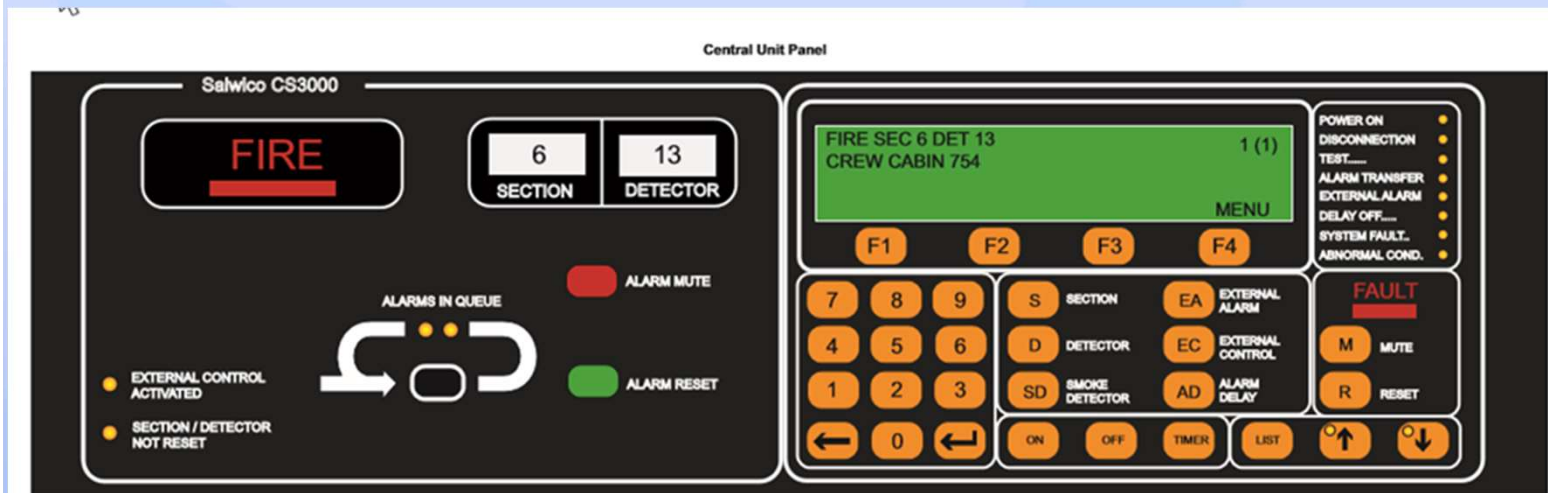
9. Gas detection equipment shall be so designed that it may readily be tested

Testing and calibration shall be carried out at regular intervals.

Suitable equipment for this purpose shall be carried on board and be used in accordance with the manufacturer's recommendations.

Permanent connections for such test equipment shall be fitted

Example of fire alarm panel



# REGULATIONS FOR FIRE DETECTION AND ALARM SYSTEM

(cont.6/6)

- 10. Minimum 2 sets of portable gas detection equipment on ship
- 11. Oxygen levels in inert atmospheres detectors

Personal GAS monitor Riken GX2001



[source: <http://www.rkiinstruments.com>]

Gas Detector Riken RX41



[source: <http://www.equipcoservices.com>]

- Thank you for your attention