

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

Plan of lecture

- 1. Fire organization and action to be taken on ships subject to the IGF Code**
- 2. Special hazards associated with fuel systems and fuel handling on ships subject to the IGF Code**
- 3. Firefighting agents and methods used to control and extinguish fires in conjunction with the different fuels found on board ships subject to the IGF Code**
- 4. Firefighting system operations**

FIRE ORGANIZATION AND ACTION TO BE TAKEN ON SHIPS SUBJECT TO THE IGF CODE

EMERGENCY ORGANIZATIONAL STRUCTURE: (cont.1/5)

1. Emergency Command Centre
2. Emergency Party
3. Back-up Emergency Party
4. Engineers Group

1. Emergency Command Centre, should:

- In port be established in the Cargo Control Room
- The senior officer in control of the emergency, supported by another officer and a crew member acting as a messenger
- Communication maintained by portable radio or telephone

(cont.3/5)

2. Emergency Party, should:

- Pre-designated group
- The first team sent to the scene and reports to the Emergency Command Centre on the extent of the incident
- Recommends the action to be taken and the assistance required
- The Party is under the control of a senior officer and comprises officers and other suitable personnel trained to deal with rescue or fire-fighting

(cont.4/5)

3. Back-up Emergency Party, should:

- Assist the Emergency Party at the direction of the Emergency Command Centre
- Led by an officer and comprises selected personnel

(cont.5/5)

4. Engineers Group, should:

- Normally under the leadership of the chief engineer
- Responsible for dealing with an emergency in the main machinery spaces
- Provides emergency engineering assistance as directed by the Emergency Command Centre

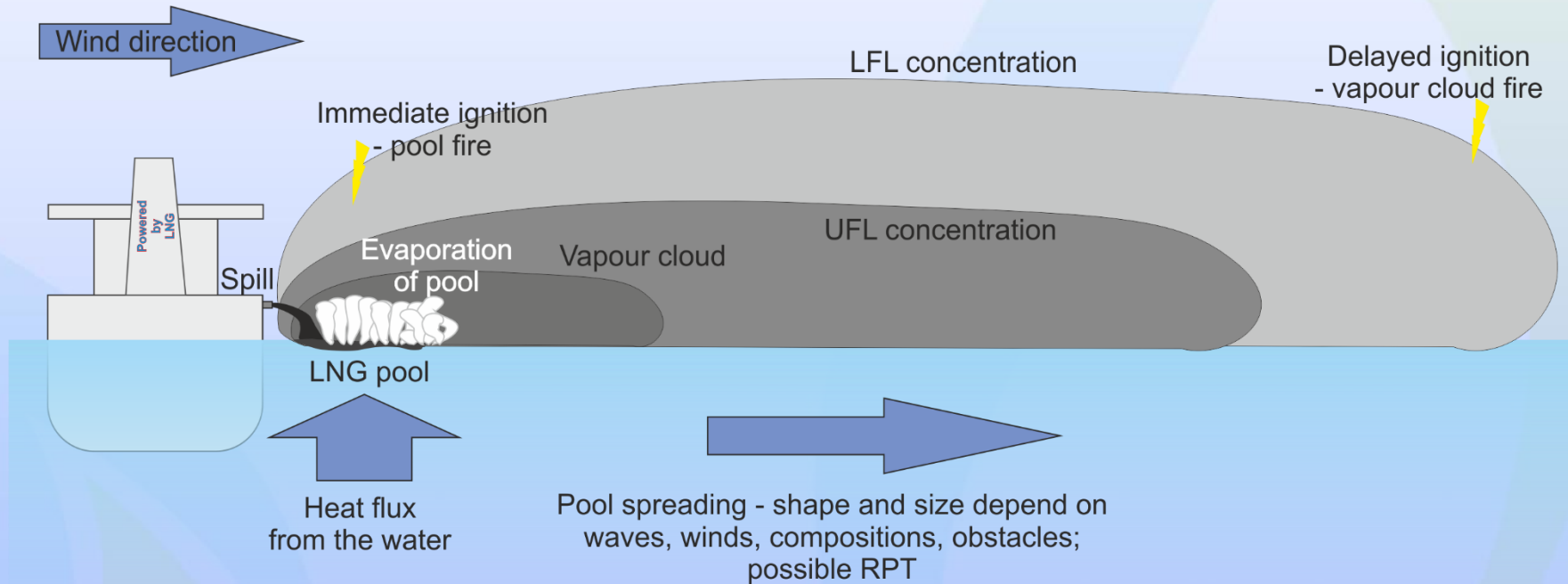
FIREFIGHTING AGENTS AND METHODS USED TO CONTROL AND EXTINGUISH FIRES IN CONJUNCTION WITH THE DIFFERENT FUELS FOUND ON BOARD SHIPS SUBJECT TO THE IGF CODE

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
- CO₂
- 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



CO2 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 capacity	Number of outfits
5000 m ³ and below	4
Above 5000 m ³	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

Supply of compressed air shall consist of:

- Minimum one spare air bottle
- Air compressor
- Charging manifold

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 on LNG tankers

- Water spray systems
- Dry chemical powder
- Gas smothering systems (CO₂ or N₂)

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 N₂ 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:

- CO₂ 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')

FIREFIGHTING SYSTEM OPERATIONS

GENERAL REQUIREMENTS WITH REGARD TO PUMPS, CAPACITY, AREA COVERED ETC

and

REGULATIONS FOR FIRE MAIN

REGULATIONS FOR FIRE MAIN SYSTEM AND HYDRANTS (cont.1/4)

1. Fire main on deck (port and starboard side)
2. Isolation valves (fire proof butterfly valves)
3. Remote start of fire main pumps on wheelhouse
4. Fire pump shall simultaneously supplying two jets of water
 - via fire hoses
 - with 19 mm nozzles
 - at a pressure of at least 0.5 MPa

REGULATIONS FOR FIRE MAIN SYSTEM AND HYDRANTS (cont. 2/4)

5. Fixed water monitors

- creating a water spray of not less than 10 l/min/m²
- 1,5 m horizontal coverage of the manifold area

6. Fire hose equipment for ½ of hydrants for tank deck

- min 9 for vessels below 10 000 GT
- min 12 for vessels above 10 000 GT

7. Easy visible fire boxes

- one box with a minimum of 3 hoses next to the accommodation

8. Minimum two portable foam applicators

- stored next to the front of the accommodation
- facing cargo area,

Additionally

- Minimum two portable foam applicators aft of the cargo manifolds

fire protection at cargo dome

*[source: Gcaptain, photo
made by: Tom Guldner,
President of Marine
Firefighting]*



REGULATIONS FOR FIRE MAIN SYSTEM AND HYDRANTS (cont.4/4)

9. Fire Hoses shall be:

- diameters of 50 mm or 38 mm
- with interchangeable couplings and hose connections
- capable of handling supplies from the foam line.
- made of synthetic fibers

10. The nozzle shall be:

- made of metallic
- corrosion resistant material

**ALL MOVABLE PARTS AND HYDRANTS MUST BE
MADE OF COPPER ALLOY OR EQUIVALENT
MATERIAL**

REGULATIONS FOR WATER SPRAY SYSTEM

The water spray system may be part of the fire main system when:

- fire pump capacity + working pressure are sufficient for the simultaneous operation of all water spray system

Example of Water Spray system, with supply from Engine Room



WATER SPRAY SYSTEM (cont.1/2)

WATER SPRAY SYSTEM SHALL:

- 1.cover exposed parts of fuel storage tank(s) located on open deck
- 2.cover normally occupied deck houses that face the storage tank on open decks
 - except tank is located 10 m or more from the boundaries
- 3.cover exposed lifeboats, liferafts and muster stations

WATER SPRAY SYSTEM (cont.2/2)

WATER SPRAY SYSTEM requirements:

1.Application rate:

- 10 l/min/m² for the largest horizontal projected surfaces
- 4 l/min/m² for vertical surfaces.

2.Min 40 min distance between stop valves for water supply (possible two or more independent sections of system)

3.Sufficient capacity to deliver the required amount of water

4.Connected to fire main via stop valve if not being a part of main fire system

5.Readily accessible position for remote start of pumps

6.Approved full bore type nozzles

REGULATIONS FOR DRY CHEMICAL POWDER FIRE-EXTINGUISHING SYSTEM

DRY CHEMICAL POWDER FIRE-EXTINGUISHING SYSTEM:

1. Minimum two independent units.

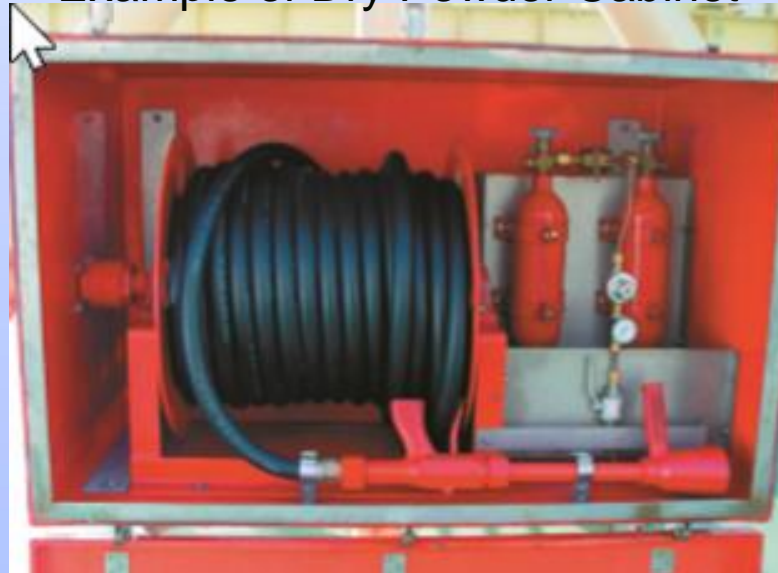
Exception: one unit required for ships with a cargo capacity of less than 1,000 m³

2. Monitor capacity: minimum 10 kg/s

3. Non-kinkable hand hose lines + on/off operation nozzle

- discharge rate minimum 3.5 kg/s

Example of Dry Powder Cabinet



REGULATIONS FOR DRY CHEMICAL POWDER FIRE-EXTINGUISHING SYSTEM

4. One man operation
5. Maximum 33 m length hand hose line
6. Easy manual release from outside the protected area
7. Additionally one 5kg portable dry powder extinguisher near the bunkering station
8. Test to be carried:
 - tightness test
 - functional testing

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)

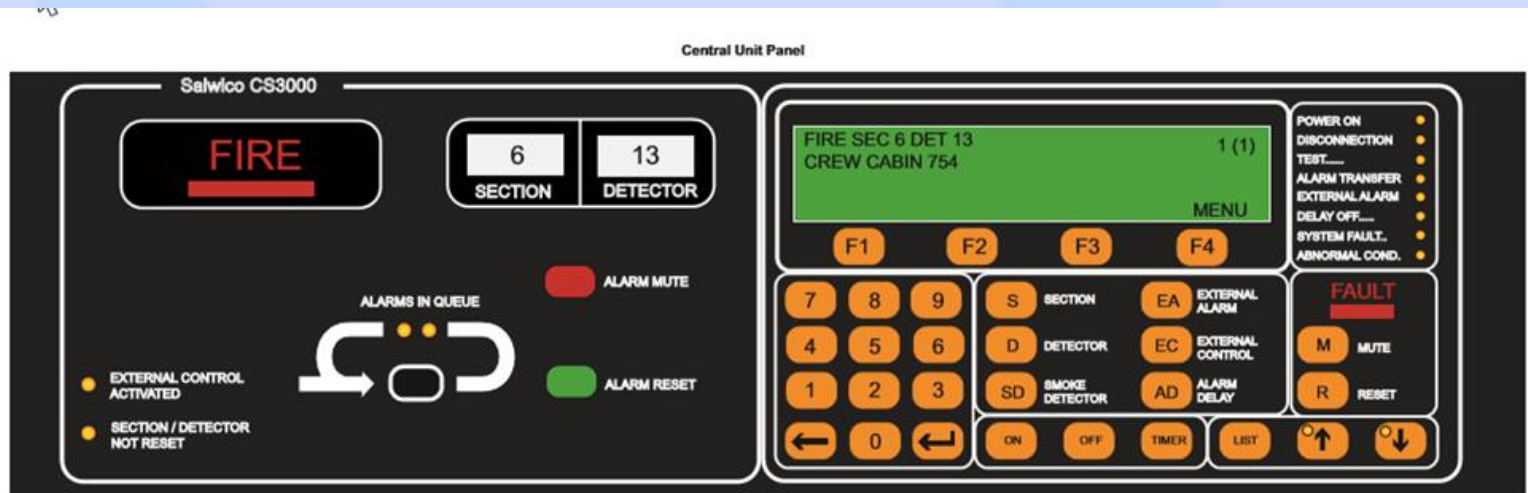
9. Gas detection equipment shall be so designed that it may readily be tested

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



Gas Detector Riken RX41



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

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