

INTERVENTION ON GASES AND EVAPORATORS

CARD NUMBER: **F 1.1**, **F 1.2** and **F 1.3**

F 1.1	Toxic and Explosive gas cloud – Always use this card if the chemical nature of the gas is unknown.
F 1.2	Toxic gas cloud.
F 1.3	Explosive gas cloud.

**Applicable for groups G, GD, E, ED, FE, FED, DE
(in the SEBC code, all groups with G or E).**



Estimation of the zone where the RISK is non negligible:

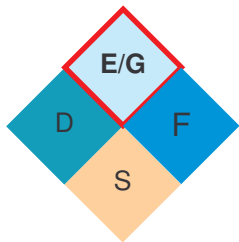
F1.1			
	F1.2		F1.3
SPILL	HEALTH RISKS		FIRE / EXPLOSION RISKS
Compounds	Ammonia, Vinyl Chloride, Chlorine	Methane (LNG), Propane, Butane (LPG), Ethylene, Butylene, Butadiene	Ammonia, Vinyl Chloride, Methane (LNG), Propane, Butane (LPG), Ethylene, Butylene, Butadiene
Tons	Km	Km	Km
0.1	1	0.2	0.2
1	2	0.4	0.4
10	5	1	1
100	10	2	2
1,000	20	4	4

Such estimates should always be regarded with reservations and **never be alternatives** for monitoring.

These estimates can also be applied to liquid chemicals which are flammable and/or hazardous for health. The spread of evaporated gas, from spills of E, ED, FE and FED chemicals, can be calculated very roughly by multiplying the values in the table by $V_p/100$, where V_p is the liquid's vapour pressure in kPa, which is less than 100 at ambient temperature.



F1.1



EVAPORATORS / GAS

Density	< Water
Vapour Pressure	> 3 kPa
Solubility	< 5%
Toxicity	High

MAJOR RISKS



Toxic



Explosive



Flammable



Corrosive

EMERGENCY

TO PROTECT

- To evacuate the leeward zone
- To cut ignition sources out
- To stop the leakage

TO ALERT

- Immediate alert of the site owner & emergency team
- Urgent alert in the leeward zone (civil people)

TO RESPOND

- To identify substance and define spillage location
- To estimate volume spilled & contaminated zone
- To delimit danger area & control the access

PRIORITY STRATEGIES

- Consider an UNKNOWN gas as DANGEROUS
- Make sure people on site are safe
- Always be aware of the weather forecast (wind & rain)
- Wear the appropriate equipment (Self-contained breathing apparatus...)
- Monitoring clouds vapour: Explosively, Flammability, Toxicity, Corrosivity, Carcinogenicity, Radioactivity

EMERGENCY RESPONSES

Shoreline Harbour Open sea

Forecasting gas cloud behaviour

Emergency Softwares: (ALOHA, ELSA, CHEMMAP...)
Difficulty to get accurate & efficient information.
Never substitute this information to monitoring.

X

X

X

Monitoring (performed by equiped & qualified personnel)

Trace gas (delimitate a safety zone)

Gas detection tubes	Photoionization instruments	Portable gas chromatographs
Semiconductor instruments	IR trace gas detectors	Mobile mass spectrometers

X

X

-

Flammability & Explosiveness

Explosive meter	Combustible gas detector
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X

X

-

Oxygen-deficiency

Chemical celloxygen meters

X

X

-



EMERGENCY RESPONSES (Continued)

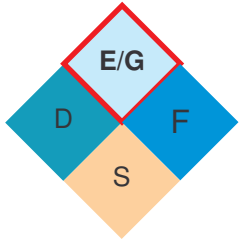
	Shoreline	Harbour	Open sea
<p>Recovery systems</p> <p>To seal the breach with specific mechanical or pneumatical tools (requirement: avoid sparks)</p> <p>Recondensing leaking gases Covering the container with a flat tarpaulin. Collecting the jet stream with a tarpaulin made as a funnel or a cone.</p> <p>Water spray (water mist) Wash down water soluble gas clouds Cooling down hot surfaces Stop, steer or dispers gas clouds IMPORTANT: Containment and recovery of polluted water</p> <p>To mark the clouds with specific substances to make it better visible (ammoniac for instance)</p>	X	X	X
	X	X	X
	X	X	-
	-	-	X

Accident feedback

YUYO MARU N°10 (1974 – Japan)	Collision in Tokyo Bay	Propane, butane, naphtha [G]	Flammable gaseous products.	Towing and anchoring out at sea in Tokyo Bay. Ship attacked by fire	
MULTITANK ASCANIA (1999 – GB)	Fire on-board ship due to bad weather conditions	Vinyl acetate (1 750 t) [ED]	Flammable and polymerisable product, natural product possibly carcinogenic.	Evacuation of the crew because of a fire on-board. Ship stranded at least half a mile from the coast. Establishment of a temporary 5km exclusion zone, necessitating the evacuation of 200 inhabitants. Reconnaissance by helicopter of the hot spots on-board (risk of explosion) using the ship's IR camera. Towed by a tug.	Advantages of a « chemical » exercise two weeks earlier. Positive action taken by the crew before abandoning ship. Importance of an intervention team in time of chemical risks. Importance of the disposal of emergency towing equipment.



F1.2



EVAPORATORS / GAS

Density	< Water
Vapour Pressure	> 3 kPa
Solubility	< 5%
Toxicity	High

MAJOR RISKS



Toxic



Corrosive

EMERGENCY

TO PROTECT

- To evacuate the leeward zone
- To stop the leakage

TO ALERT

- Immediate alert of the site help & public help
- Urgent alert in the leeward zone

TO RESPOND

- To identify substance and define spillage location
- To estimate volume spilled & contaminated zone
- To delimit danger area & control the access

PRIORITY STRATEGIES

- Only the responders team on site
- Always be aware of the weather forecast (wind & rain)
- **Wear the appropriate equipment (Personal Protective Equipment, gloves...)**

Level A



A fully encapsulating chemical protective suit in which a Self-Contained Breathing Apparatus (SCBA) is worn beneath the suit.

Level B



A chemical resistant suit with an external SCBA.

Level C



Body is protected with chemical resistant clothing, gloves and boots. Only a full-face mask air-purifying respirator.

- **Monitoring clouds vapour: Toxicity, Corrosivity, Carcinogenicity**



EMERGENCY RESPONSES

Shoreline Harbour Open sea

Forecasting gaz cloud behaviour (see F1.1)

X X X

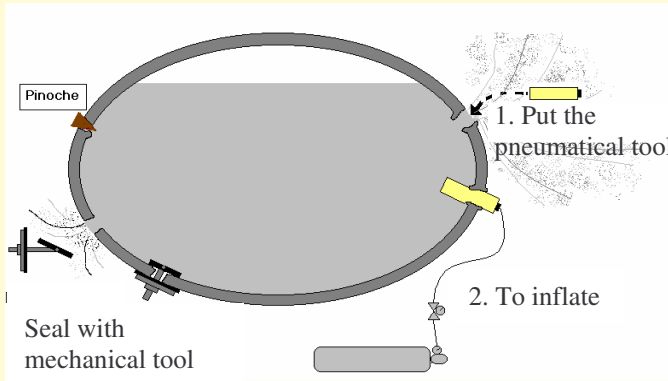
Monitoring (performed by equipped & qualified personnel) (see F1.1)

X X X

Recovery systems

To seal the breach with specific mechanical or pneumatical tools (requirement: avoid sparks)

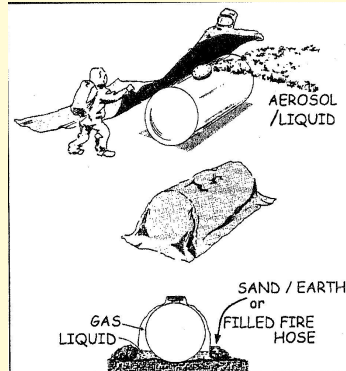
X X -



Recondensing leaking gases

Covering the container with a flat tarpaulin.
Collecting the jet stream with a tarpaulin made as a funnel or a cone.

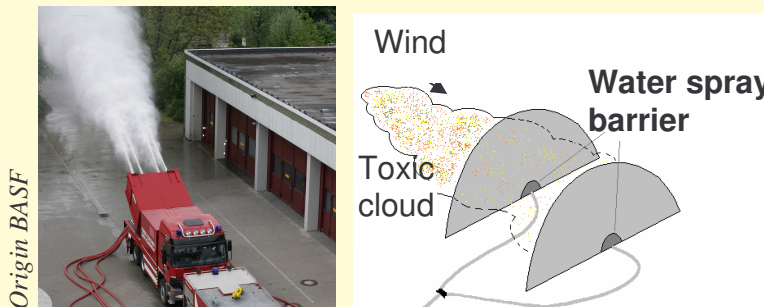
X X -



Water spray (water mist)

Avoid using water on **cold** liquified gases
Wash down water soluble gas clouds
Cooling down hot surfaces
Stop, steer or disperse gas clouds
IMPORTANT: Containment and recovery of polluted water (if possible)

X X -

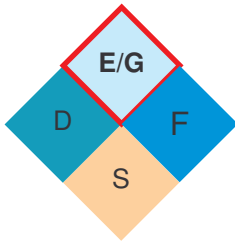


To mark the clouds with specific substances to make it better visible (ammoniac for instance)

X X -



F1.3



EVAPORATORS / GAS

Density	< Water
Vapour Pressure	> 3 kPa
Solubility	< 5%
Toxicity	~ 0

MAJOR RISKS



Explosive



Flammable

EMERGENCY

TO PROTECT

- To evacuate the leeward zone
- To cut ignition sources out
- To stop the leakage

TO ALERT

- Immediate alert of the site help & public help
- Urgent alert in the leeward zone

TO RESPOND

- To identify substance and define spillage location
- To estimate volume spilled & contaminated zone
- To delimit danger area & control the access

PRIORITY STRATEGIES

- Only the responders team on site
- Always be aware of the weather forecast (wind & rain)
- Wear the appropriate equipment (Personal Protective Equipment, gloves...)



Level D:

This level is the lowest level of protection and consist of basic work clothing such as coveralls, gloves and safety shoes.

- Monitoring clouds vapour: Explosivity, Flammability.



EMERGENCY RESPONSES

	<i>Shoreline</i>	<i>Harbour</i>	<i>Open sea</i>
Forecasting gaz cloud behaviour (See F1.1).	X	X	X
Monitoring (performed by equiped & qualified personnel) (see F1.1)	X	X	-
Recovery systems			
To seal the breach with specific mecanical or pneumatical tools	X	X	-
Recondensing leaking gases	X	X	-
Water spray (water mist), water barrier	X	X	-
To mark the clouds with specific substances to make it better visible (ammoniac for instance)	X	X	-
It is necessary to avoid thermic equipment (engine...) and to suppress spark, flame formation...			

