

Technical Popularization Pamphlet

1

**CRAIM**  
MAJOR INDUSTRIAL ACCIDENTS  
REDUCTION COUNCIL\*



## Worst-case Scenario versus Alternative Scenario

### Vision and Mission of the CRAIM

#### Vision

**CRAIM** aims to be the benchmark in hazardous substance risk management within the scope of sustainable development by applying rigorous, responsible and concerted methodologies.

#### Mission

**To DEVELOP** rigorous tools and methods that provide responsible management of risks related to hazardous substances.

**To PROMOTE** and support a culture of collaboration between all stakeholders to effectively manage the risks involving hazardous substances.

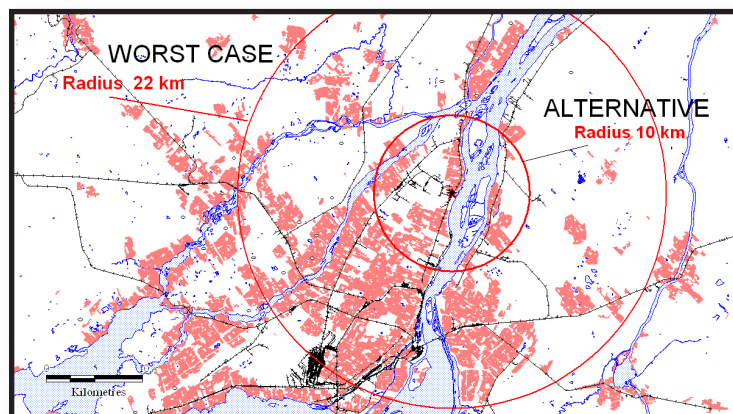
**To FOSTER**, with stakeholders, a reduction in the risks of major industrial accidents through the implementation of appropriate prevention, preparedness, response and recovery measures.

This document, based on current available facts, is designed to familiarize the reader with certain basic concepts. The reader must be aware that the information provided in this document is not complete, and therefore, that other complementary sources must be consulted to avoid any unfortunate situations. The reader is entirely responsible for any decisions or actions taken on the basis of this document.

### Hazard level use upon the risk

**HAZARD LEVEL:** Predefined level of the concentration of a hazardous substance in the air following an emission or a predefined level of thermal flux in case of fire or a predefined level of overpressure in case of explosion from which there can be certain damages to the population, the environment and/or to property.

Risk	General Consequences	Hazard Level	Consequences at the Hazard Level
Fire	Release of heat and smoke.	5kW/m <sup>2</sup> (heat flux) for slow kinetics phenomena	Second degree burns at 40 seconds
		or 1000 (kW/m <sup>2</sup> )*s (thermal dose) upon exposure duration for fast kinetics phenomena (<40s, ex. Fire Ball)	or possibility of serious burns or low percentage of the average population may die.
Explosion	The combustible vapours mixture can explode at the contact of heat source or spark.	1 psi (pound per square inch) or 68 mbar	The shockwave produced can cause injuries due to the breaking of windows. (Glasstone 1977, CCPS Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs, 1994).
Flash fire	The combustible vapours can disperse and be remotely ignited at the contact of a more or less distant ignition source.	50 % of LFL (to take in account the potential presence of higher concentration combustible gas pockets).	The flame front will then travel back to the source of the leak and can cause significant burns to people along the way.
Toxic Release	A toxic cloud is formed and moves and is diluting with the wind.	AEGL 2 (1 hour)	Concentration of a substance in the air below which or at which nearly all individuals <b>could be exposed for up to 1 hr</b> without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.



### Definitions

#### Major Technological Accident

**AN UNEXPECTED AND SUDDEN EVENT INVOLVING A HAZARDOUS SUBSTANCE** (i.e. the release of toxic, flammable or reactive substance) causing (or having the potential to cause) consequences for the population, the environment, and / or property outside the site of the facility.

#### Container System:

**MEANS ANY RECEPTACLE OR NETWORK OF RECEPTACLES THAT IS USED TO CONTAIN A SUBSTANCE** — including any connected pipelines or piping — except any part of that network that is automatically or remotely isolated from the rest of the network by shut-off valves, or other mechanisms, in the event of any environmental emergency.

#### Worst case scenario:

**AN EVENT INVOLVING THE MAXIMUM QUANTITY OF A HAZARDOUS SUBSTANCE**, held in the container system with the greatest capacity, or the maximum expected quantity of the substance on-site that is not in contained (e.g. stored in bulk) with the greatest impact distance, taking into account passive but not active protective measures.

#### Alternate scenario:

**OTHER ACCIDENT SCENARIOS INVOLVING A HAZARDOUS SUBSTANCE** that can be reasonably expected and which are likely to cause harmful effects on the environment and property or to constitute a danger to human life or health. These scenarios take into account the proximity, the interconnection of the containers of the substance concerned as well as domino effects.

Active and passive protection and preventive measures are taken into account.

#### Alternate planning scenario: (Alternate worst-case scenario according to E2 2019)

**ALTERNATE SCENARIO THAT IS MORE LIKELY TO OCCUR THAN** the Alternate worst-case scenario **and** that has the longest impact distance outside the boundary of the facility (if it exists).

### Synonyms

#### Worst-case Release Scenario

- Standardised scenario
- Most penalizing scenario (France)

#### Alternative Scenario

- Possible scenario
- Likely scenario
- Plausible scenario
- Residual risk evaluation scenario (France)

## Comparative Table

### Worst-Case Scenario

**Without active mitigation measure**

- **Basis for comparison**
- **Extremely unlikely**
- **No active mitigation measure is considered**
- **Adverse weather parameters & prescribed duration of release**
- **No interconnected containers (if the shut-off valves are automatic or remotely controlled)**

### Alternative Scenario

**With active mitigation measure**

- **Special case**
- **More likely to occur**
- **Active and passive mitigations are considered**
- **Selected weather parameters\*; no prescribed release duration**
- **Interconnected containers and domino effect**

\* CRAIM recommends the use of adverse weather parameters

### Link with Section 4 of the “Environmental Emergency Regulations”

The 2019 E2 requires that a covered facility must define in its emergency plan the three types of scenarios mentioned on the previous page. See Articles 4 (2) d) and e) of the Regulation