

# The European Commission's science and knowledge service

Joint Research Centre

## Common inspection criteria - Natech risk

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Inspections (TWG 2)

# Current status



## Common inspection criteria

## Natech Risk

The first draft has been released.



Comments from Natech work group have been received and implemented.



## 1. Definition and characteristics of Natech accident

Natural hazards, such as earthquakes, floods, storms, extreme temperatures etc., can trigger major accidents involving fires, explosions and toxic releases at establishments that process, store or transport dangerous substances. **These technological “side effects” of natural-hazard impacts are called “Natech” accidents (from “natural hazard triggered technological accident”).**

**With climate change raising the intensity and frequency of extreme natural events, the European Union has taken measures for better Natech risk control.**

Natech accident features:

- Multiple simultaneous accident could occur at the same time.
- Safety measures are often ineffective or insufficient against Natechs as they are usually not designed to withstand a natural event.
- Utilities are often disrupted during a natural event.
- Standard response measures may not be functional or appropriate during a Natech accident

## 2. Scope and Relevant Seveso or other legal obligations

### SCOPE:

This document provides guidance to inspectors on assessing the adequacy of the measures adopted by operators of Seveso III establishments to prevent accidents triggered by natural hazards and to limit their consequences for human health and the environment.

The Directive requires that operators identify and assess all the risks in Seveso III establishments, including Natech risks. This means that operators should provide in their safety reports:

“a description of the possible major-accident scenarios and their probability or the conditions under which they occur including a summary of the events which may play a role in triggering each of these scenarios, the causes being internal or external to the installation; including in particular: [...] **natural causes, for example earthquakes and floods**” (Annex II of the Seveso III Directive 2012/18/EU).

### 3. The role of inspections

The inspector should check that:

- an **analysis of possible natural hazards** at the location and in the surroundings of the establishment has been carried out and its results included in the safety report;
- major accidents caused by natural hazards are properly **analysed in the safety report**;
- safety reports demonstrate that the operator has implemented adequate measures to **prevent Natech scenarios and to mitigate their consequences**;
- information on **Natech is accounted for in the MAPP and SMS**, and measures are taken to reduce the Natech risk;
- information on **Natech is included in internal emergency plan**, and the information is shared with the public authorities responsible for the **external emergency plan**;
- the right information has been provided in order to **inform the population** of natural hazards and the Natech risk according to legal requirements;
- the Natech information in the relevant documents is **representative of the situation** at the establishment.

## Natech information that should be present in safety reports

- Safety reports should include information of the **natural hazards that could affect the establishment**, such as extreme temperatures, high winds, floods, landslides, extreme precipitation, storms, lightning, earthquakes, or wildfires.
- Safety reports should demonstrate that the operator has **identified and adequately described major-accident scenarios** triggered by the identified natural hazards.
- Safety reports should include an **assessment of the risks** arising from accidents due to natural hazard impact.
- Safety reports should include information concerning the Natech **risk assessment's assumptions**, data limitations and uncertainties. The effects of climate change on worsening future natural hazards should be considered.
- Safety reports should include information on the **safety measures implemented** to prevent or mitigate accidents triggered by natural hazards. The safety measures should be able to survive the impact of the natural hazards that triggered the Natech accident.

## Natech information that should be present in safety reports (continues)

- The design specifications of **utilities and safety equipment** units should be clearly stated in the safety report, as well as the natural hazard **conditions under which they fail** (e.g. flood with water depths of more than 1.5 m).
- Operators should carefully choose the **location of these** in order to **minimize the likelihood of unavailability** during natural hazard impacts.
- **Safety reports\*** should include information on the **training of employees** to ensure that they are **aware of the natural hazard** and that they are properly trained in the **procedures** to adopt during natural hazard impacts.
- Safety reports of new installations should consider natural hazard risks **when selecting the site of the installation**. Within the site, designers should carefully consider **where to locate process and storage facilities of hazardous substances** in light of the local natural hazards.
- **Scale plans** for new installations should include the risks of major accidents triggered by natural hazards.

## Specific information to be included in emergency plans

- Accident prevention and mitigation measures **should be effective even during natural-hazard conditions**, e.g. during floods, heavy precipitation, high winds and extreme temperatures.
- **Standalone utilities**, such as back-up power generators and water reservoirs **should be available even after the impact of a natural hazard**. If this is not possible, emergency plans should clearly state which utilities are available and which are unavailable for the response to Natech scenarios. Emergency plans should discuss possible response strategies to adopt when the main utilities are unavailable.
- Operators should be able to show **the information exchange on natural hazards and Natech risk with the public authorities** responsible for external emergency plans and disaster risk management.



## 5. The components of Natech risk information

- 5.1. Assessment of the natural hazards in the area of the establishment
- 5.2. Identification of equipment damage and vulnerabilities
- 5.3. Identification of contributing factors
- 5.4. Identification and description of Natech accident scenarios
- 5.5. Assessment of Natech scenario likelihood

## Assessment of the natural hazards in the area of the establishment

The natural hazards that **may play a role in triggering a major accident** should be identified and described.

The natural hazard description **could be probabilistic or deterministic**. The choice of the approach should be taken considering the data availability and the actual conditions at the site.

**Natural events with greater intensity than the design intensity**, are likely to cause damage to the main equipment. In this case, it is important that the operator acknowledges which natural hazards and which design criteria could potentially be exceeded.

## Identification of equipment damage and vulnerabilities

For every facility  
facilities suffered  
should be assessed

- the main structure
- the main piping
- the pipe network

List and describe

Example:

“Displacement  
translation and  
toppled over  
ruptures in the  
earthquakes of  
uplifting buoy  
Girgin and Krausmann, 2018).”



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damage (Necci,

## Identification of contributing factors

The possibility of **damage or disruption** to utilities, safety equipment, instrumentation and auxiliary systems should also be assessed.

Typical disruptions to these are:

- Loss of electric power
- Short circuit
- Alarm failure
- Instrument failure
- Pump/compressor failure

## Identification and description of Natech accident scenarios

While in principle Natech scenarios could be described in the same way as those for conventional technological accidents, **Natech-specific conditions should be considered** (when applicable) for scenario modelling.

Examples of Natech-specific conditions are:

- Exceptional environmental/meteorological conditions (e.g. strong winds, floods);
- Loss of safety barriers (e.g. damaged firefighting equipment, alarms and detectors, flooded containment dikes);
- Loss of utilities (e.g. power, water supply, communication);
- Multiple and simultaneous accidents due to natural hazard impact

## Assessment of Natech scenario likelihood

Not always the information of the natural hazard comes with a likelihood, but for some types of hazard the likelihood is crucial to define the hazard itself (e.g. seismic risk). For all the cases in which the natural hazard likelihood is available, Natech likelihood should be assessed as well.

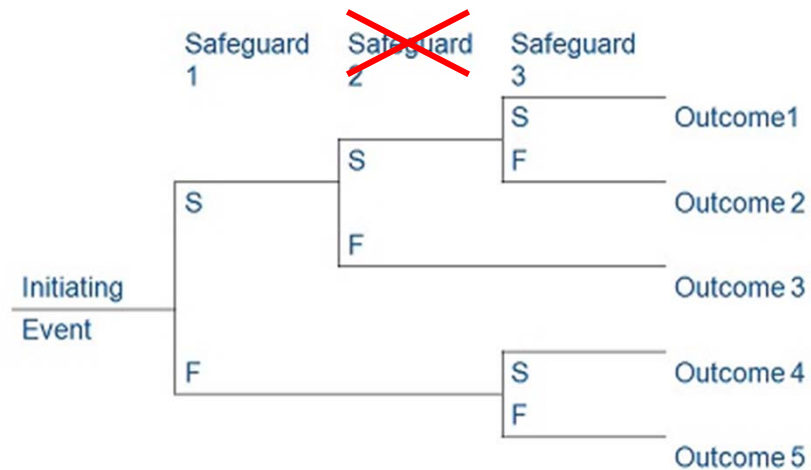
### 5.5.1. Natech critical (TOP) event likelihood assessment

There are two main categories of critical events:

- Natech accidents that result from releases following physical damage of a containment structure,
- Natechs accidents that are produced by uncontrolled process upsets, e.g. due to blackouts.

### 5.5.2. Natech accident scenario likelihood assessment

The **specific conditions of the Natech scenarios** should also be taken into account, including all the contributing factors.



# Measures for managing Natech risk

## Improve the resistance of equipment and structures

1. Existing equipment that may be damaged by natural hazards **should be retrofitted** to improve its survivability to natural hazard impacts.
2. The **site should be developed** to mitigate specific natural hazards in areas with critical facilities.
3. Consider **relocating individual processes and the storages** of hazardous substances

## Preparation for natural hazard impact

Operators should identify specific procedures to prevent Natech accidents or to mitigate their consequences in response to natural hazard impacts and early warnings.

## Measures for managing Natech risk (continues)

### Improve the preparedness for Natech events

Operators should consider all the items, systems, and manpower unavailable. Seveso establishments in natural hazard zones should have back-up utilities, safety systems, and emergency resources that could operate until the end of the emergency.

### After the natural hazard impact

It is possible that some damage has been caused without being immediately spotted, or that the conditions are not safe for a restart (e.g. equipment soaked in water). It is extremely important that procedures for start-up include actions that take into account natural hazard impact.



# Thank you for your attention!



RAPID-N tool for rapid Natech risk assessment and mapping:  
***[rapidn.jrc.ec.europa.eu](http://rapidn.jrc.ec.europa.eu)***



eNATECH database for Natech accidents  
***[enatech.jrc.ec.europa.eu](http://enatech.jrc.ec.europa.eu)***