

# Human factors in investigations and barrier management

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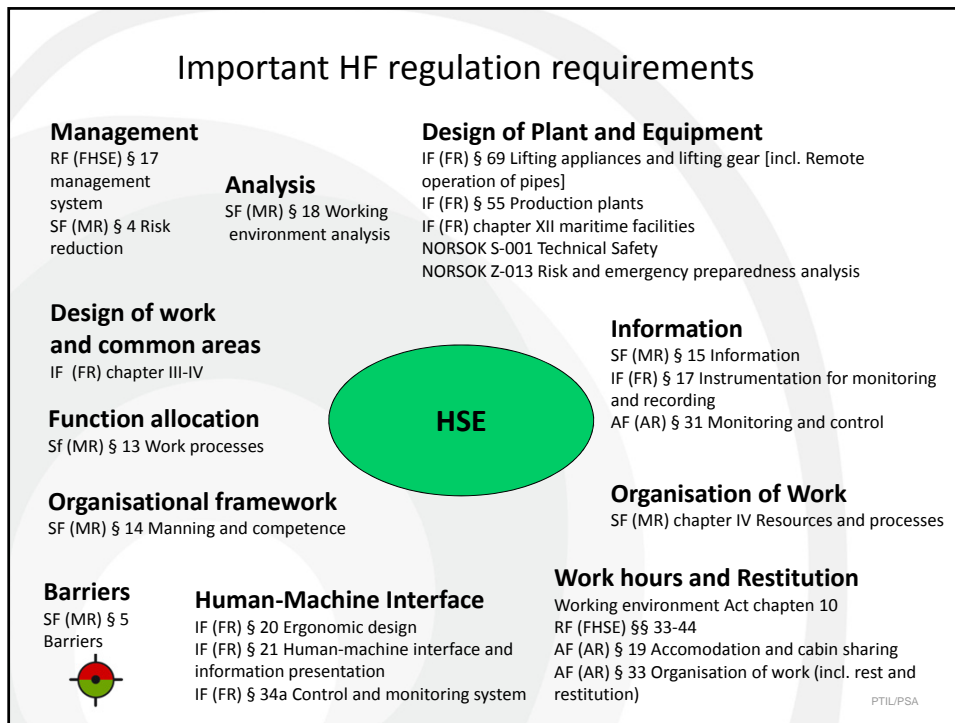
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## Content

- **Regulations**
  - regarding HF and barrier management
- **Barrier Management**
  - technical, operational and organisational barrier elements
- **RNNP qualitative studies**
  - HC leaks
  - Well control



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## Human Factors requirements in MR § 18 and AR § 33 (abbreviated)

Technical, operational and organisational solutions shall reduce risk for:

- a) mistakes that can result in hazard and accident situations,
- b) exposure and physical or psychological effects.

The employer shall ensure that the work is organised so as to avoid hazardous exposure and unfortunate physical and psychological strains for the individual employee, and to reduce the probability of mistakes that can lead to hazard and accident situations.



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Management  
Regulation section 5  
Barriers (extract)

**It shall be known** what barriers have been established and which function they are intended to fulfill, as well as **what performance requirements have been defined in respect of the technical, operational or organisational elements** necessary for the individual barrier to be effective.

Many different interpretations of the concept "barrier".  
Particular when it comes to operational and organisational barrier elements

The necessary technical, operational and organizational barrier elements needed to ensure a specific barrier function must be identified

Performance requirements must be specific and verifiable, also when it comes to operational and organisational requirements




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The PSA's guideline related to barriers

2013

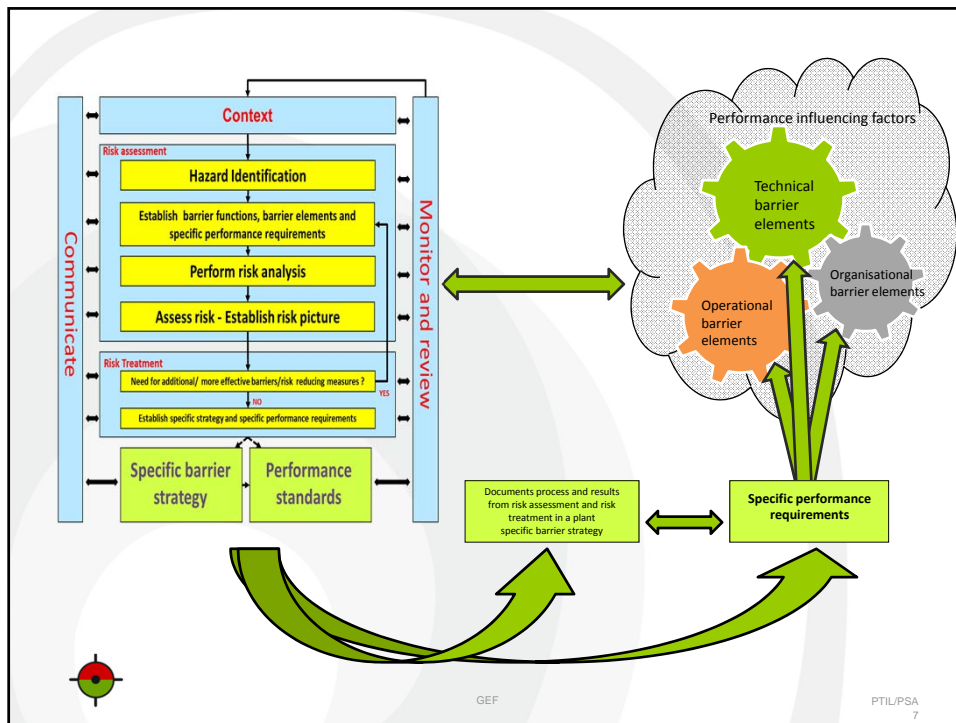
Principles for barrier management in the petroleum industry



PSA  
28.01.2013

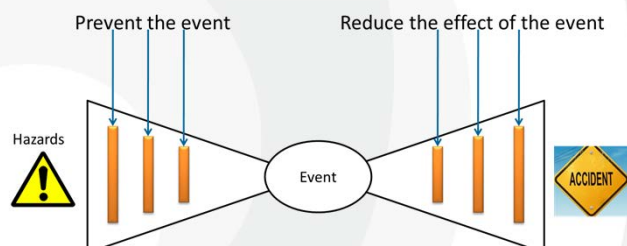
- PSA have identified relatively substantial differences between the players understanding of the regulatory requirements related to barrier management.
- As a consequence of this, a number of nonconformities with significance for safety have been identified
- That follow-up has highlighted a need to make the regulatory requirements related to barrier management more easily accessible.
- However, this document does not form part of the formal petroleum regulations.

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## Barrier Concept

- Barrier : Technical, operational and organisational elements which individually or together shall:
  - a) reduce the possibility of occurrence of specific errors or hazards, or
  - b) reduce or prevent damage if they occur.
- Barrier elements : Technical, operational or organizational measures or solutions necessary for realizing barrier functions
- Barrier function: the task or role of the barrier



## *Barrier element definitions*

- *Organisational barrier elements* – personnel with defined roles or function which constitute a part of realising a barrier function
- *Operational barrier elements* – actions and activities the personnel have to perform constitute a part of realising a barrier function
- *Technical barrier elements* - equipment and systems which constitute a part of realising a barrier function



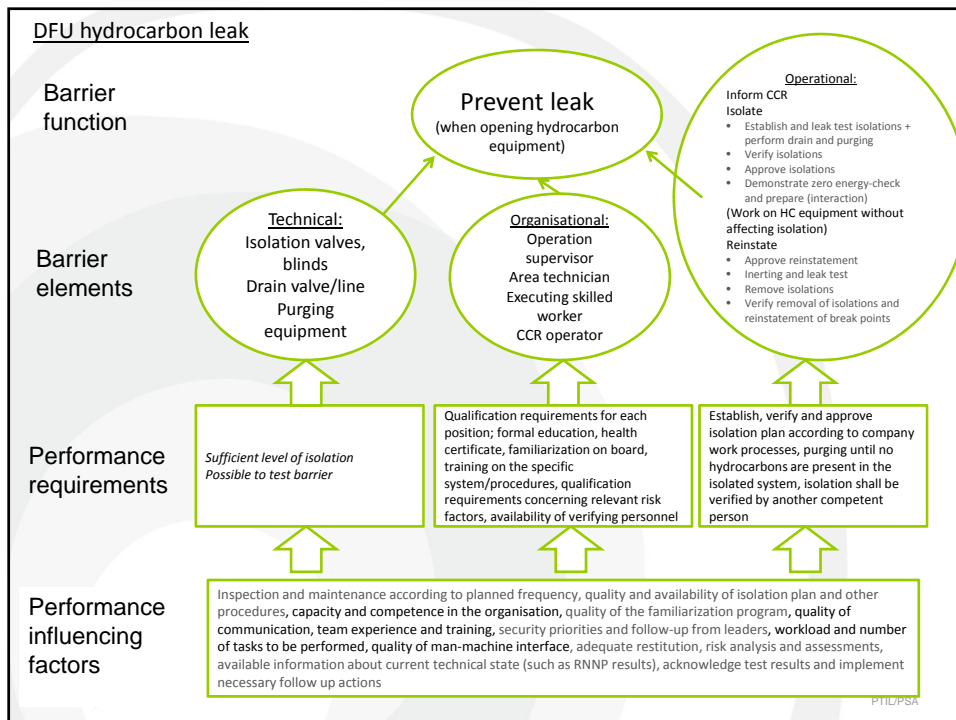
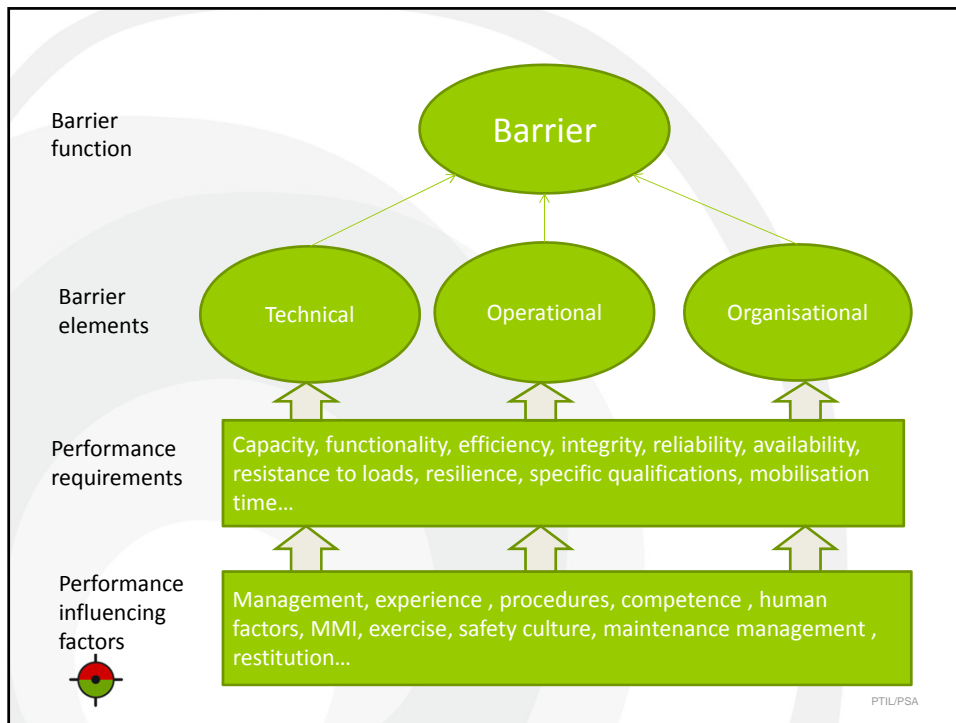
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Some examples of performance influencing factors which is not organisational or operational barrier elements

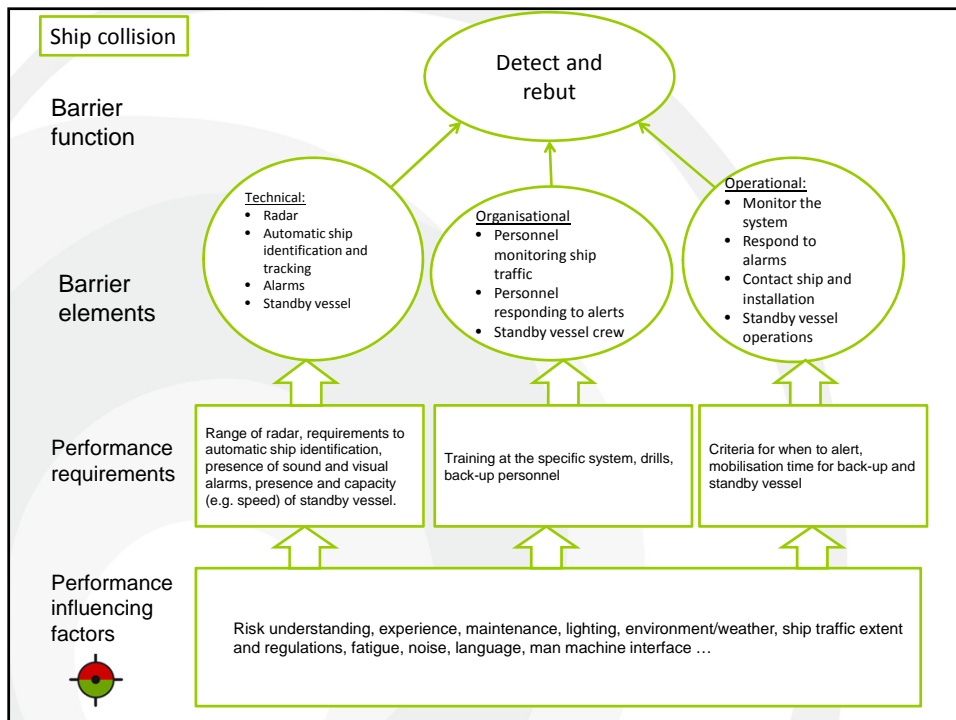
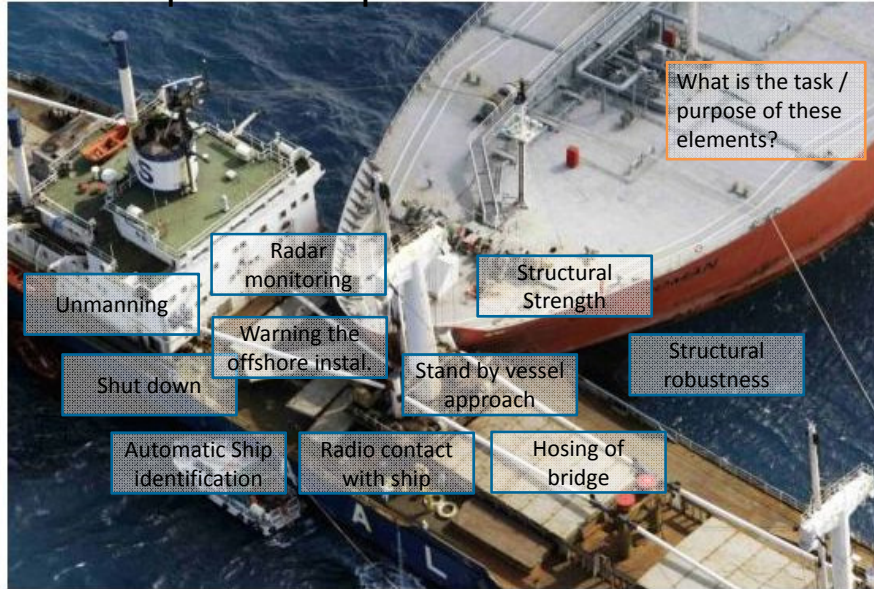
- **Procedures**
  - but can describe equipment, personnel and actions which are incorporated in a barrier function, and how barrier elements shall be established, tested and maintained
- **Safe Job Analyses (SJA)**
  - but a tool for identifying risk which must be managed by technical, organisational and operational barrier elements
- **Work permit (WP)**
  - but can specify which barrier elements must be in place before a specific job begun
- **Management in general**
  - But can contribute to ensuring that routines and resources are in place for establishing and maintaining barriers
- **Specific management roles and their functions at different levels however can be organisational and operational barrier elements**



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## Example: Ship collision



## Trends in risk level in the petroleum activity (RNNP) Qualitative Studies



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## Qualitative Study – (RNNP)

The Trends in Risk Level reports aims to:

- Identify areas which are critical for HSE
- Give priority to identifying causes in order to prevent unplanned events and accidents
  - In 2010 a qualitative study of hydrocarbon leaks, their causes and preventive measures – Sintef, Studio Apertura
  - In 2011 a qualitative study on casual relations and measures associated with well control incidents – Sintef
  - In 2013 a qualitative study causes and measures associated with structural and maritime incidents – Safetec, Preventor

**Only some few results from these studies will be presented here**



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## Qualitative study in 2010 Hydrocarbon releases – cause vs measures

This study's main object was to identify some challenges that the industry can make use of in its own preparation of measures to reduce risk of hydrocarbon leakages

Problems addressed in this study:

- What human, technical and organizational causes can be put forward to explain the occurrence of hydrocarbon leaks on the Norwegian Continental Shelf?
- What risk reducing measures has been proposed after post-event investigations?
- Is there a good correspondence between identified causes and these measures?



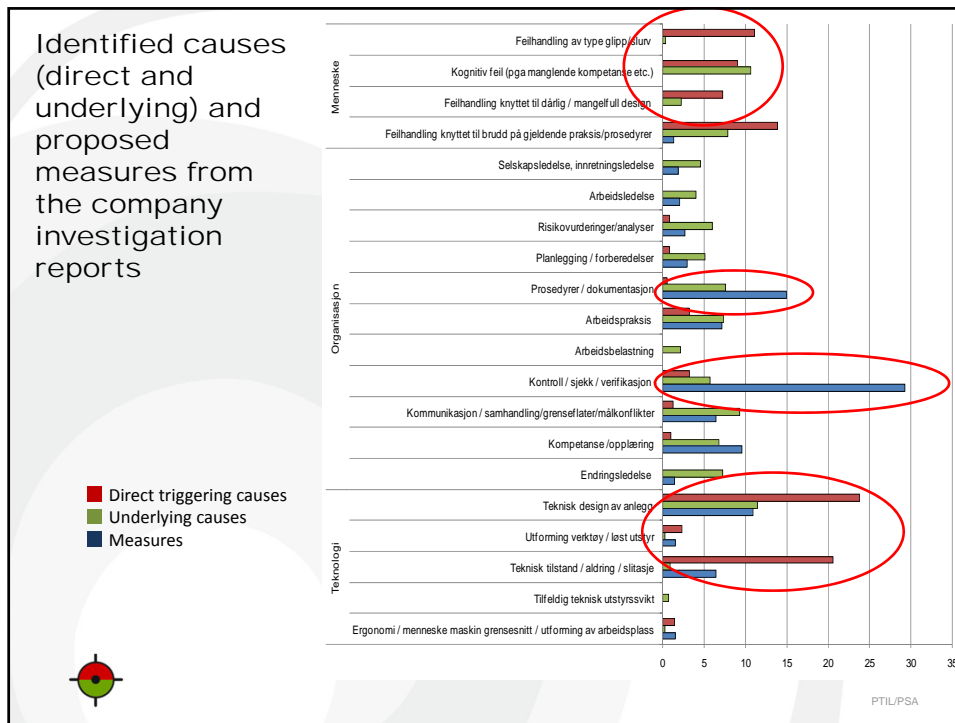
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## Data

- 42 investigation reports (2002-2009)
- Reports from various research communities, consultancies and authorities
- 33 research articles
- Description of measures considered by the operator companies' own specialists to be the most important contribution to risk reduction



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## Study basis – Well Control Incidents

- **10 well control investigation reports**
- **21 event reports**
- 18 interviews - total of 33 persons
- A review of written evaluation on causes and suggested measures received from company experts on drilling from 18 companies



