

Guidelines for investigation of logistics incidents and identifying root causes



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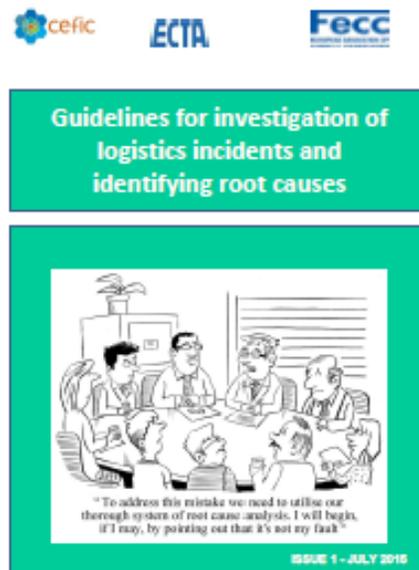
Guideline content

- Introduction
- Scope and objective
- 1. Incident investigation
- 2. The incident investigation process
- 3. The root cause analysis method for logistics operations
- 4. Corrective Actions
- 5. Examples



Scope & Objective of the guideline

- Learning from accidents is key to avoid same type of accidents occurring again.
- Good learning is only possible if the root causes have been identified!



- Provide guidance on how to carry out an **off-site incident investigation**
- Identify the **root causes**
- Identify the **corrective actions** to prevent re-occurrence

Incident investigation



An incident investigation is a process conducted for the purpose of **incident prevention** which includes the gathering and analysis of information, drawing of conclusions, including determination of causes and, when appropriate, making of safety recommendations.

Root cause analysis (RCA)

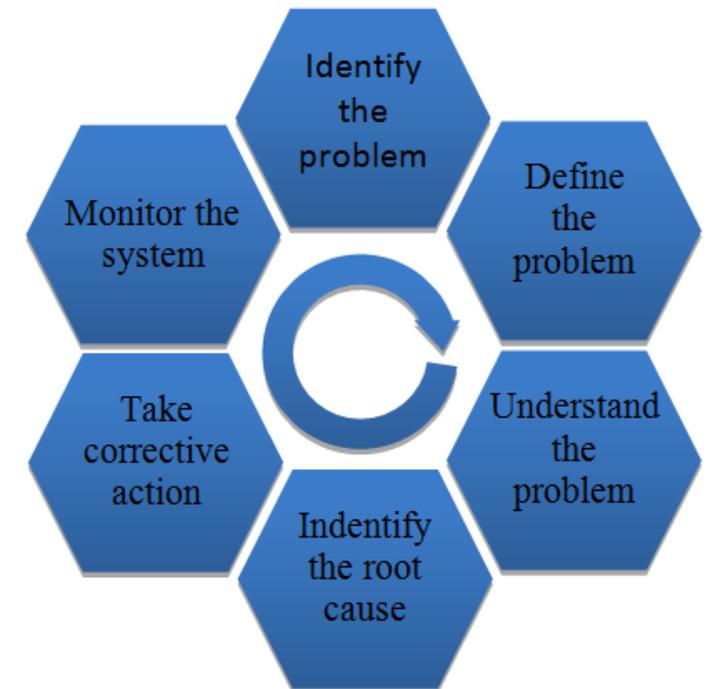


A [Root Cause Analysis \(RCA\)](#) is a method that allows **identification** of the **true causes** of incidents, with the aim of **preventing** these root causes so that they are **not repeated** over and over again

Why perform an incident investigation and root cause analysis?



Applying the **incident investigation** process, including **root cause analysis (RCA)**, will structurally lead to an **improvement cycle** of company's management system, processes and barriers used to **manage** its health, safety, security and environmental **risks**



When to perform an incident investigation and root cause analysis?



Follow the two days - two weeks rule !!!

- Root cause analysis initiated after no more than **2 days**
- Incident investigation conducted and reported within **14 days**





Incident Categorization: Examples

Severity

- Major
- Moderate
- Minor
- Near misses
- Unsafe circumstances or acts

Effect (1)

- Human impact
- Environmental impact
- Property and equipment loss

Effect (2)

- Financial impact to other parties
- Media attention
- Reputational damage
- Public disruption

A detailed RCA should not only be carried out for major incidents, but also for “high potential incidents” or “high learning value incidents” !!!



The incident investigation process



“To address this mistake we need to utilise our thorough system of root cause analysis. I will begin, if I may, by pointing out that it’s not my fault”



The different steps





The incident investigation process

1. Setting up an effective incident investigation team

- Team leader should be close to but **not have any responsibility** for the incident
- Team members must be **aligned** to the business process
- The facilitator must be **trained** and **independent**
- Team members have to be sufficiently **trained** or **guided** through the process

Conditions

- People involved in the incident should never be part of the team but should be **interviewed** as part of the investigation process
- Corrective actions should be **agreed upon** with the process owners
- ...



The incident investigation process

2. Description of the incident

- When, where, what happened and who was involved
- Affected elements : products, material, type of failure, ...
- Consequences

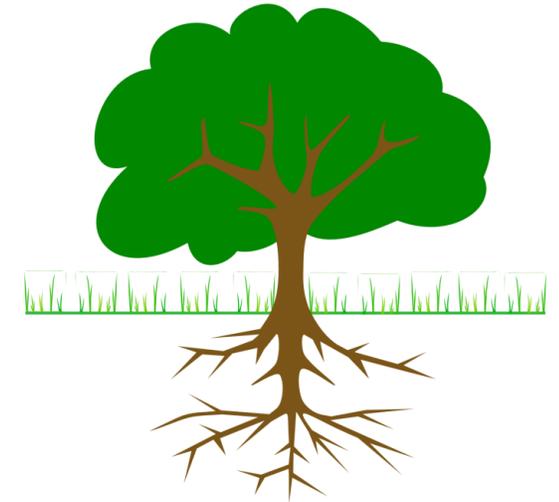
3. Gathering evidence and facts

- Record only facts, not opinions
- Interview people involved in the incident
- Pictures , CCTV, on board camera recording
- **IMPORTANT** : do not allocate blame during the evidence gathering!



The root cause analysis

- Available methods of accident investigation were reviewed by the Issue Team, but all of them are more related to production environment



Something specific for the logistics operations was needed

- The Issue Team developed a method based on the Root Cause Analysis principle

The root cause analysis method for logistics operations



1st step: TYPE OF PRIMARY EVENT

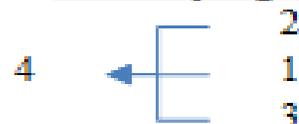
Building of an **event tree** from the **primary event** and determine the type of the primary event (see **list 3.1**)

Single underlying event



Underlying event 8 was necessary and sufficient for Primary Event 9 to occur.

Conjunction of underlying events



Underlying events 2, 1 and 3 together were necessary and sufficient for primary event 4 to occur.

Single underlying event



Underlying event 6 was necessary and sufficient for both primary events 2 and 5 to occur.

The root cause analysis method for logistics operations



2nd step: IMMEDIATE/DIRECT CAUSES

Each **event** to be investigated by using a separate **tree** and asking the following questions:

- What was needed for that event to happen?
- Was it necessary?
- Was it sufficient ?

=> identification of the **immediate/direct cause(s)** of the primary event (see **list 3.2**)

The root cause analysis method for logistics operations



3rd step: BASIC/ROOT CAUSES

For each direct cause, dig deeper to find the **Basic/Root causes** (see [list 3.3- 3.3.1](#) for organisational causes – [list 3.3.2](#) for human causes) by asking the questions:

- What was needed for that immediate cause to happen?
- Was it necessary?
- Was it sufficient ?



The root cause analysis method for logistics operations



4th step: CORRECTIVE ACTIONS

For each basic/root cause corrective actions must be implemented in order to **prevent re-occurrence** of the same kind of incident

Two types of causes

1. **Organisational causes**. See the [list 4.2](#)

➤ Select the type of cause and define an appropriate action to close the gap

2. **Human causes** (in more detail presented in the afternoon)



Example



Whilst exiting a parking zone of a cleaning station, the driver had to turn right onto the road. The turn was taken too sharply and the rear wheels passed onto the grass verge. The wheels slid and drove down the banking, leading to the tip and roll-over of the vehicle



Facts gathering

1. This was the first time the driver visited this cleaning station. The driver used a gate/road he/she was unfamiliar with
2. The incident happened during the dawn. The visibility was reduced
3. The turn was to the right and the driver sat on the left
4. The driver misjudged the road corner
5. The driver was not injured and there was no leakage
6. The driver had loaded at another site the evening before and stayed overnight on the parking of the cleaning facility
7. There were more drivers leaving through the same gate, but these vehicles were empty (cleaned)
8. There were tyre marks on the grass



Facts gathering

Interviews were held with relevant people. The outcome was the following:

- Driver: “Thought it was ok, there was someone leaving just before me taking the same turn. This was the most obvious way to leave, because it was in the direction I had to go and there were no signs to warn about soft sides off the road”
- Planner: “We often send drivers to that cleaning facility to clean or to park a loaded vehicle”
- SSHEQ manager of the transport company: “I visited that facility to inspect the cleaning station but I did not inspect the parking place and exit”
- Site manager: “We have an operational permit, including the parking entrances and exits”
- Municipality representative: “Yes, we issued the operational permit. We do not have to check the design of entrances and exits”



Accident investigation

1. Type of event

3.1.9 Leaving the road. This is the main event to be investigated

3.1.12 Roll-over. This is the consequence of the vehicle leaving the road

2. Direct causes

3.2.1 Non-standard operation: the parking is normally not used for loaded vehicles

3.2.16 No warning: there is no sign or other warning that the exit should not be used to turn right

3.2.22 Human failure: the driver followed the example of drivers of empty trucks. The driver could have stopped to assess the sharp turn



Accident investigation

3. Basic/ Root causes

Organisational causes

- 3.3.1.2 i) Incomplete risk analysis: the transport company did not inspect the site for parking of loaded trucks. The cleaning station did not assess the exit of the parking area. Inadequate routing on the site
- 3.3.1.7 i) Inadequate design: the design of the exit was not adequate. There were no warning signs that vehicles should not turn right
- 3.3.1.9 i) Work environment inadequate: inadequate lighting of the parking exit



Accident investigation

3. Basic/ Root causes

Human causes

3.3.2.2 iii) Unintentional behaviour. Poor judgment: The driver decided to try the sharp turn, following the example of other drivers

During the analysis the investigation team wondered if it was possible to turn right safely and decided to go to the site to gather more evidence. The team concluded that it is not possible to turn right safely: the driver made an unintentional human error.



Accident investigation

4. Corrective actions for the cleaning site

4.2.3 Carry out risk analysis and implement mitigating measures accordingly

4.2.3.4 Introduce a “near-miss and unsafe acts and conditions reporting system” at the cleaning site (other drivers used this exit before)

4.2.3.6 Road information systems (close the exit or clearly indicate that vehicles are not allowed to turn right)

4.2.3.11 Improve lighting

4.2.19 Improve design of site exit



Accident investigation

4. Corrective actions for the transport company

4.2.3 Carry out risk analysis and implement mitigation measures accordingly

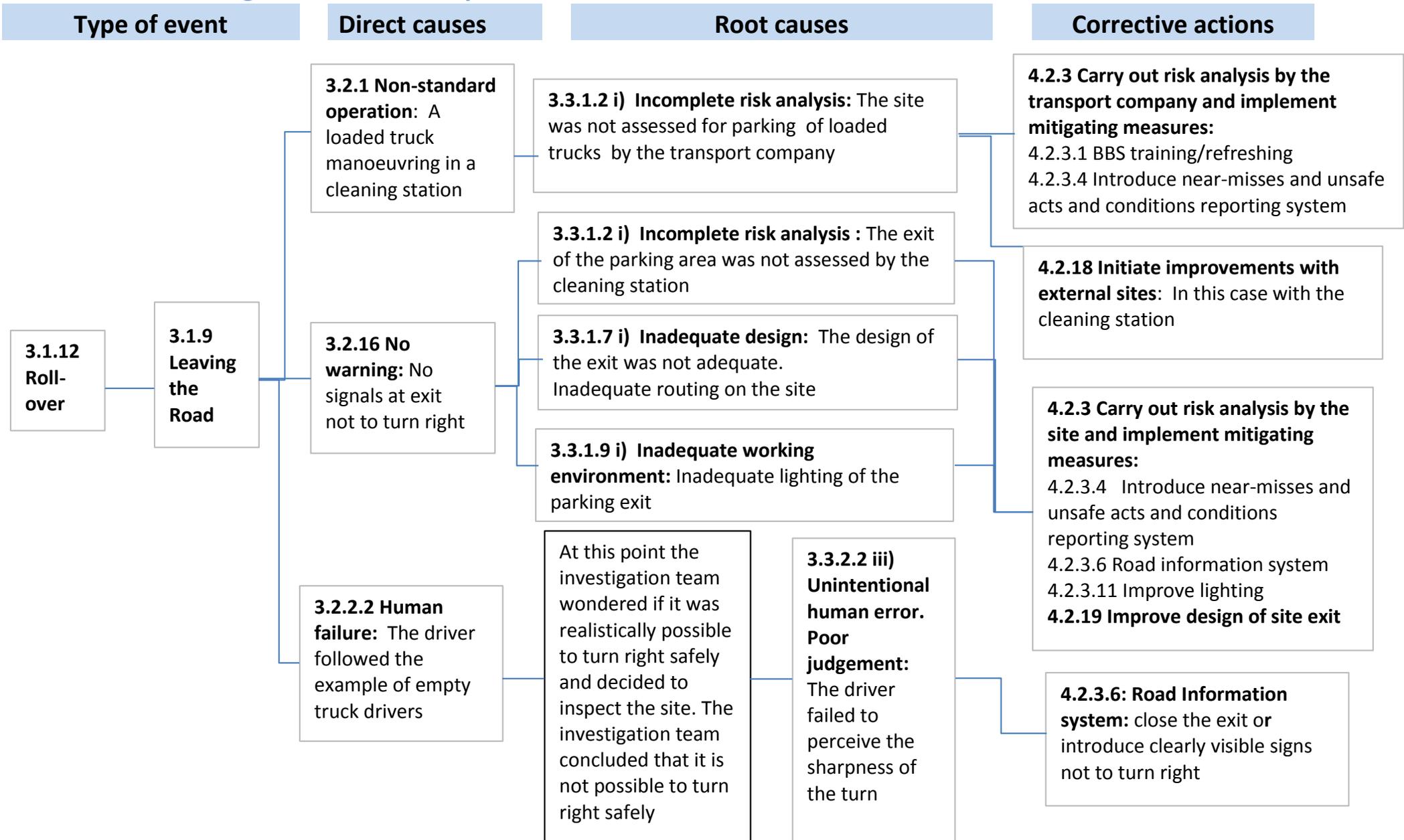
4.2.3.1 BBS training/refresher training

4.2.3.4 Introduce a “near misses and unsafe acts and conditions reporting system” in the transport company (other drivers used this exit before)

4.2.18 Initiate improvements with external sites (in this case the cleaning station)



Accident Investigation Tree example 1





Reporting the incident

Following reports should be issued :

1. An **immediate incident notification** to the stakeholders (basic information by a quick call followed by the “first incident report” within 24 hours),

Format of ADR/RID 1.8.5 can be used in the absence of any prescribed reporting format.

2. An **investigation report** (root causes analysis & corrective actions) for sharing the findings with the stakeholders, following section 3 and 4 of this guideline

3. A **report** for sharing the **learning** via **Cefic** (optional)



New Cefic incident report

<http://www.sqas.org/>

Logistics
Transport incident/accident report



Date Code (to be defined by Cefic)

Title

| | |
|---|--|
| <p>Incident/accident description</p> <p>Type of events (from the list in chapter 3.1)(*)</p> <p>Immediate/direct causes (from the list in chapter 3.2) (*)</p> | <p>Basic/Root causes (from the list in chapter 3.3) (*)</p> <p>Areas for corrective actions (from the lists in chapters 4.2) and Ref to chapter 4.3 (*)</p> |
|---|--|

Insert a picture (if available)

Thank you for your attention!



Brussels – 29 October 2015



BACK UP SLIDES

3.1 Type of events



- 3.1.1 Person / object caught between/in/on
- 3.1.2 Collision of persons / equipment
- 3.1.3 Human exposure to (electricity, heat, cold, chemicals, etc.)
- 3.1.4 Container / tank implosion
- 3.1.5 Equipment failure
- 3.1.6 Explosion
- 3.1.7 Fall from height
- 3.1.8 Fire
- 3.1.9 Leaving the road / derailment
- 3.1.10 Loss of containment (leaks, spills, etc.)
- 3.1.11 Overfilling / overflowing of tanks
- 3.1.12 Overturning / Roll over / Tipping over
- 3.1.13 Slip and fall / trip over
- 3.1.14 Struck against / by / into
- 3.1.15 Unintended mixture (for example (un)loading in the wrong tank)
- 3.1.16 Chemical reaction
- 3.1.17 Object falling off
- 3.1.18 Unintended moving of cargo

3.2 Immediate/direct causes (Partial view)



- 3.2.1 Non-standard operation
- 3.2.2 Weather conditions
- 3.2.3 Equipment / material failure
- 3.2.4 Instrument failure
- 3.2.5 Instrument non calibrated
- 3.2.6 Falling to use PPE properly
- 3.2.7 Too high speed
- 3.2.8 Inappropriate loading of truck (overweight /
underweight/uneven load distribution)
- 3.2.9 Incorrect (un) loading
- 3.2.10 Incorrect lifting
- 3.2.11 Incorrect position for task
- 3.2.12 Incorrect cargo securing
- 3.2.13 Incorrect storage / placement
- 3.2.14 Lack of coordination between operator and driver
- 3.2.15 Lack of instrument
- 3.2.16 No warning
- 3.2.17 Non-compliant documentation
- 3.2.18 Non-compliance with legislation

3.3 Basic/ Root causes



3.3.1 Organisational causes (partial view)

3.3.1.1 Inadequate training / coaching programme

- i) Inadequate communication (omission / misunderstanding / wrong information)
- ii) Inadequate guidance / supervision / monitoring / coaching
- iii) Inadequate / lack of training (driver not familiar with load / route, inadequate skills, lack of knowledge, etc.)
- iv) No BBS programme (including defensive driving / roll-over prevention)

3.3.1.2 Inappropriate (use of) procedures/processes

- i) No/incomplete or incorrect risk analysis
- ii) No/inadequate procedure
- iii) Task design inadequate (competence requirements not well defined, responsibility not clear, repetitive tasks, excessive length of shift, etc.)
- iv) Corrective action not implemented
- v) Procurement process failure (inadequate specifications, inadequate receiving/inspection, inadequate contractor selection)
- vi) Quality assurance / quality control failure

3.3.1.3 Incorrect contractor management

- i) Inappropriate selection process
- ii) Inadequate definition or communication of requirement
- iii) Inadequate monitoring and reviewing of requirements

3.3.1.4 Inadequate fitness to work

- i) Inadequate physical / mental condition, sick, misuse of drugs, fatigue

3.3.1.5 Incompatible goals

- i) Task planning inadequate
- ii) Work pressure too high

3.3.2 Human causes (partial view)

3.3.2.1 Intentional behaviour

- i) Wrong attitude (not respecting safety rules, horseplay, etc.)
- ii) Cutting corners

3.3.2.2 Unintentional behaviour – human error

- i) Did not see, hear ...
- ii) Forgot to do, ask, check
- iii) Poor or wrong judgement (thought this was Ok)
- iv) Wrong action

4.2 Corrective actions on organizational causes:



- 4.2.1 Implement HSE management systems
- 4.2.2 Improve visible and felt (senior) management commitment to HSE
- 4.2.3 Carry out risk analysis and implement mitigation measures accordingly.
See examples below of mitigation measures:
 - 4.2.3.1 BBS training/refreshing training
 - 4.2.3.2 Fatigue risk management
 - 4.2.3.3 Installation of interlock systems to avoid human error
 - 4.2.3.4 Near-misses and unsafe acts and conditions reporting
 - 4.2.3.5 Preventive maintenance
 - 4.2.3.6 Road information systems
 - 4.2.3.7 Route familiarization training
 - 4.2.3.8 Subcontractors selection (for example through SQAS) and follow up of gaps and performance issues
 - 4.2.3.9 Task analysis
 - 4.2.3.10 Investigate if working at height can be avoided or provide fall protection
 - 4.2.3.11 Improve lighting
- 4.2.4 Clarify responsibilities
- 4.2.5 Define/implement/improve procedures
- 4.2.6 Implement Management of Change
- 4.2.7 Improved engineering
- 4.2.8 Follow up of corrective actions from previous incident