

Tripod-BETA

Incident Investigation and Analysis



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Incidents are an indicator to improve our performance

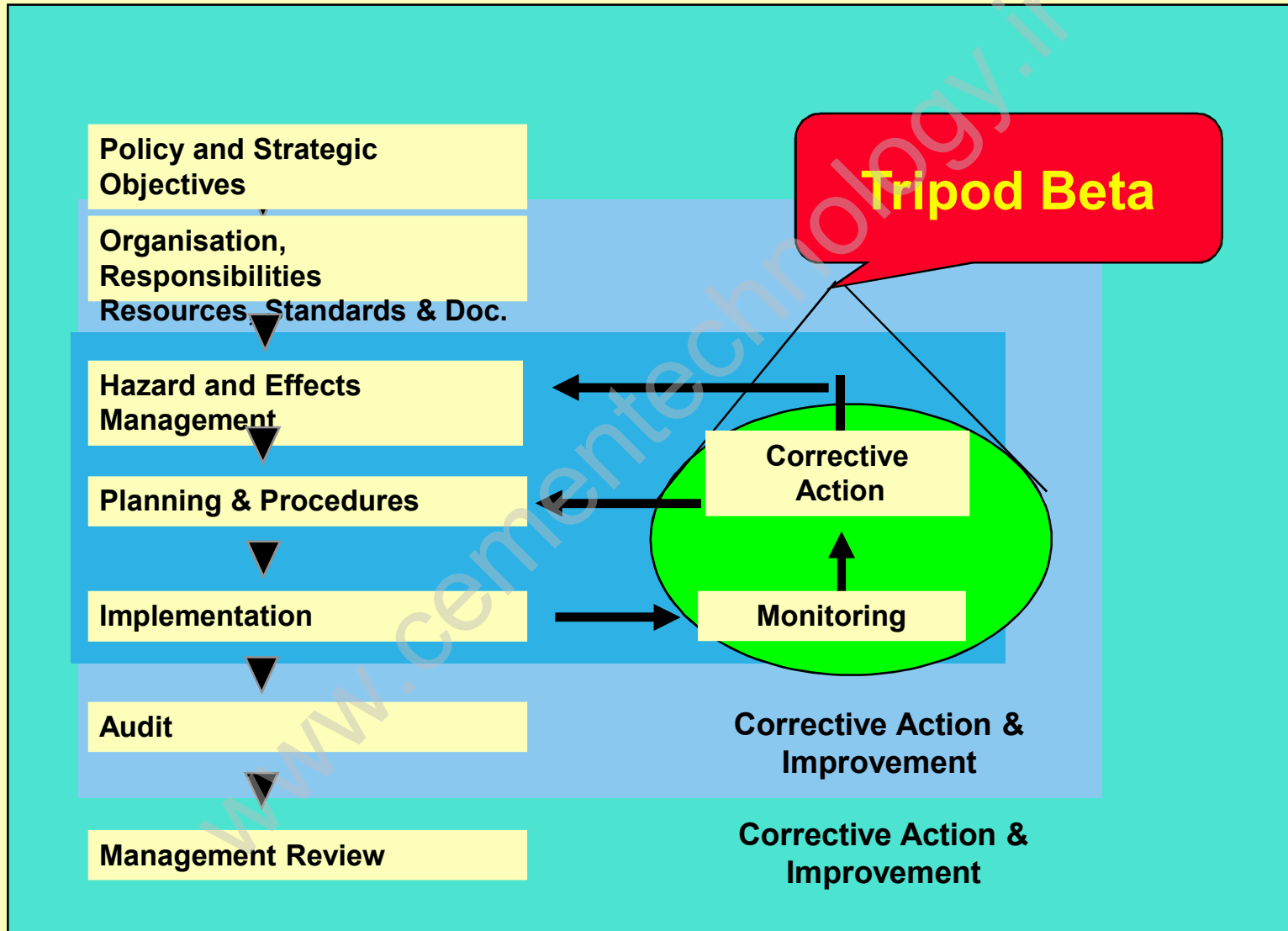
Understanding what
happened and why
enables us to
improve our
business

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Structure of the HSE Management System

Leadership and Commitment



What is Tripod-BETA ?

A methodology for incident analysis during an investigation ...

combining concepts of hazard management and ...

the Tripod theory of accident causation.

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How does Tripod-BETA work ?

The incident facts are built into a tree diagram showing ...

- What happened ...
- What hazard management elements failed and
- Why each element failed.

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What does the software do ?

The software:

- | Stores investigation facts
- | Provides tree-building graphics
- | Checks the implicit tree logic
- | Attaches data to tree elements
- | Assembles attached data into a draft report.

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How does the tree work ?

**Let's walk through a simple incident
introducing the terminology
and logic
that underpins Tripod-BETA**

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The Incident

- | **Location:** an offshore platform
- | **Incident:** an operative coming off shift slips and falls in the shower room
- | **Consequence:** he hurts his back and is off work
- | In the past three months there have been two similar incidents

Initial Findings

- | **The incident occurred at 1820 hours**
- | **The operative slipped on the wet floor**
- | **Cleaning staff are supposed to keep the shower room floor dry**

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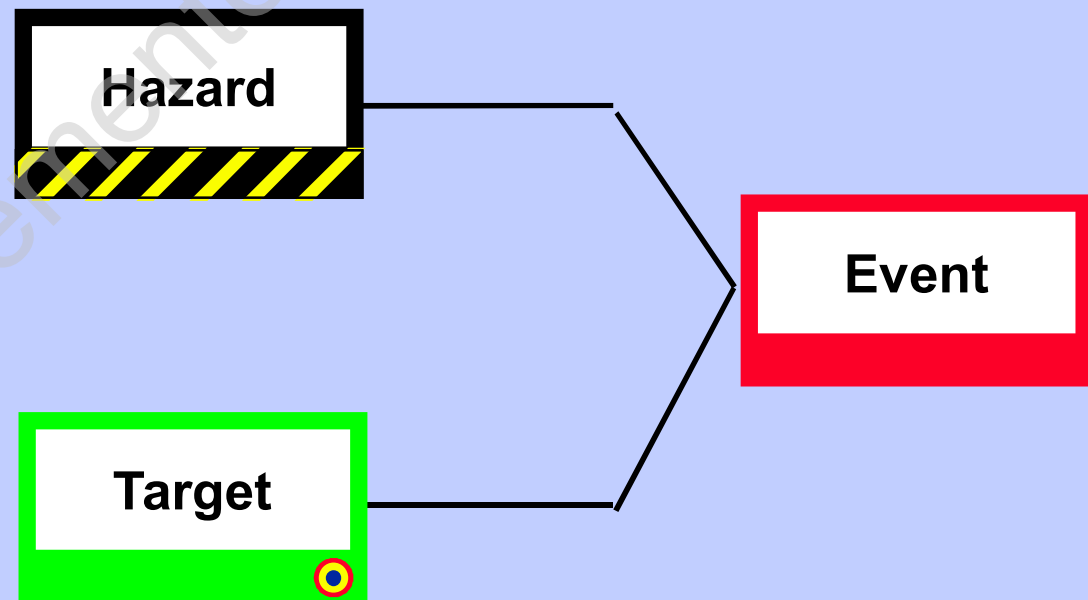
Starting a Tripod Tree

We start by identifying:

- I An **EVENT** - where a hazard and a target get together
- I A **TARGET** - a person or an object that was harmed
- I A **HAZARD** - the thing that did the harm

The Hazard, Event, Target Trio

They are shown in a Tripod tree like this:



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Hazard, Event & Target

In this incident:

The **HAZARD** is : Wet floor (slipping hazard)

The **EVENT** is : Operative falls in shower room

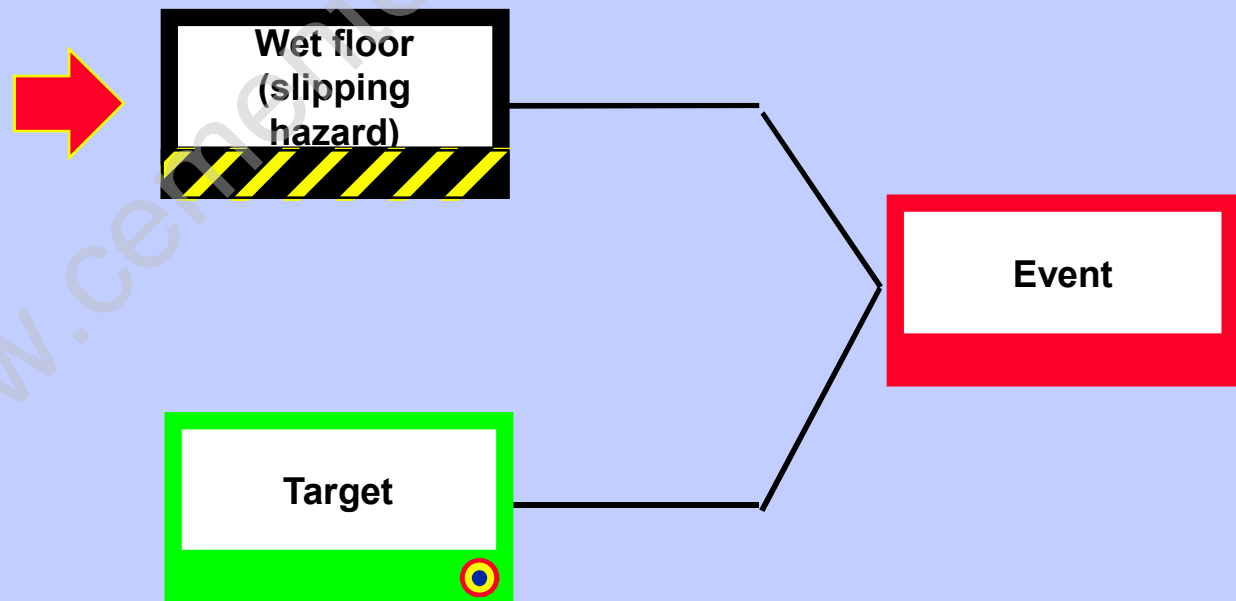
The **TARGET** is : Operative

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HET Diagram

The Hazard,

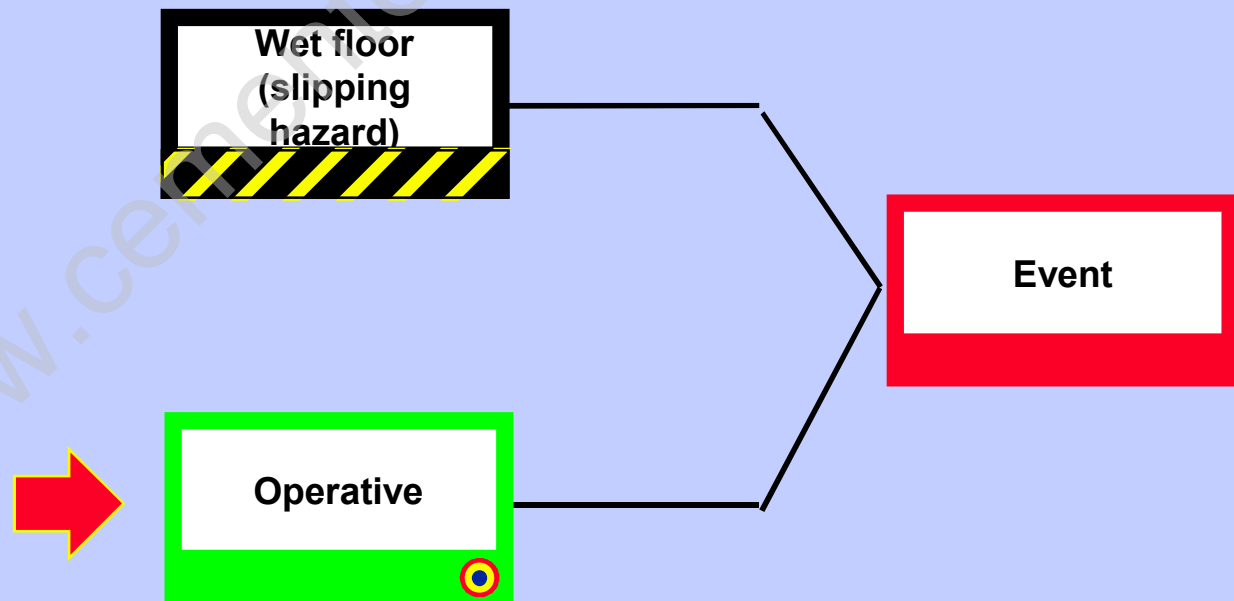


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HET Diagram

The Hazard, acting on the **Target**,

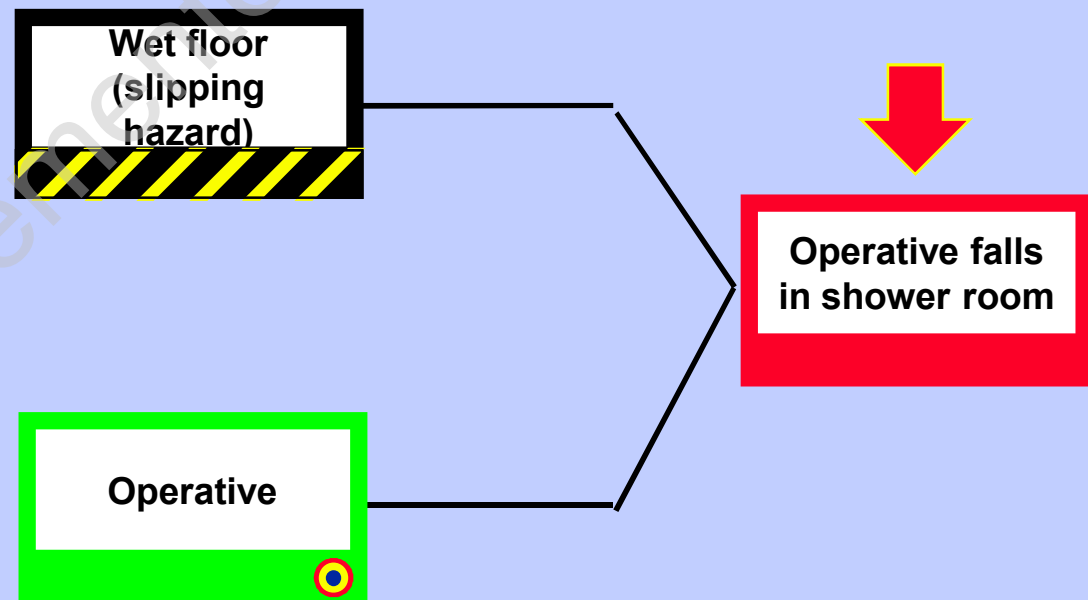


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HET Diagram

The Hazard, acting on the Target, resulted in the **Event**



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Is the investigation complete ?

I Does this show full understanding ?

Finding: The man must have been careless

Recommendation: He should take more care on a wet floor

I Or is there something more ?

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Was the incident preventable ?

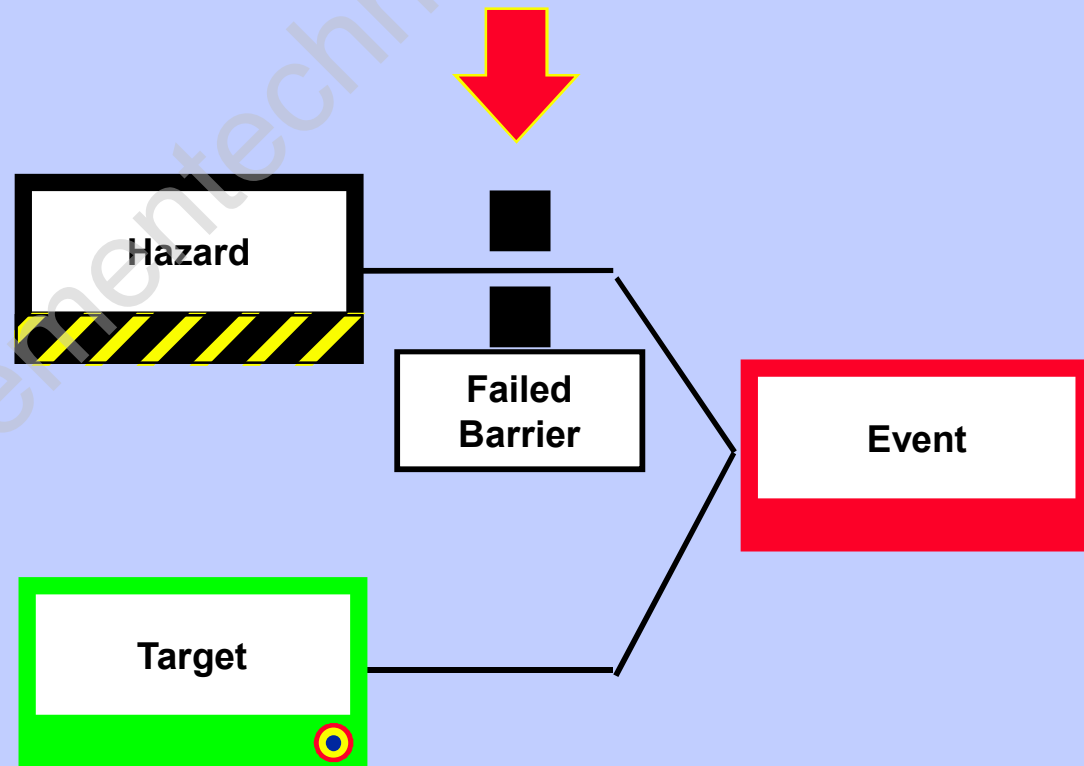
- | We know that a hazard management measure was in place
- | Cleaning staff were assigned to keep the floor dry
- | That 'barrier' to the incident failed

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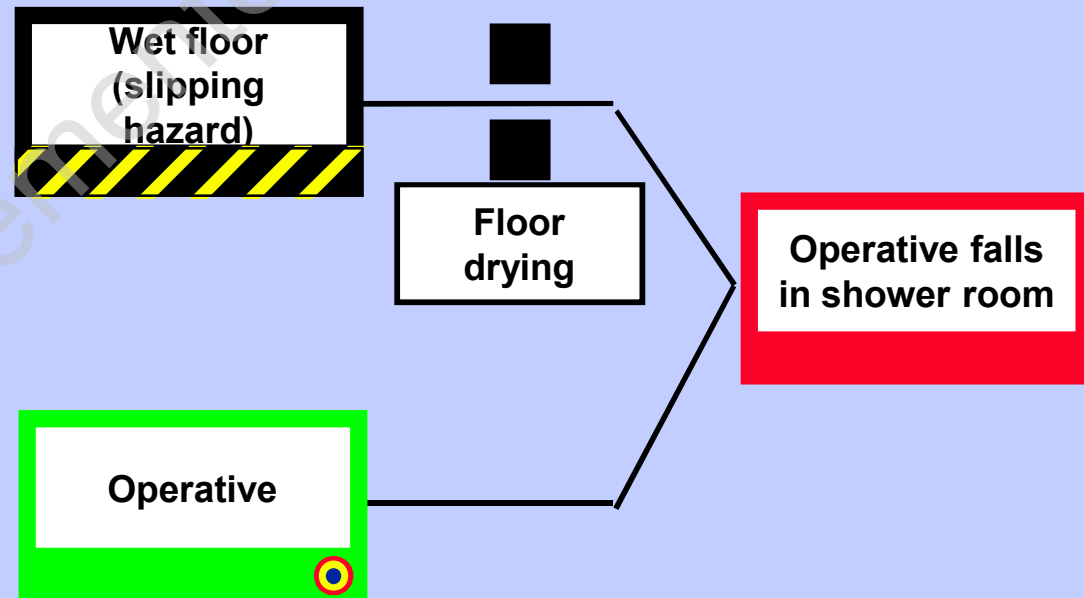
Failed Barrier

The **barrier** should have controlled the hazard



Incident Mechanism

The incident mechanism looks like this:



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Further Investigation

What caused the barrier to fail ?

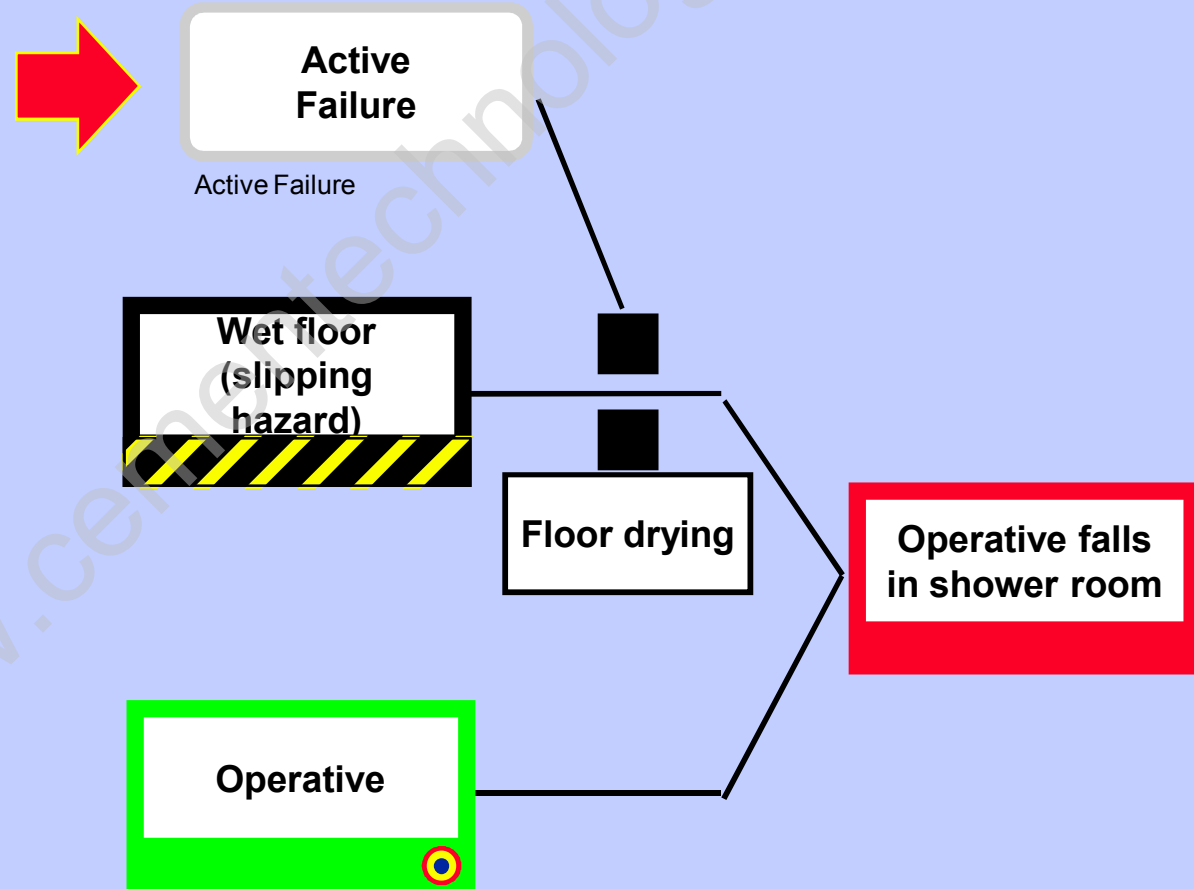
- | The cleaner could not keep the floor dry ...**
- | because the shower room was always congested between 1800 and 1900 hrs**

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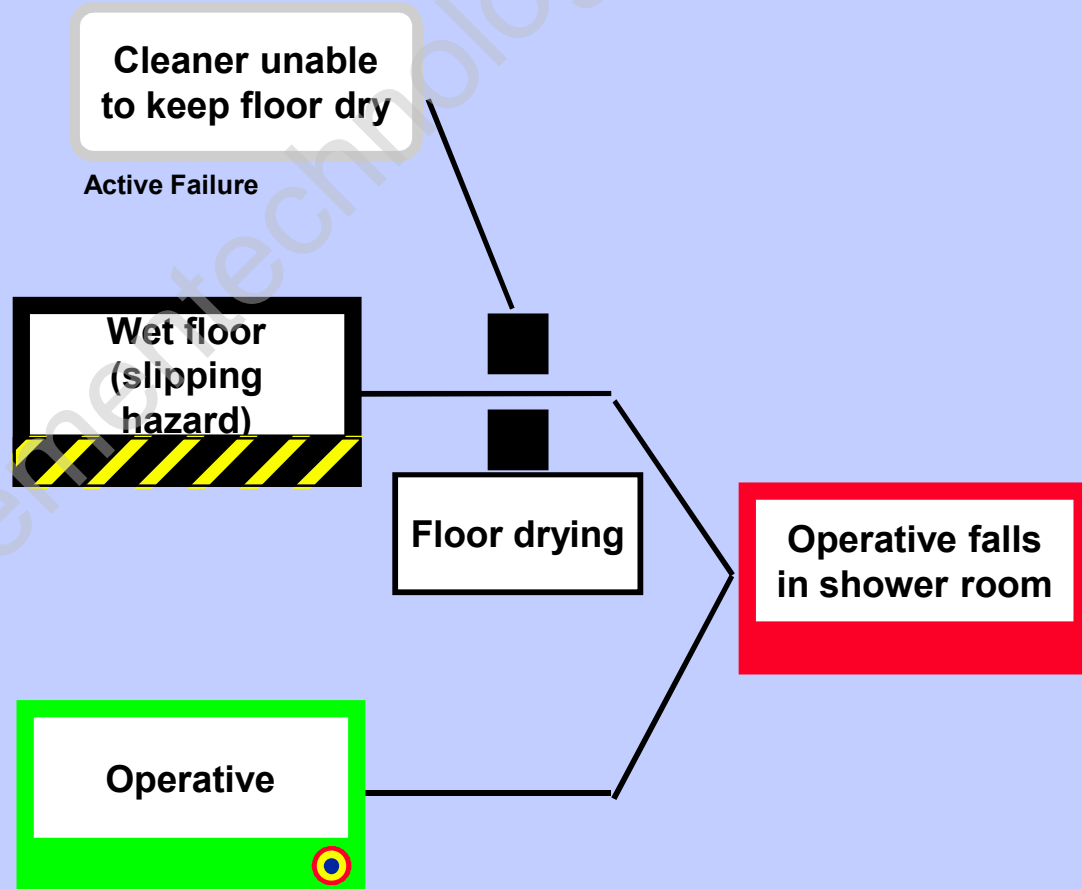
Active Failure

An **Active Failure** defeated the barrier



Active Failure

An **Active Failure** defeated the barrier



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End of Investigation ?

I Is this the end of the investigation ?

Finding: The cleaner was incompetent

Recommendation: Cleaner should be replaced or retrained

I Or is there still something more ?

Further Investigation

- | We know that congestion was a factor that prompted the active failure**
- | Telephones are only available for private calls up till 1900 hrs**
- | The congestion is caused by day shift crew hurrying to call home**

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The Full Picture

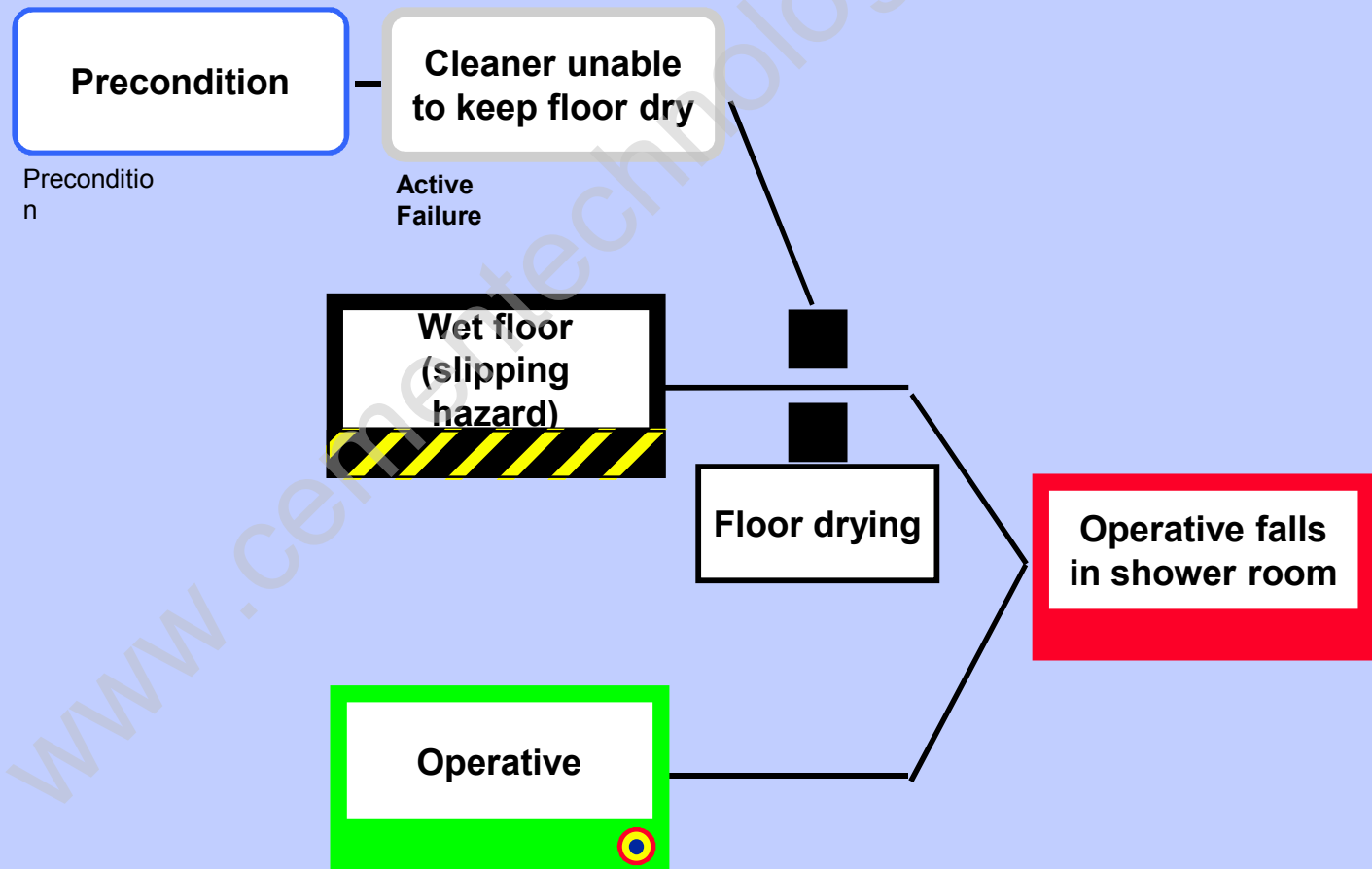
Now we have the full picture:

- | The congestion is a '**Precondition**' that influenced the cleaner's task
- | Restriction on telephones is a '**Latent Failure**' that created the precondition

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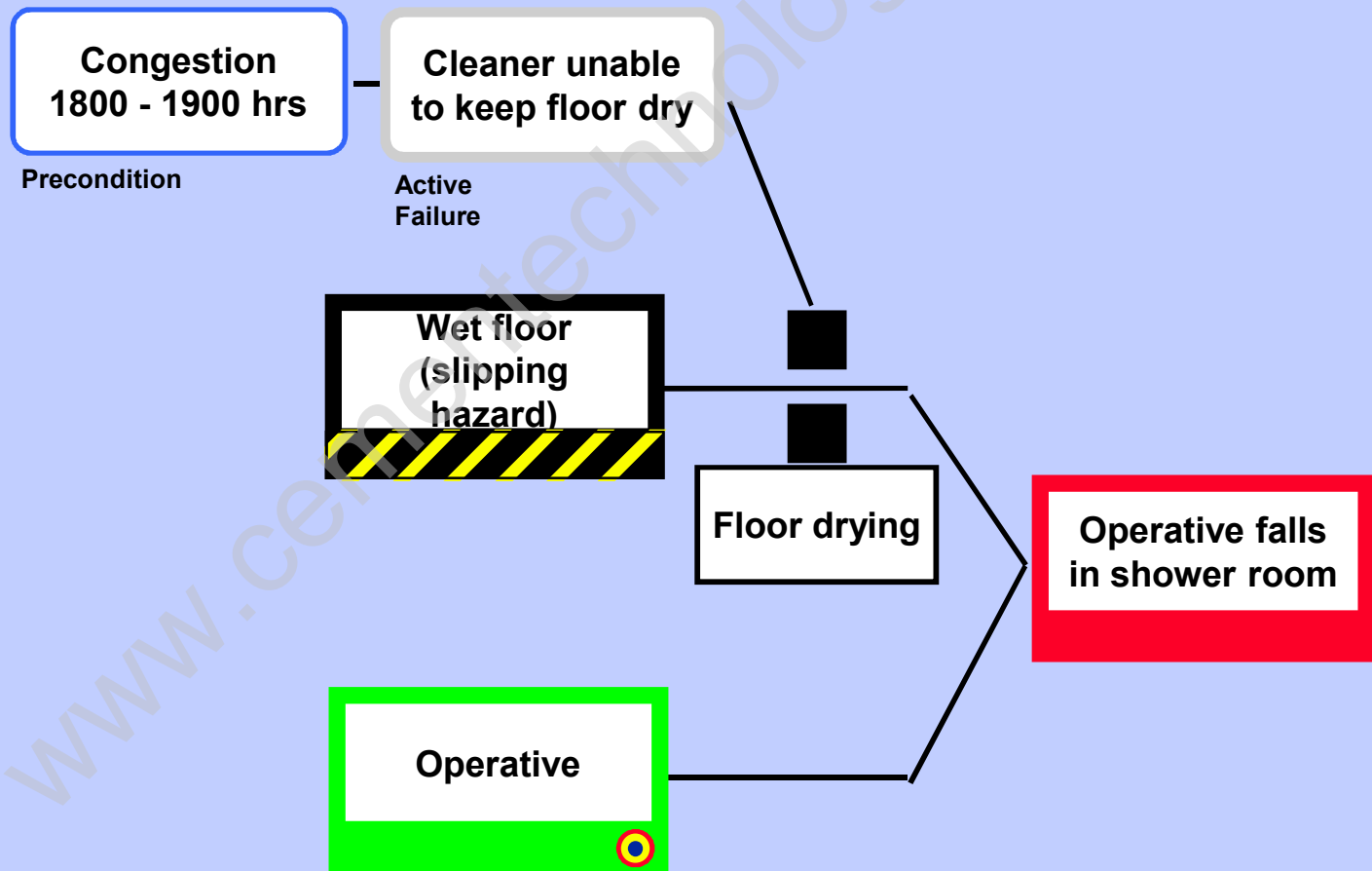
Precondition



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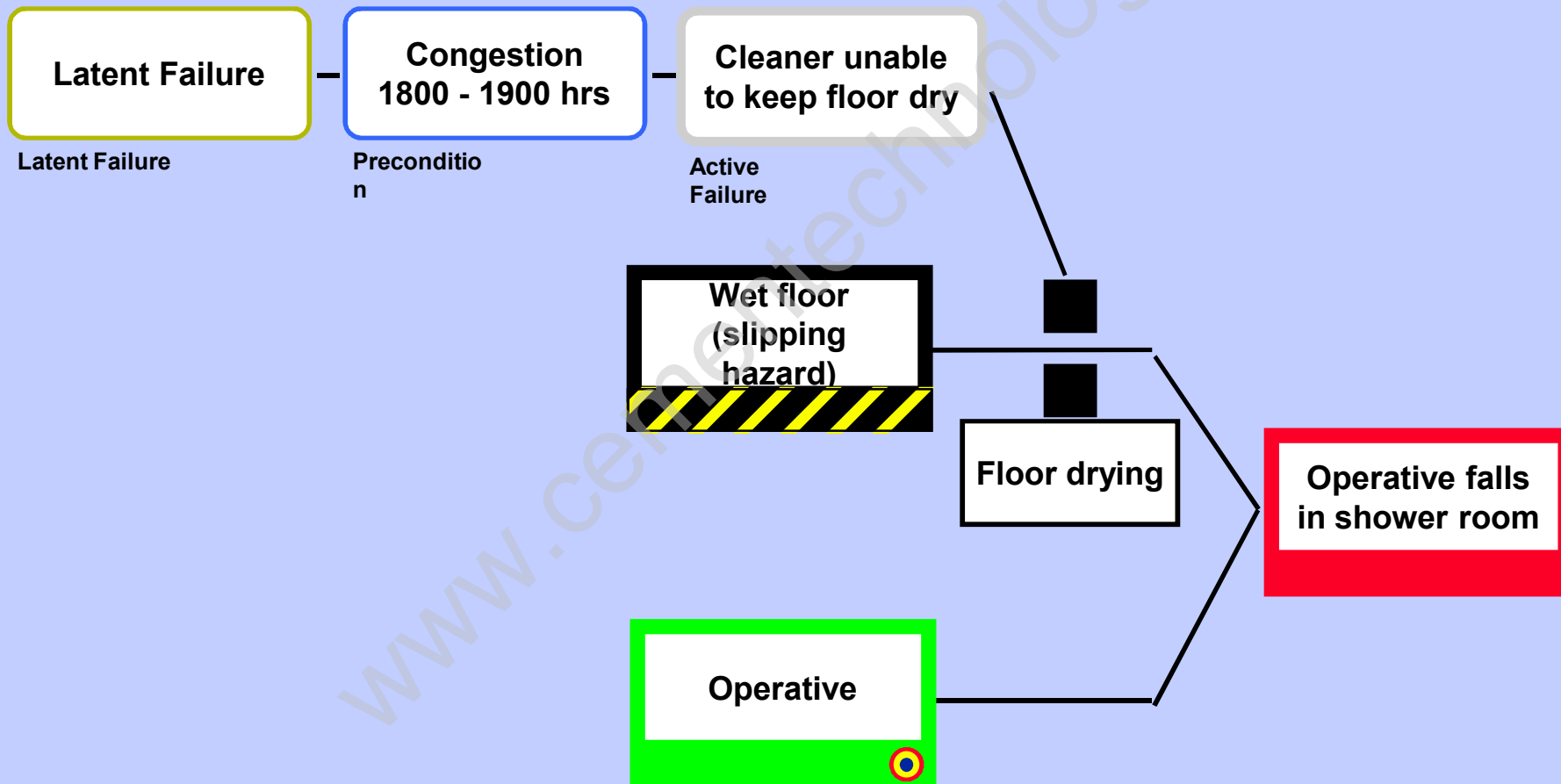
Precondition



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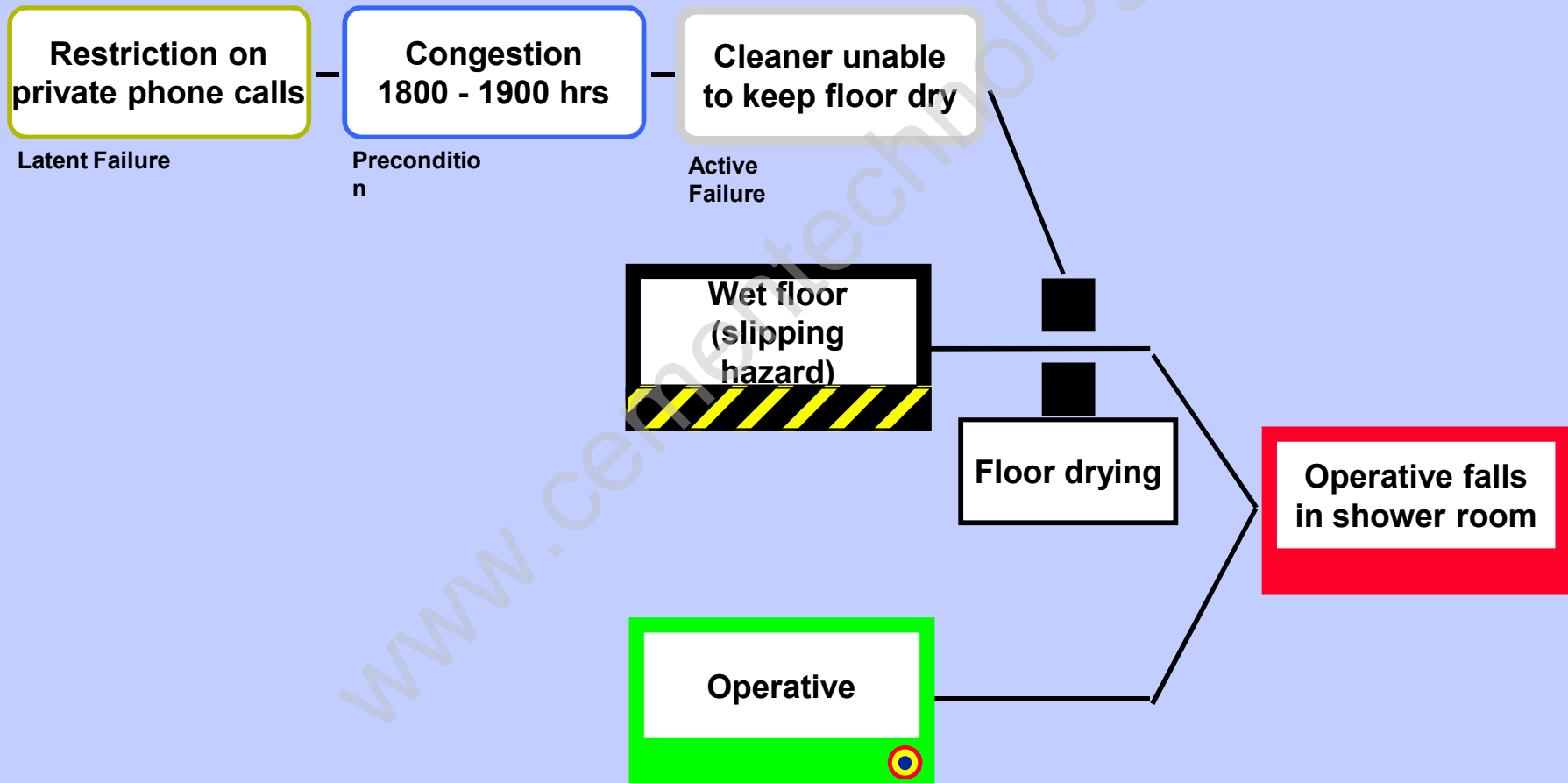
Latent Failure



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Latent Failure



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Recommendations

Action items should address:

- I **The failed barrier ...**
to restore safe conditions on a temporary basis
(provide extra cleaner between 1800 and 1900)
- I **The latent failure ...**
to remove the underlying cause
(extend the availability of shore telephone)

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Complex Events

- | **That was a simple example**
- | **The Tripod-BETA methodology can also be applied in complex events**

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Complex Events

Identify the prime **Event**,

Fire

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Complex Events

Identify the prime Event, the **Hazard**,

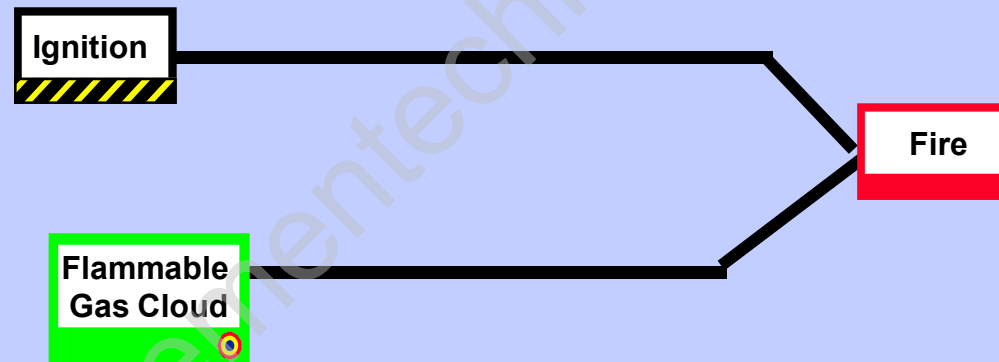


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Complex Events

Identify the prime Event, the Hazard, and Target.

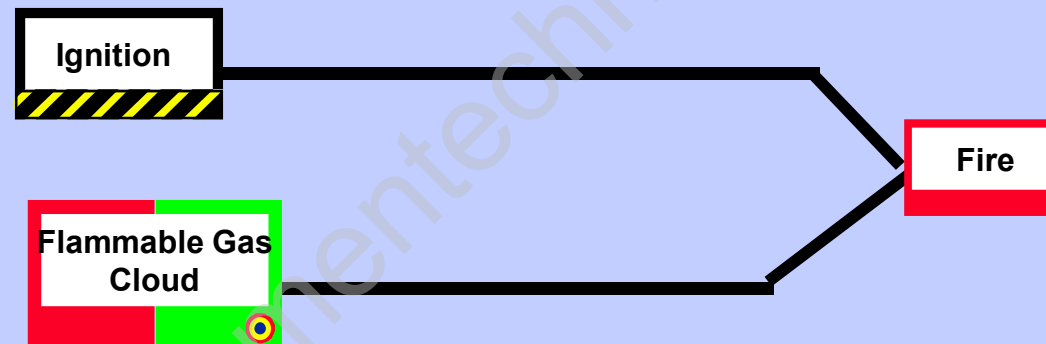


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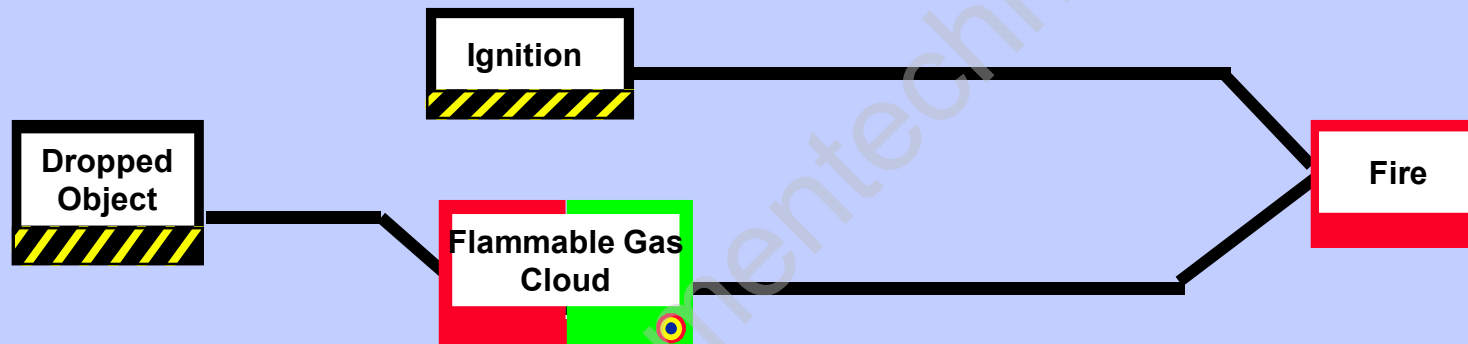
Complex Events

If, say, the target was created by a prior event



Complex Events

Identify the hazard ...

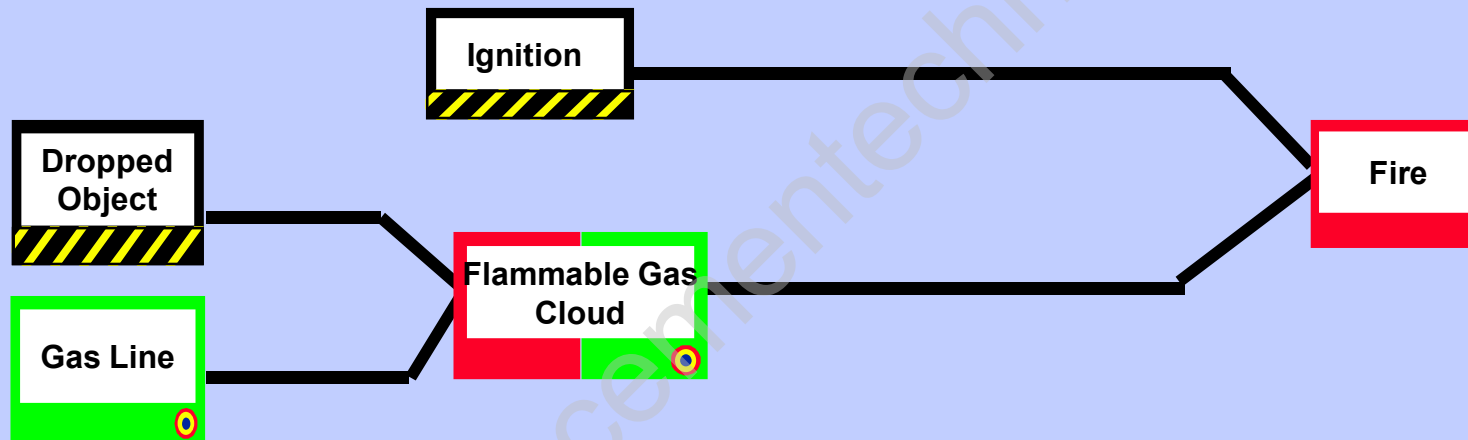


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Complex Events

and target for that event.

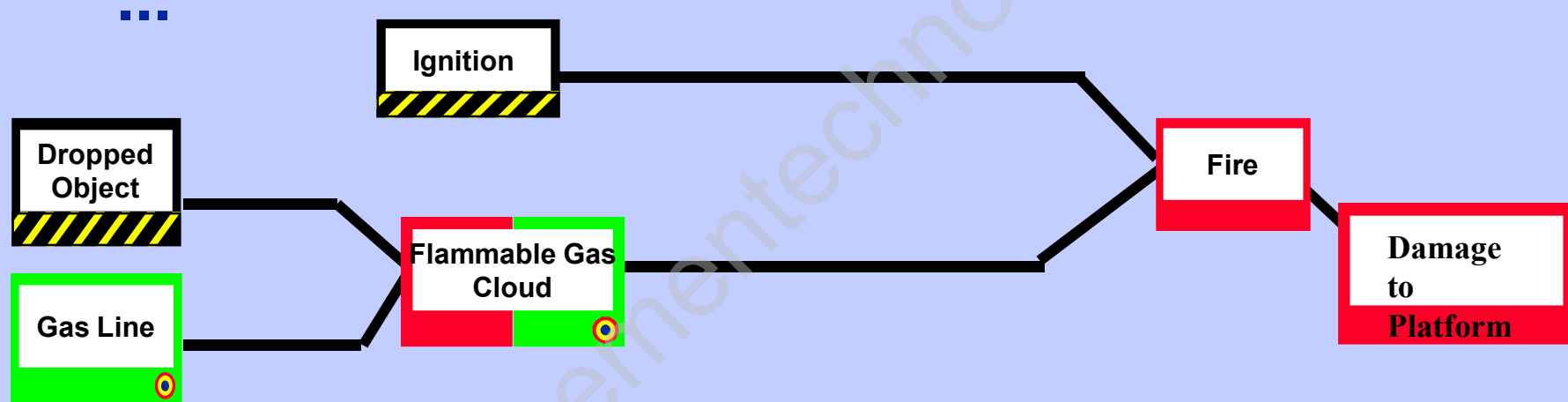


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Complex Events

Similarly, if a consequential event happens

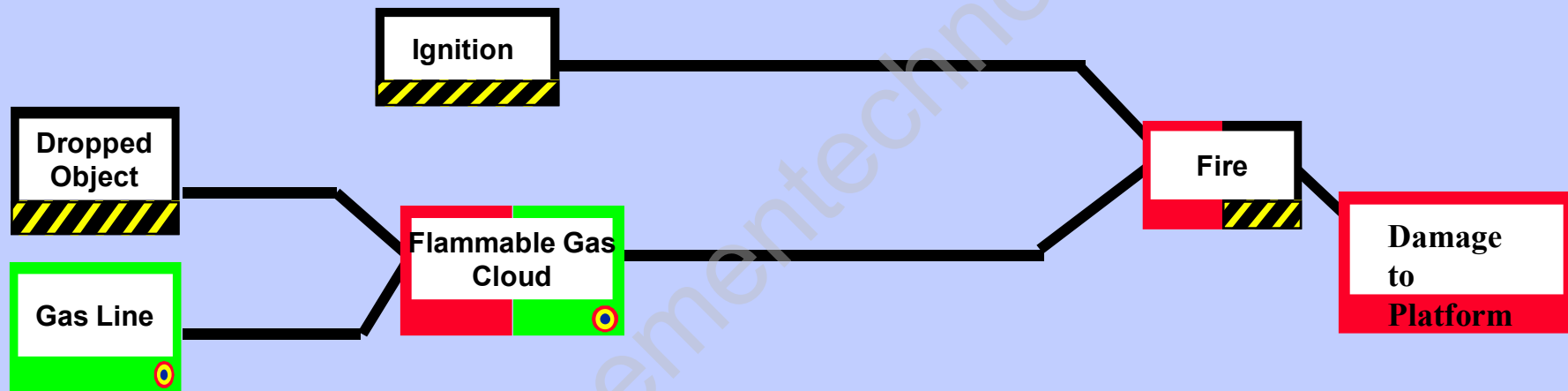


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Complex Events

because the prime event created a new hazard,

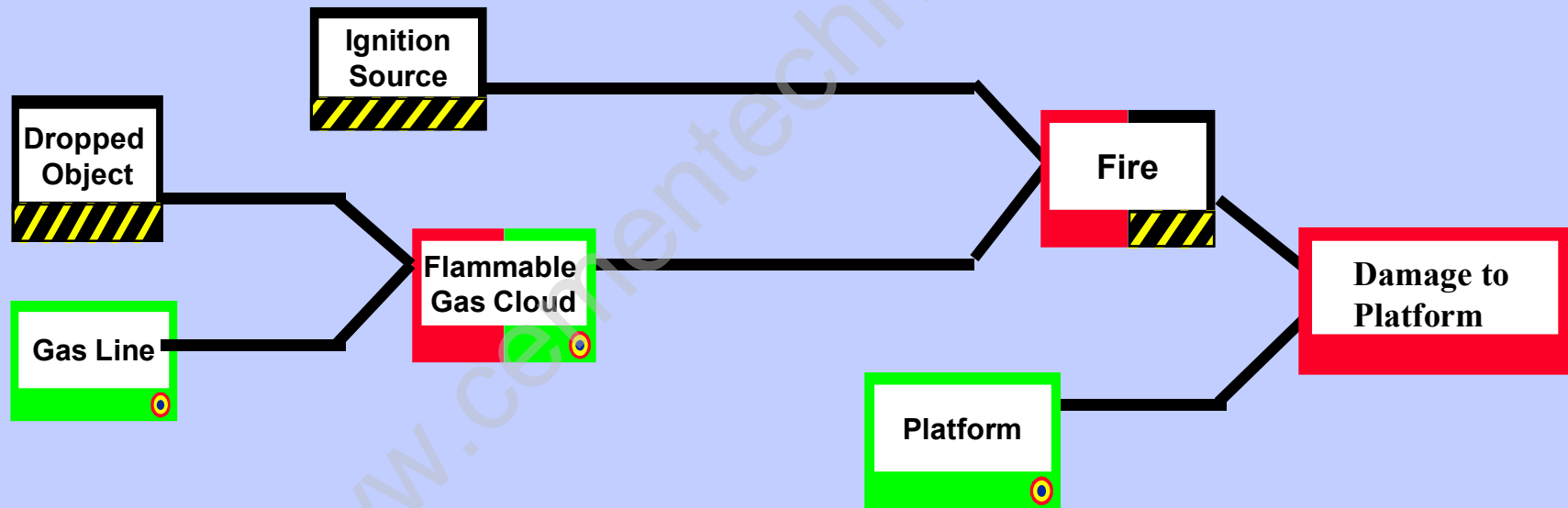


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Complex Events

identify the target for the new event.

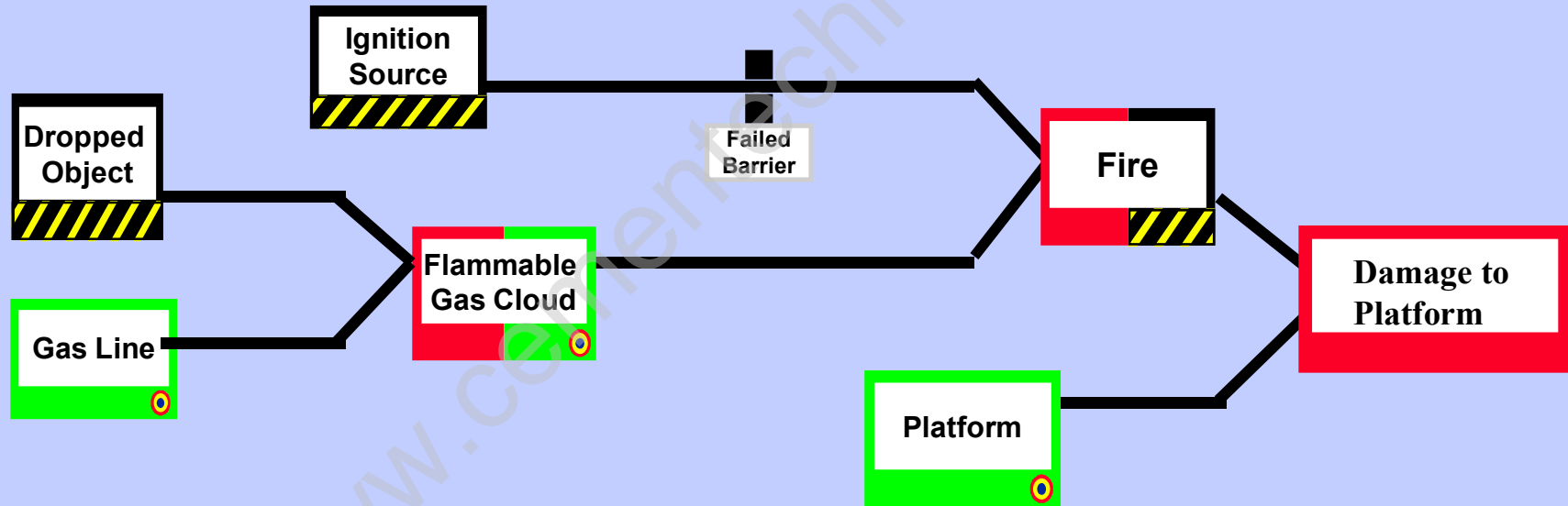


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Complex Events

Identify failed 'barriers',

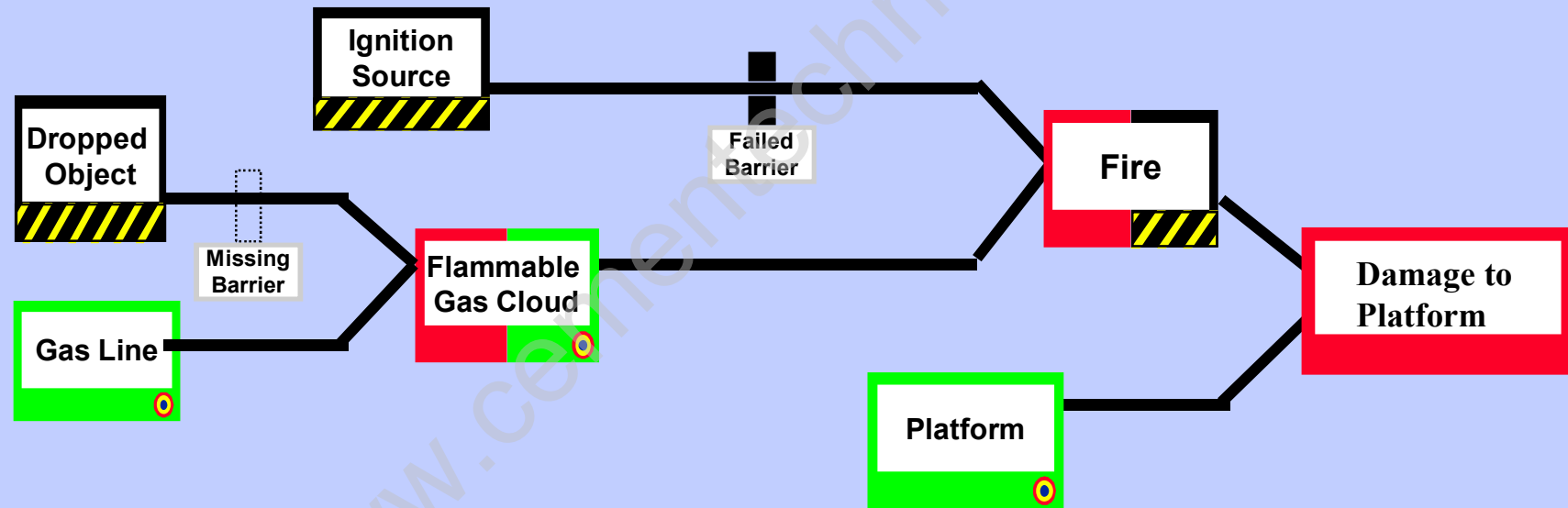


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Complex Events

and missing ones ...

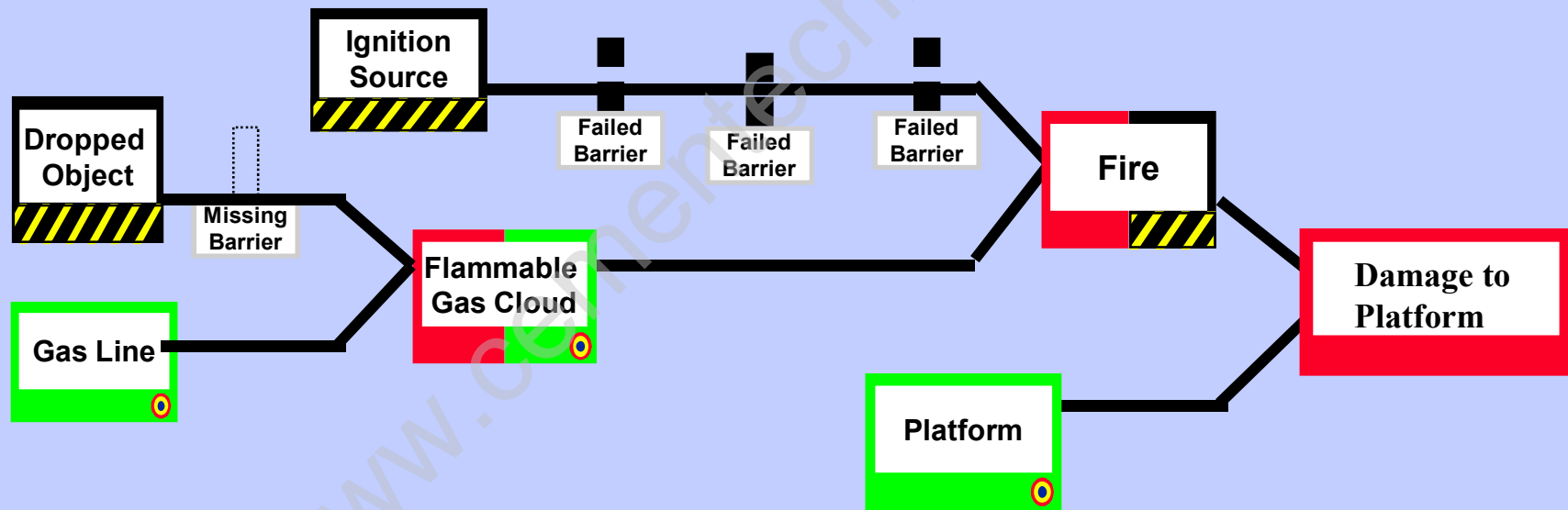


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Complex Events

including multiple failures ...

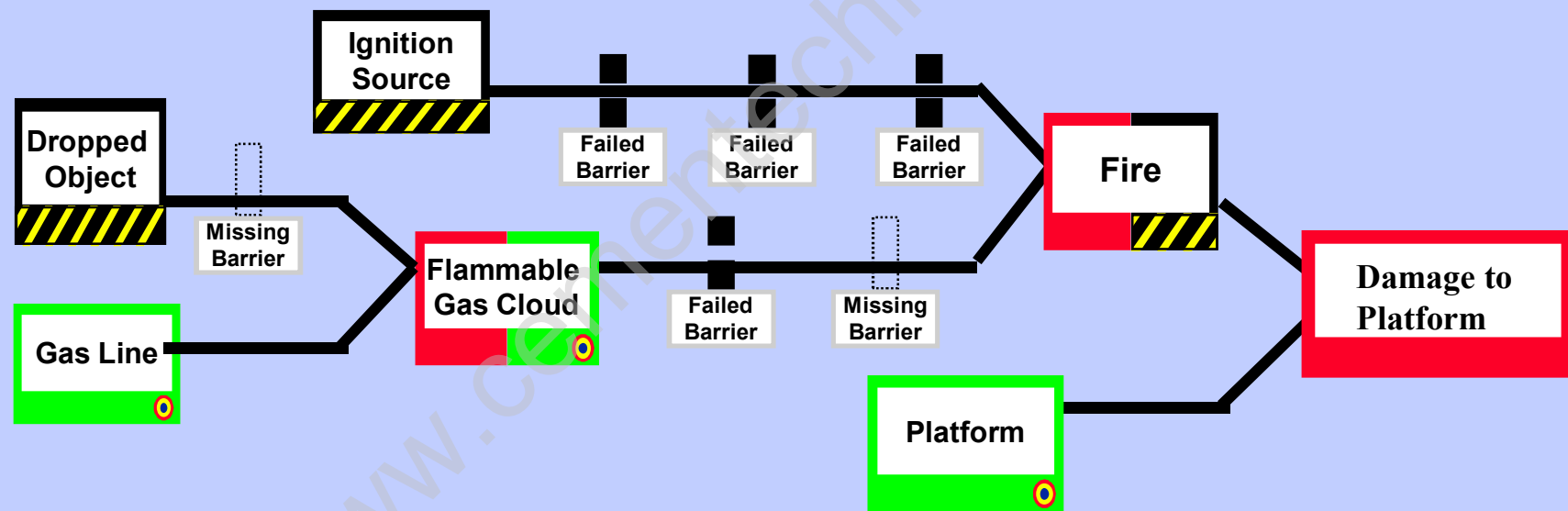


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Complex Events

on each relevant 'trajectory' ...

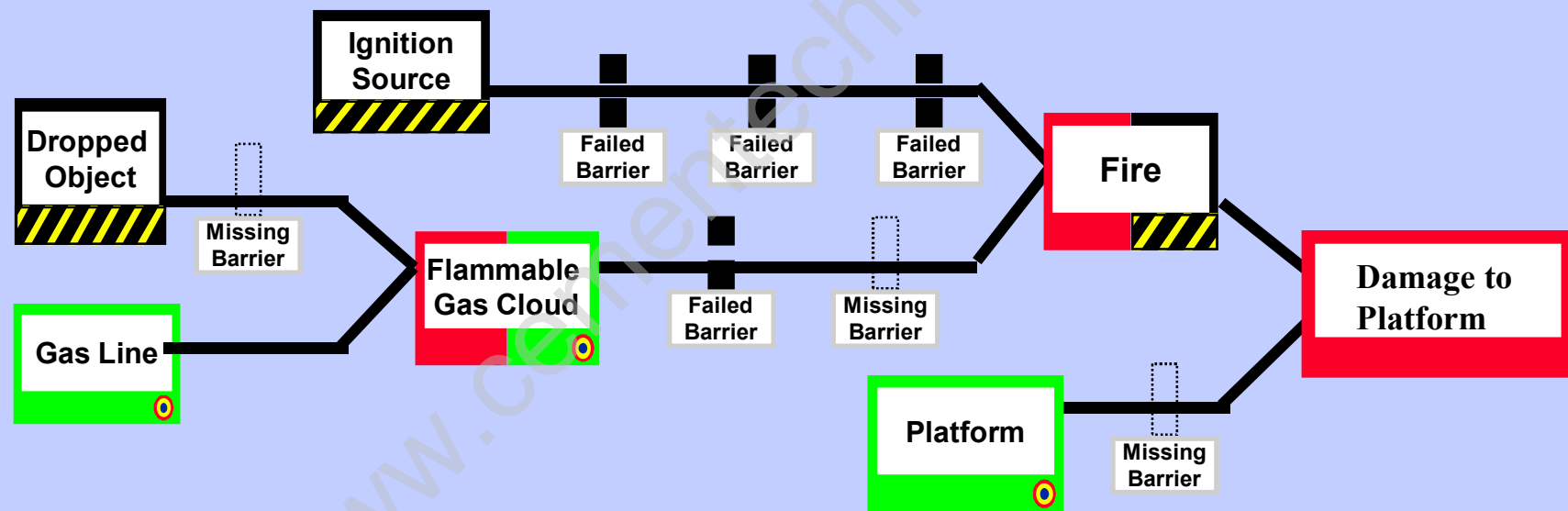


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Complex Events

until the Incident Mechanism is complete.

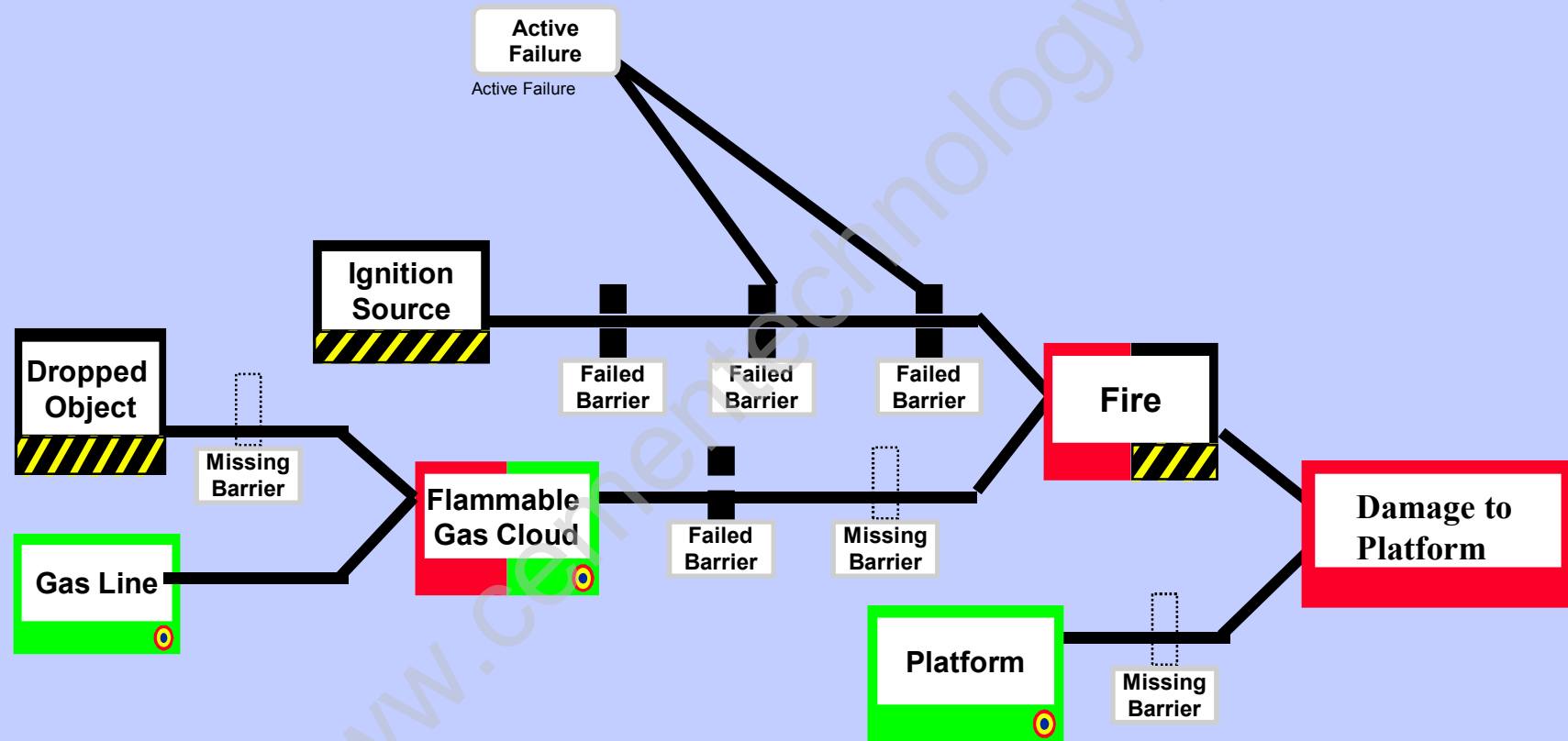


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Complex Events

Show the **Active Failure** for each barrier, ...

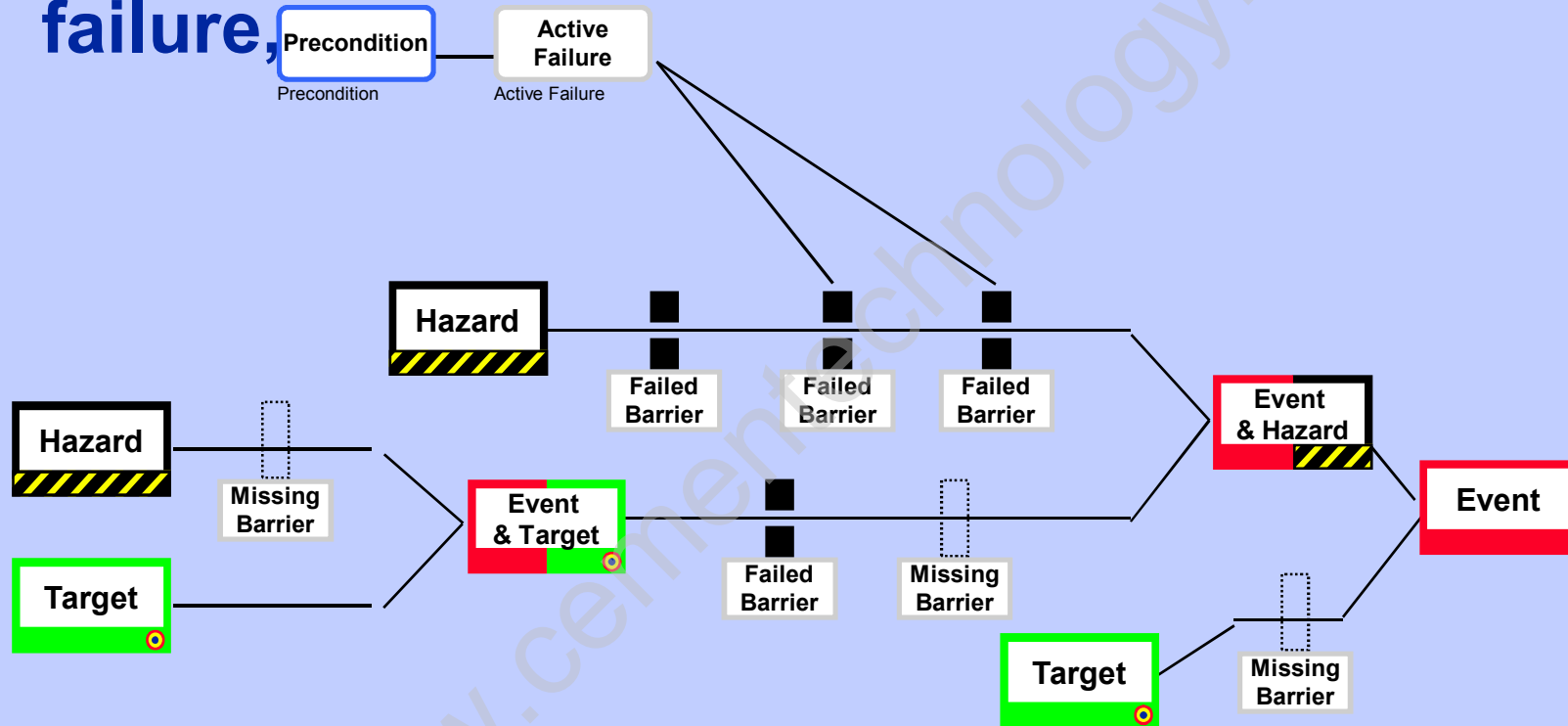


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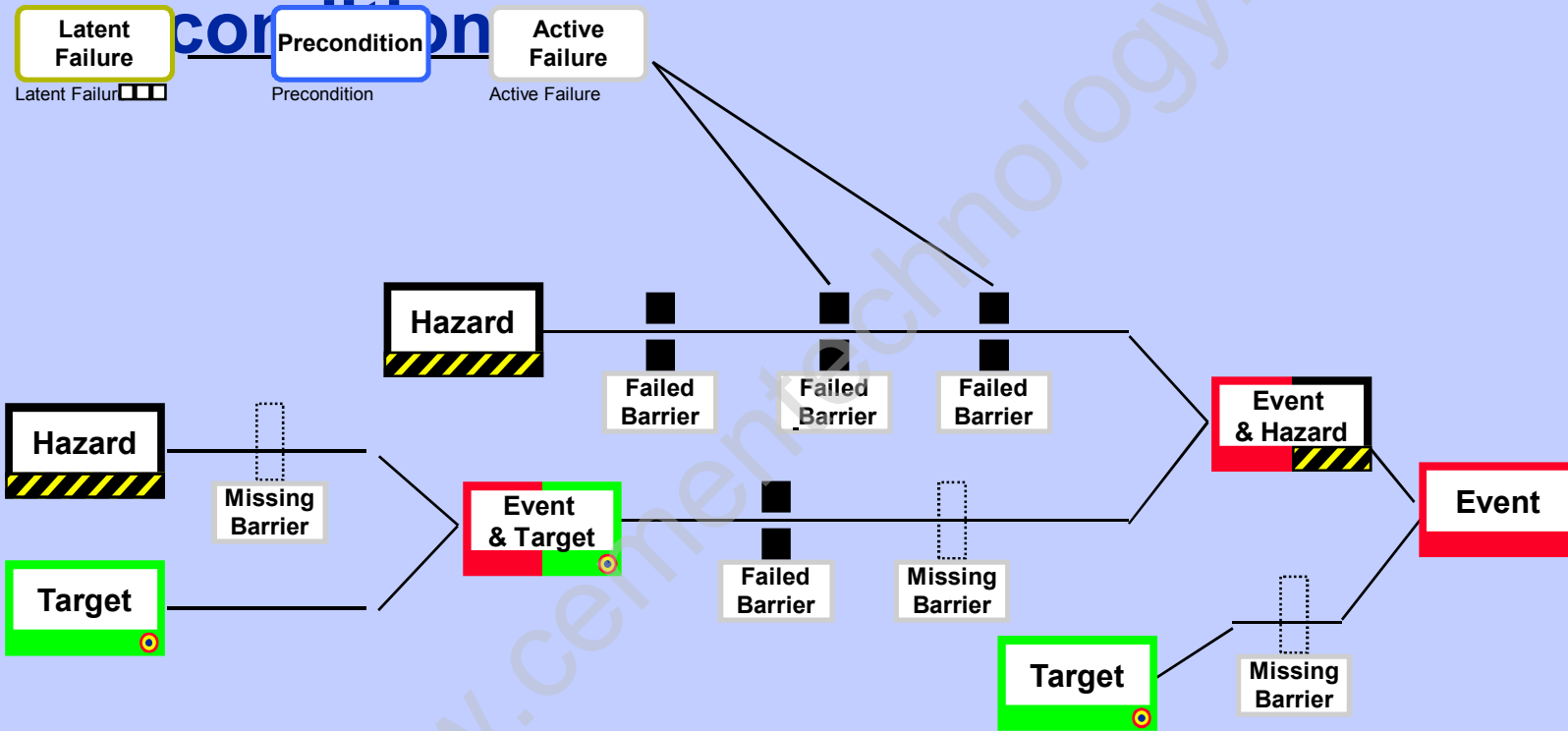
Complex Events

the **Precondition(s)** promoting each active failure,



Complex Events

and the **Latent Failure** behind each

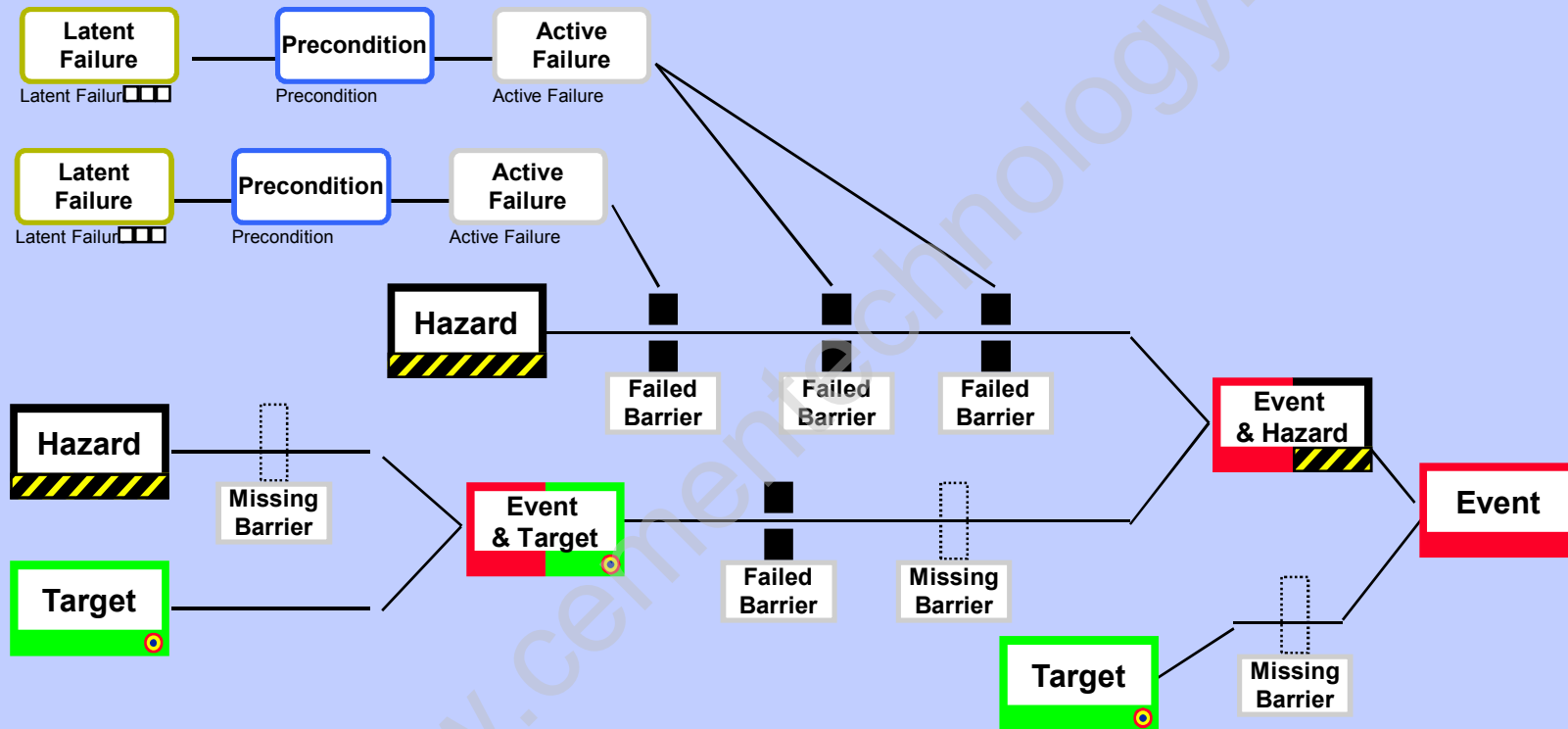


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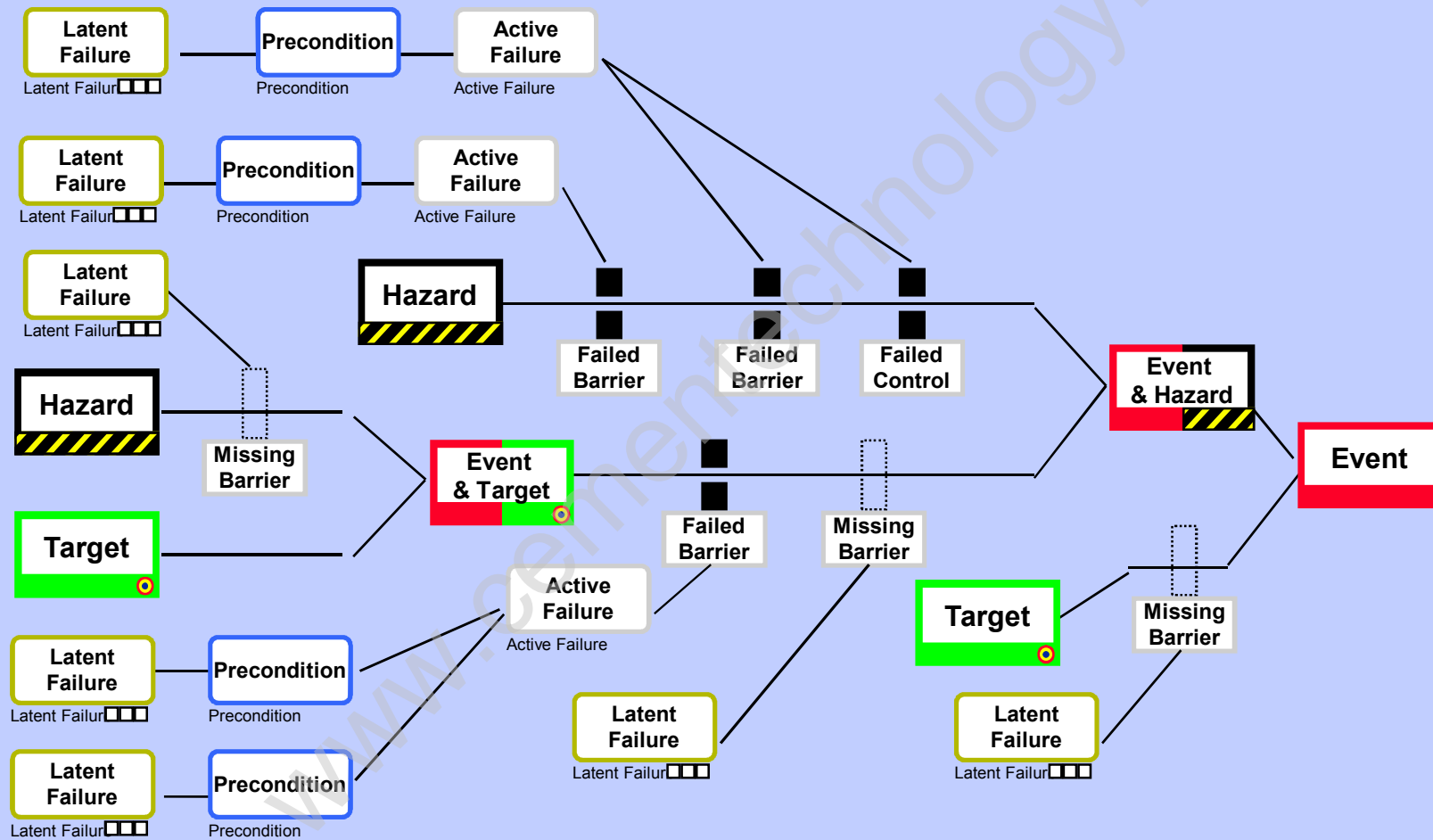
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Complex Events

Complete a 'Tripod path' for each barrier.



The completed Tripod-BETA tree

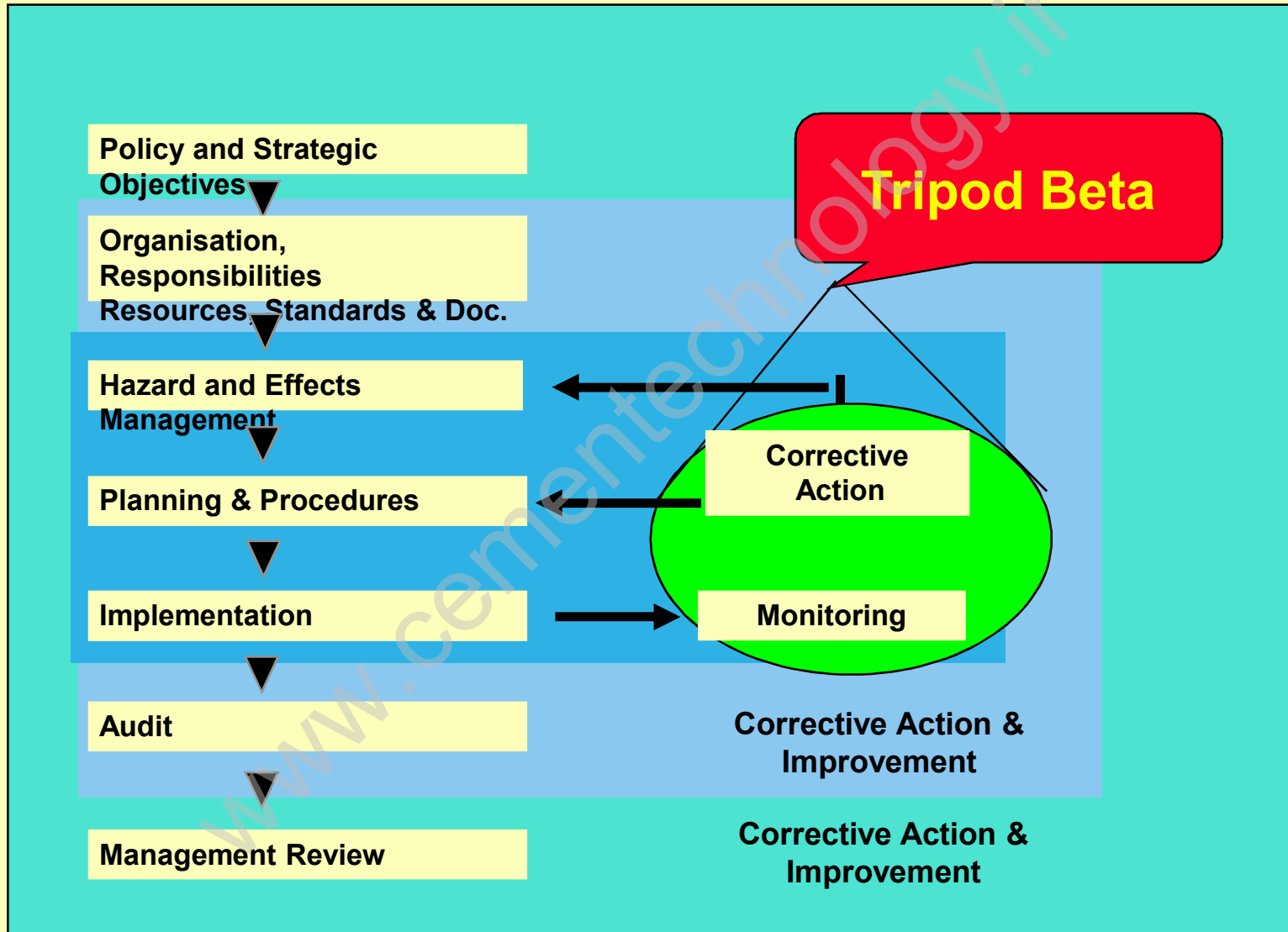


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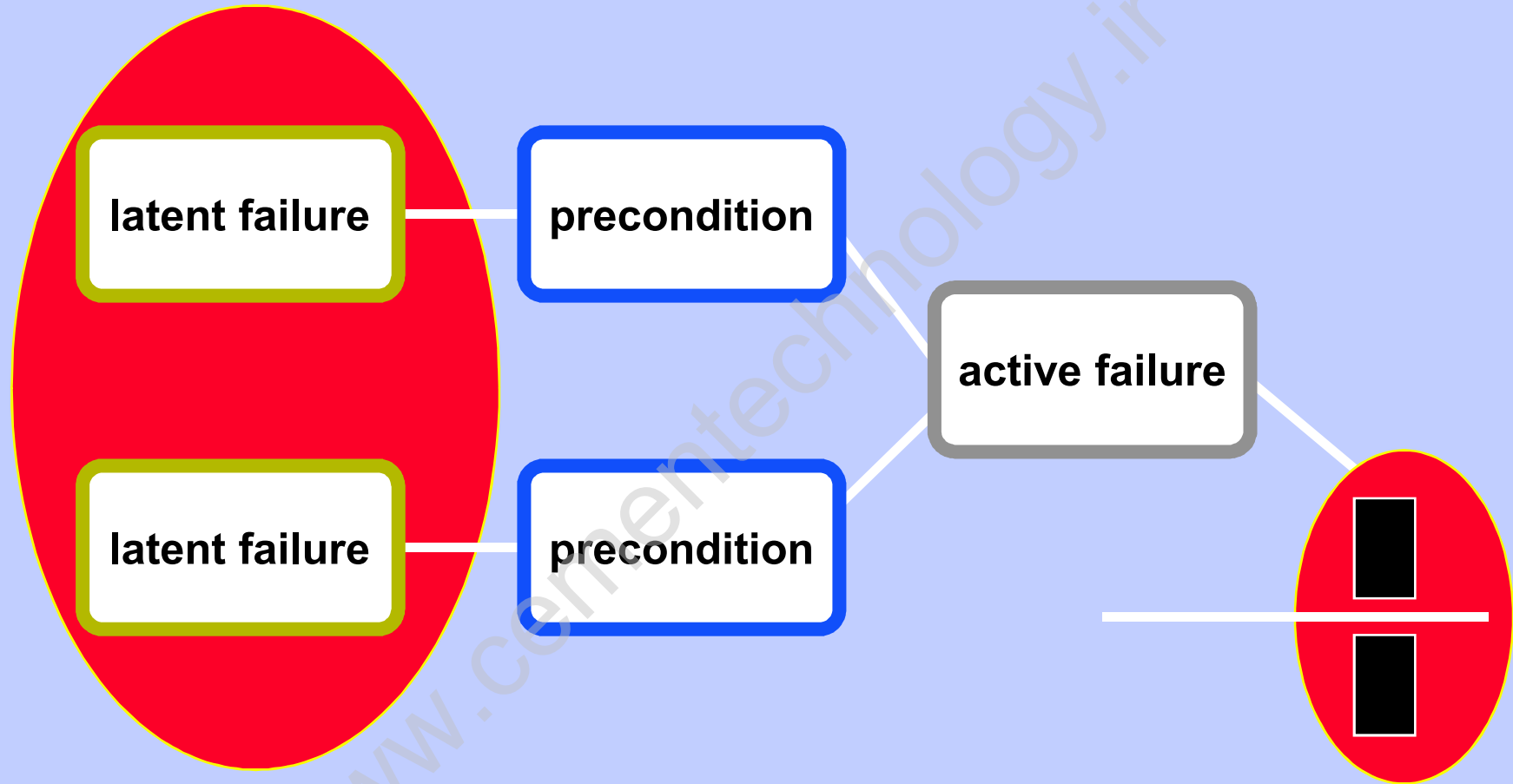
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Structure of the HSE Management System

Leadership and Commitment



Corrective Actions



Long term action to reduce latent failures

Replace the failed barrier

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Corrective Actions

- I If the barriers have not been replaced you should question why operations have restarted**
- I Actions to replace barriers are normally on site**
- I Latent Failures are deep seated do not expect to remove them tomorrow**
- I Action to tackle latent failures are normally at management level**

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Tripod-BETA

- | **Brings a structure to investigation**
- | **Helps distinguish relevant facts**
- | **Makes causes and effects explicit**
- | **Encourages team discussion**
- | **Reduces the report writing task**

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