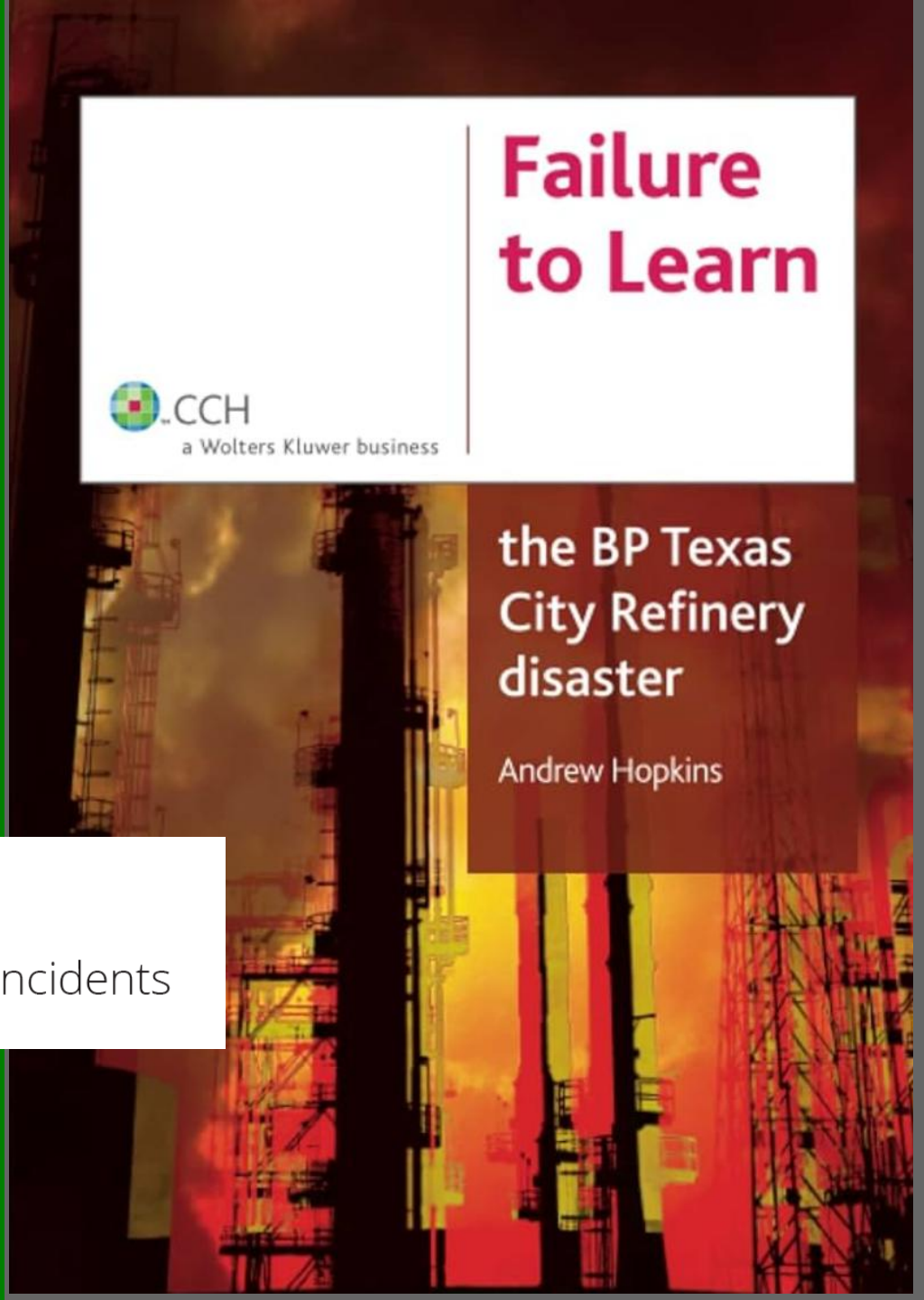
2016 presentation at this PS congres

Prof. Dr. Andrew Hopkins

Organization deficiencies leading to catastrophic incidents



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“

My parents were my best friends, they’re all I had. My life ended that day*

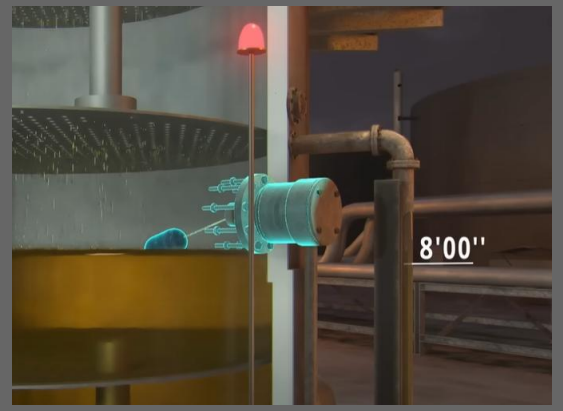
”

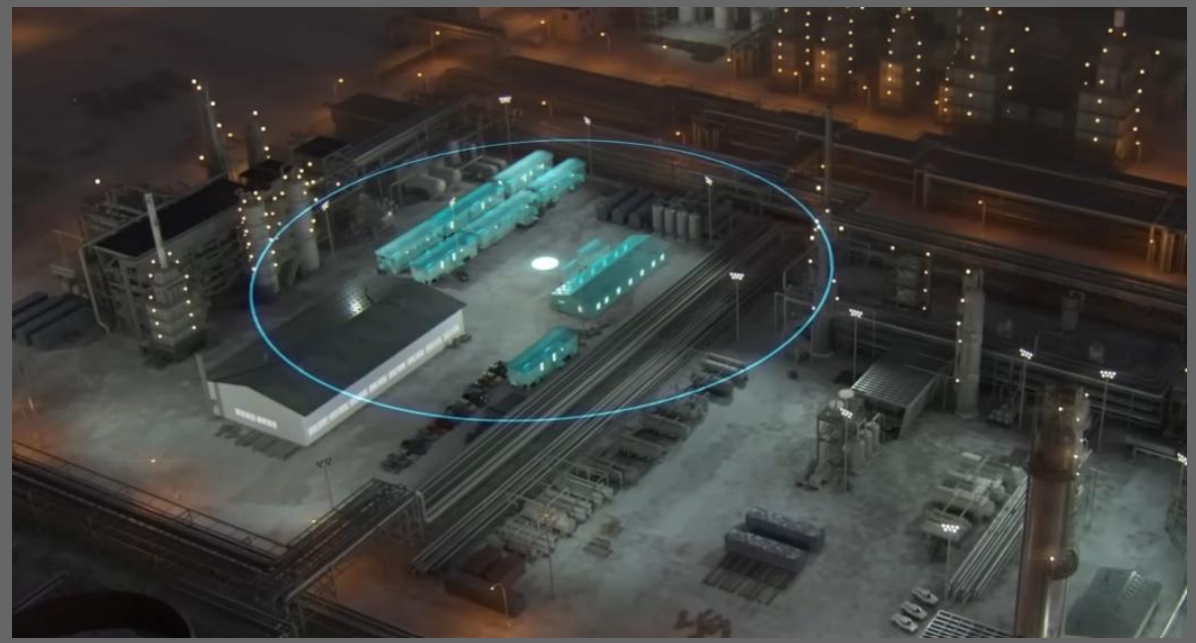
* Quote of Eva Rowe who lost both parents in the explosion in 2005, from the book failure to learn

Quick summarize:

- Following the maintenance period of the raffinate splitter, the startup commenced.
- A high-level alarm was triggered, but the secondary alarm failed to activate.
- At 5:00, the satellite operator left one hour before the shift change.
- By 6:00, the new board operator arrived, marking the 30th consecutive day of a 12-hour shift.
- At 9:00, the process of filling the tower resumed, along with heating the feed.
- By 12:00, the liquid level in the tower reached 98 feet, while the level measurement remained unchanged.
- At 12:45, high pressure was detected in the tower, prompting a bypass and reduction of heat.
- At 13:00, the rundown was opened, and high heat input led to an overfill situation.
- By 13:14, relief valves were opened to manage the overflow to the blowdown system.
- At 13:15, a vapour cloud began to form, resulting in ignition.

- A total of 15 people died and 180 were injured.
- Reflections





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Main failing barriers

- Start up procedures not followed, the rational was to protect the furnace systems.
- Inadequate instrumentation, both alarms on stripper and blowdown vessel did not function and level control not able to read above 100%,
- In proper design of the control room, not able to see ballans.
- Exclusion zones and facility sitting not followed, buildings allowed within risk contour.
- Inadequate staffing in control room.
- Ignition source by a running vehicle 25 feet away from source.

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What did we learn from Texas City incident 20 years ago.

Linked to the process safety fundamentals

Ruben Stolk

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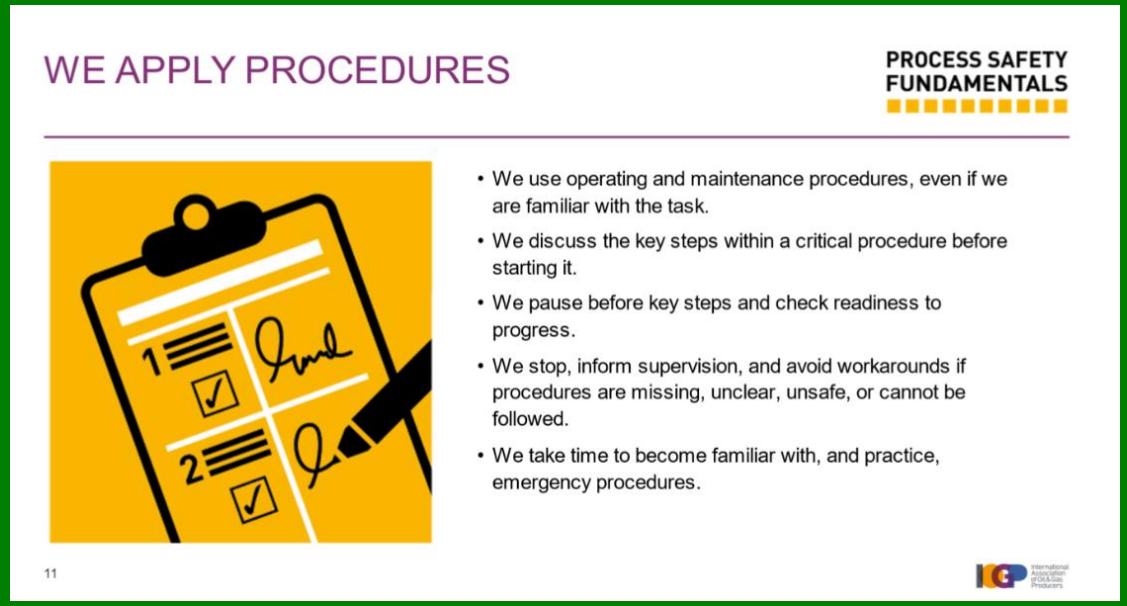
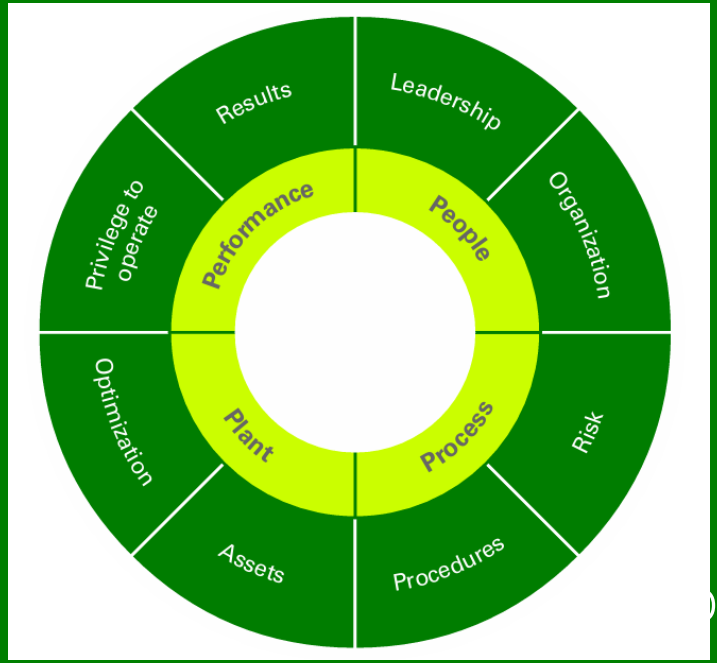
We apply procedures

- We changed the way how we use procedures and have implemented the 3F's and introduced the PSF of IOGP,

  - Follow the rules
  - Finnish what you started
  - Follow up

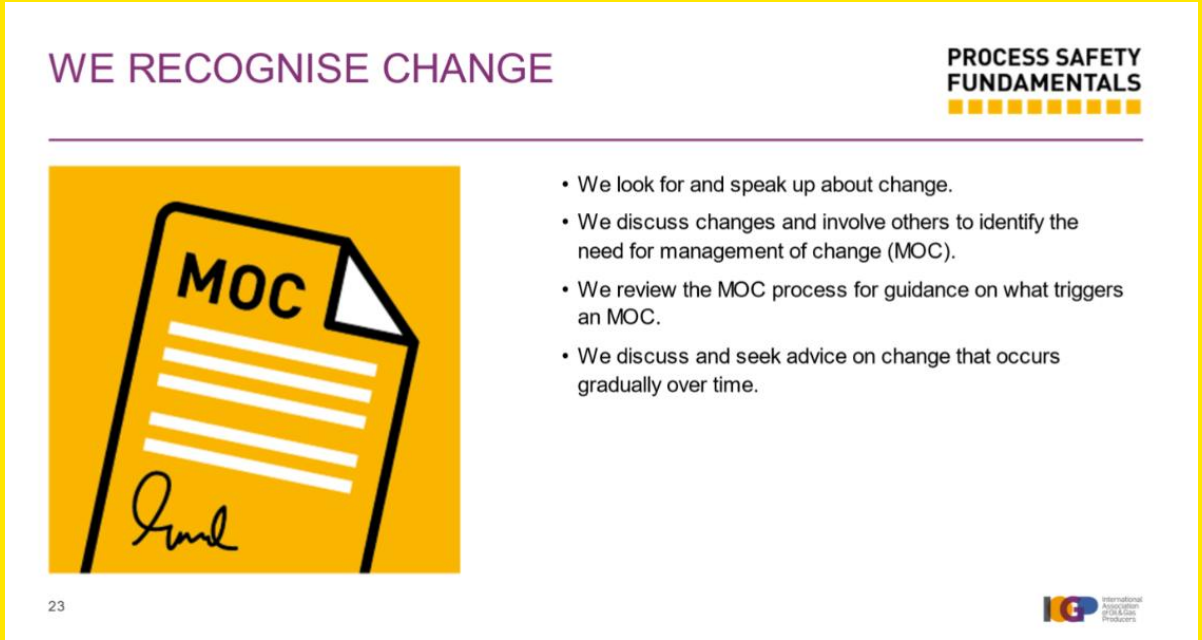
- We do not unauthorized deviate from procedures.
- We risk assess procedures by executing a transient hazop studies
  - Step by step questions of procedural steps
  - Step clear
  - Right moment
  - What can we do wrong
- Three levels of independent auditing
- New operating management system





Zoning rules related to buildings.

Ref.	Applicable equipment	Hazardous material	Basis of zoning	Red zone	Orange zone	Yellow zone	Outside defined zone
1.1	Process units Equipment that can generate blast overpressure and is not covered in 1.5 - 1.10	Flammable gas. Flammable dust.	Blast over-pressure	200 mbar (2,9 psig) or greater.	Less than 200 mbar (2,9 psig) to 42 mbar (0,6 psig) or greater.	Less than 42 mbar (0,6 psig) to 30 mbar (0,4 psig)	Less than 30 mbar (0,4 psig)
1.2	Process units Pipelines. Equipment not covered in 1.5 - 1.10	Flammable material	Fire thermal radiation	9,46 kW/m^2 (3 000 Btu/hr/ft^2) or greater.	Less than 9,46 kW/m^2 (3 000 Btu/hr/ft^2) to 6,3 kW/m^2 (2 000 Btu/hr/ft^2)	Less than 6,3 kW/m^2 (2 000 Btu/hr/ft^2) to 1,6 kW/m^2 (500 Btu/hr/ft^2)	Less than 1,6 kW/m^2 (500 Btu/hr/ft^2)
1.3	Process units Pipelines Equipment not covered in 1.5 - 1.10	Toxic gas	Spacing distance OR ERPG	100 m (330 ft). OR ERPG 3 if distance is less than 100 m (330 ft).	If distance to ERPG 3 is greater than 100 m this zone is from 100 m (330 ft) to ERPG 2. If distance to ERPG 3 is less than 100 m (330 ft) this zone is from ERPG 3 to ERPG 2. There is no Orange zone for Toxic material release.		Less than ERPG 2
1.4	Process units Pipelines. Equipment not covered in 1.5 - 1.10	Flammable gas	Spacing distance OR LFL	100 m (330 ft). OR Distance to LFL if less than 100 m (330 ft).	If distance to LFL is greater than 100 m, this zone is from 100 m (330 ft) to LFL. There is no Orange zone for Flammable gas/ Flash fire.		Concentration less than LFL
					If distance to LFL is less than 100 m (330 ft), this zone is outside defined zones and there are no Orange or Yellow zones.		
1.5	Pipework outside process unit	Flammable material And/or Toxic gas	Spacing distance	15 m (50 ft) horizontal distance from live pipe tracks/ ways/ runs.	Greater than Red zone defined distance for equipment. There are no Orange or Yellow zones.		



Include changes all changes to (portable)buildings in your management of change, include location, design, protection, occupancy i.e.

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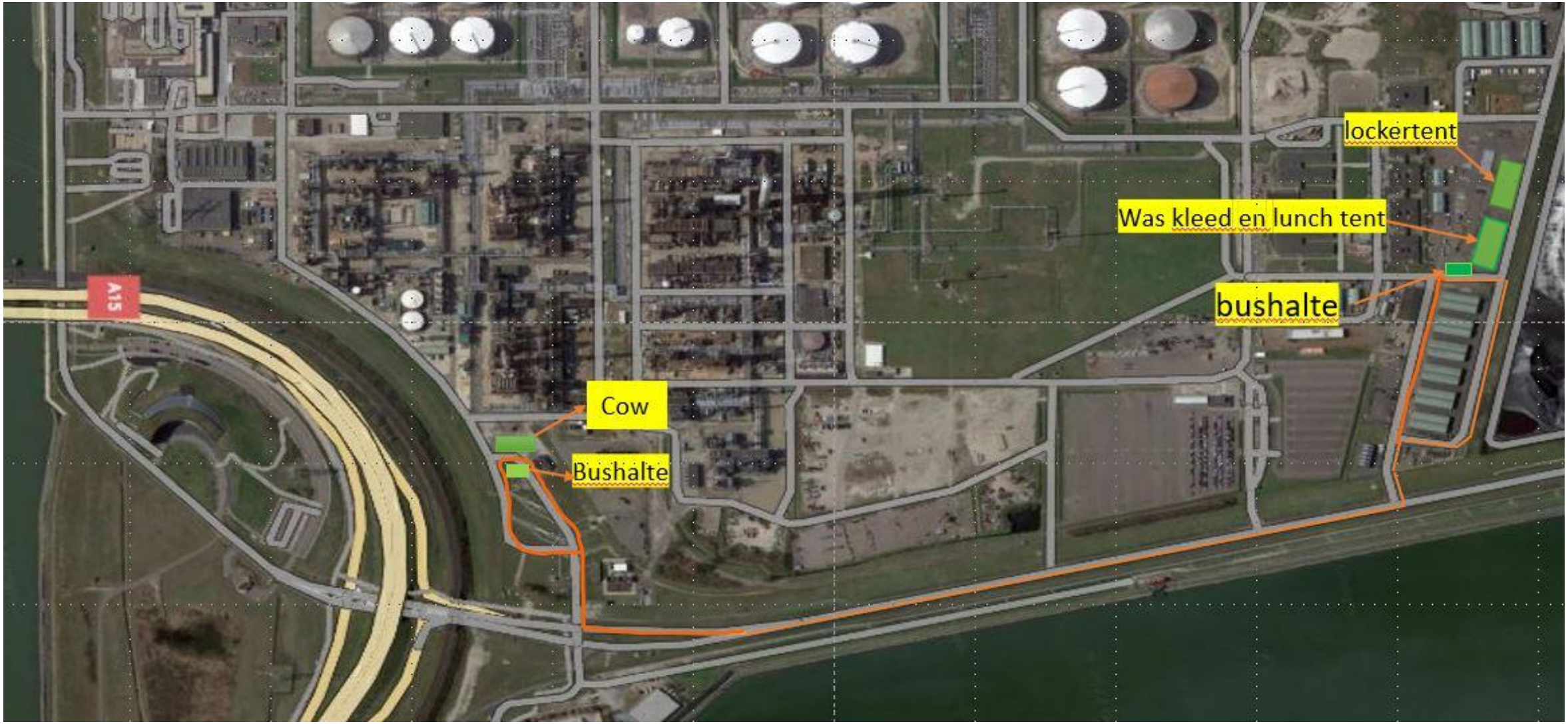
Practicality during partial shutdowns for temporarily buildings



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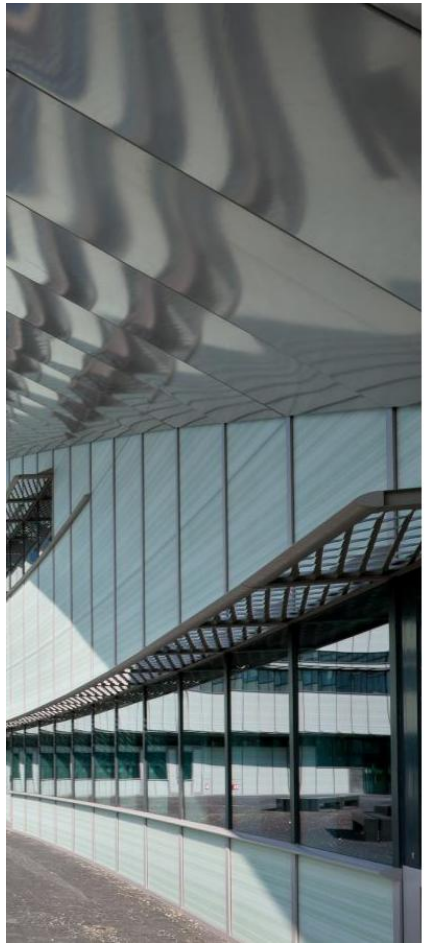
Changes in permanent buildings



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- Exclusion zones are strict followed during start up and shut down situations.
- Risk management, communication and training to increase knowledge of hazards,

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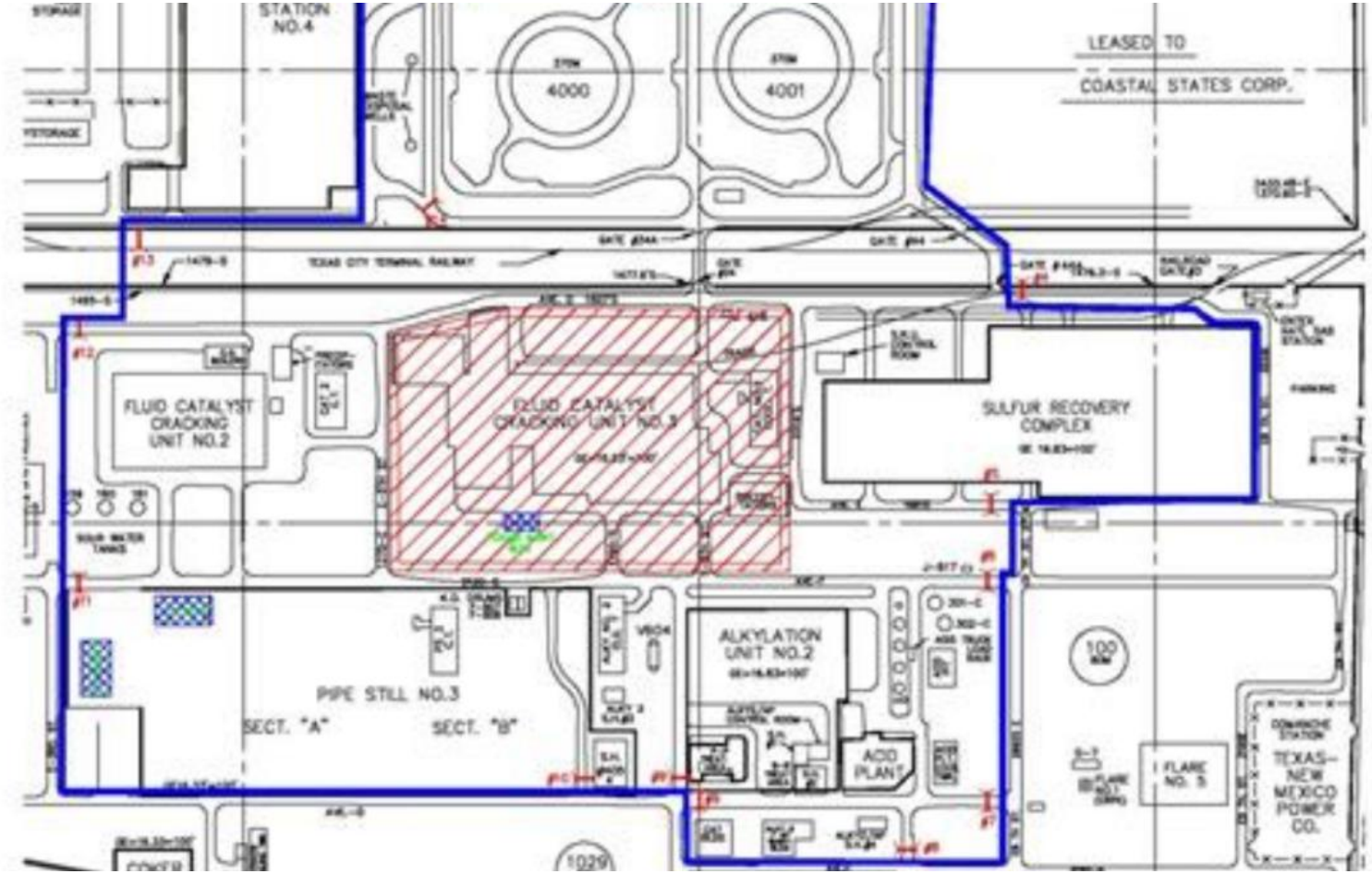
Practicality during partial shutdowns

Exclusion zones



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- Our start up procedures are changes such that we can operate within operating limits and if possible without any overides.
- We introduced safe operating and safe design limits including (daily) reporting and investigations.
- Design limits are based on risks, defined in process safety studies.

WE STAY WITHIN OPERATING LIMITS

PROCESS SAFETY FUNDAMENTALS

- We discuss and use the approved operating limits for our location.
- We escalate where we cannot work within operating limits.
- We alert supervision if an alarm response action is unclear or the time to respond is inadequate.
- We obtain formal approval before changing operating limits.
- We confirm that potential for overpressure from temporary pressure sources has been addressed.

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- Very clear structure after maintenance / turnaround / project for QA/QC, testing, commissioning and walk the line.
- People specific trained in how to execute “walk the line”
- Complete set of P&ID on rolling table for operations with all changes included,
- Strict structure in walk the line and pre-start-up review
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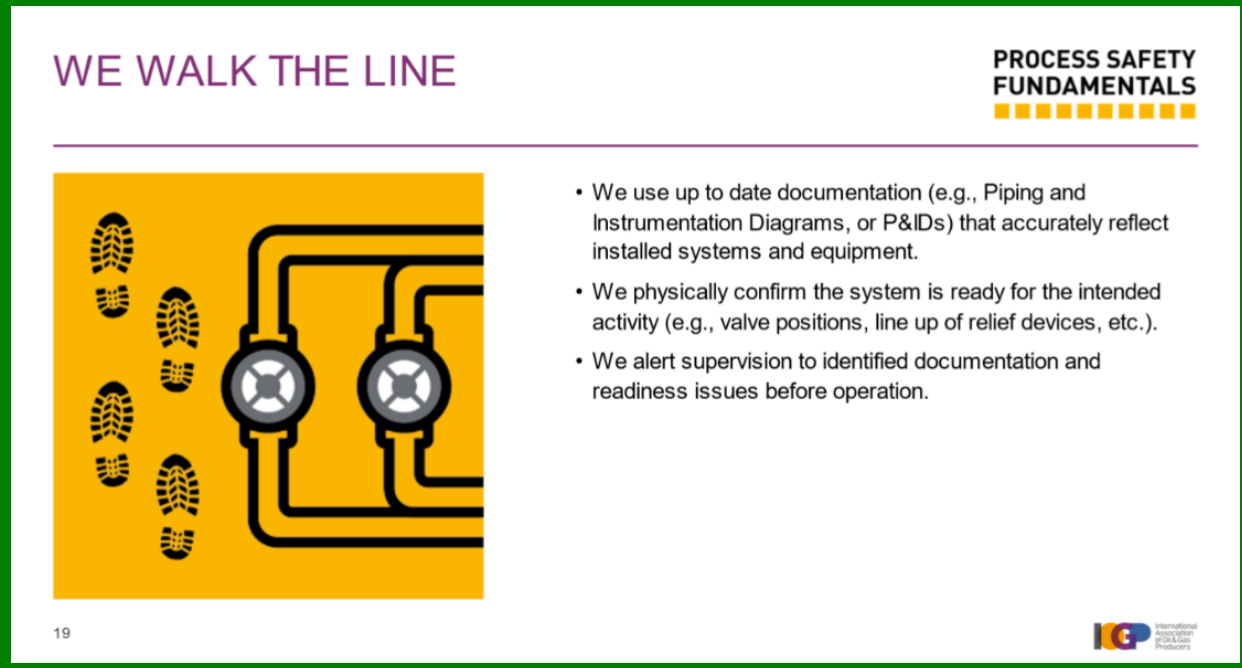

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How to bring all programs together

To manage HSSE and operational risks and drive improvements, we use our

Operating Management System

To foster a strong safety culture, we follow our **Safety** Leadership Principles

+

To prevent fatalities and life-changing injuries, we follow IOGP's

LIFE-SAVING RULES

+

To eliminate Tier 1 process safety events, we follow IOGP's

PROCESS SAFETY FUNDAMENTALS

How to bring all programs together

bp's safety aims…

eliminate
life changing injuries

Life Saving Rules **(LSRs)**

eliminate
Tier 1 Process Safety Events

Process Safety Fundamentals **(PSFs)**

embed
a consistent safety culture

Safety Leadership Principles **(SLPs)**

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