The role of Standards in an Objective/Risk based Regulatory Regime: An Australian Perspective

Cyprus Standards Roadshow 15th October 2024

Michael Malavazos – Director Energy Regulation

– Department for Energy and Mining South Australia (DEM)

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Department for Energy and Mining

Background: Land Down Under

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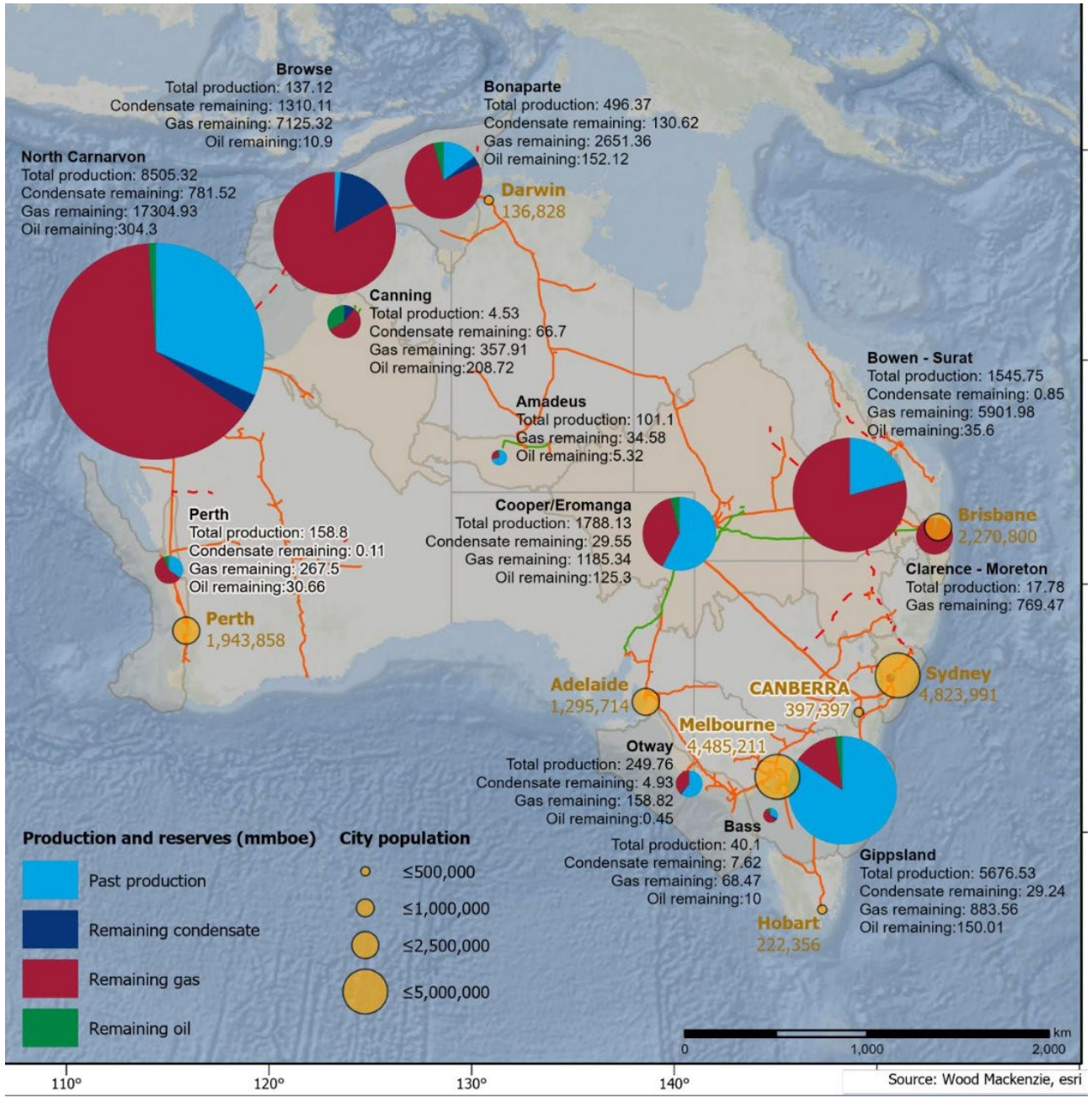
Background: Australian Oil and Gas Resources



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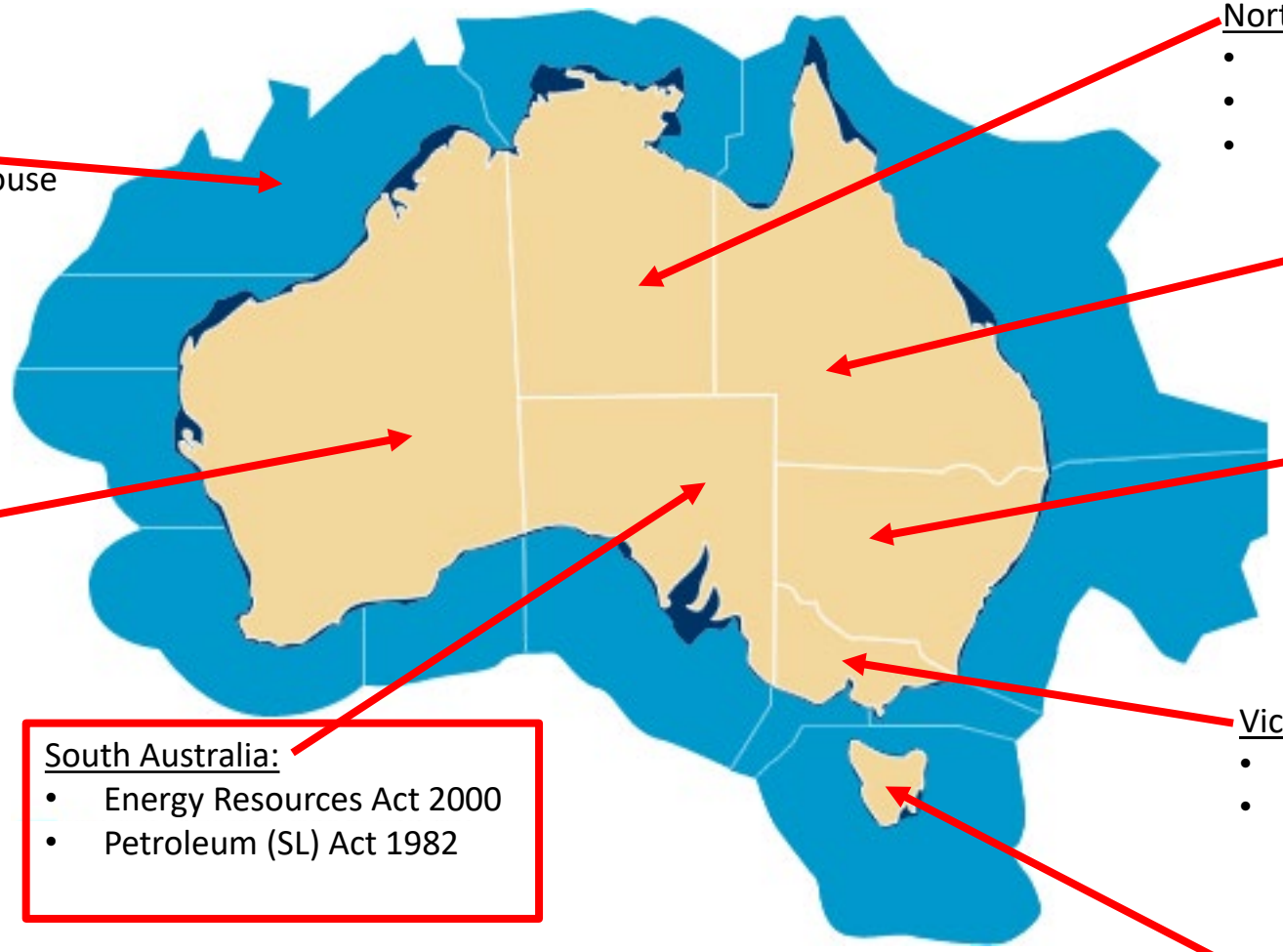

Commonwealth:
Offshore Petroleum and Greenhouse Gas Storage Act 2006

Western Australia:
- Work Health and Safety Act 2020
- Work Health and Safety (Petroleum and Geothermal Energy Operations) Regulations 2022

South Australia:
- Energy Resources Act 2000
- Petroleum (SL) Act 1982

Northern Territory:
- Petroleum Act 1984
- Energy Pipelines Act 1981
- Petroleum (SL) Act 1981

Queensland:
- Petroleum and Gas Act 2004
- Petroleum Act 1923

New South Wales:
- Petroleum Onshore Act 1991
- WHS (Mines and Petroleum) Act 2013
- Pipelines Act 1967

Victoria:
- Petroleum Act 1998
- Offshore Petroleum and Greenhouse Gas Storage Act 2010

Tasmania:
- Mineral Resources Development Act 1995

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Background: South Australian Legislation

- *Energy Resources Act 2000*:

  - Oil and gas exploration and production and processing activities;
  - Geothermal exploration and exploitation activities;
  - Carbon Capture and Storage;
  - Natural CO2 exploration and exploitation;
  - Underground coal gasification (UCG);
  - Natural hydrogen (gold) exploration and production;
  - Underground regulated substance storage (e.g. natural gas/H2/CO2);
  - High pressure transmission pipelines (oil and gas/H2/CO2)

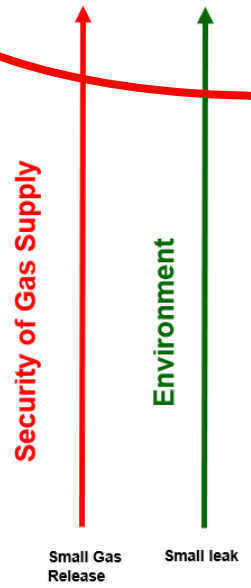
Background: South Australian Legislation

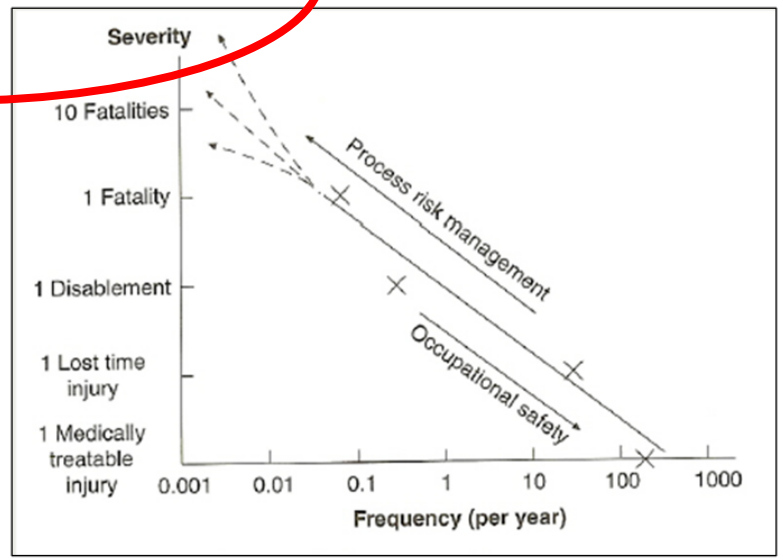
- *Hydrogen and Renewable Energy Act 2023*:
    - Licensing and regulation of renewable energy projects (e.g. wind/solar/wave energy);
    - Associated infrastructure for renewable energy (e.g. power transmission lines, energy storage etc.);
    - Hydrogen generation (includes all hydrogen types, brown/blue/green/pink….etc.);
    - Hydrogen processing facilities (e.g. electrolysers/methane reformers, surface storage);
    - Hydrogen power plants;
    - Hydrogen export terminals (e.g. wharves)

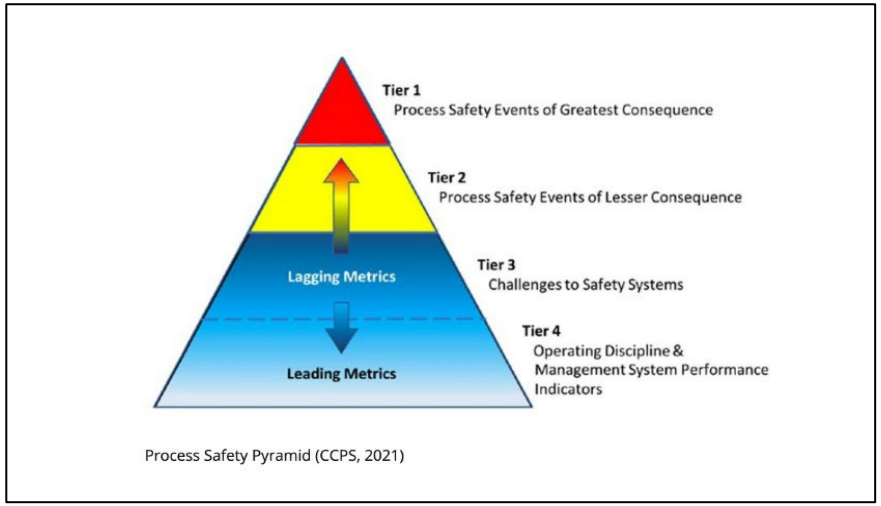
Regulatory Philosophy

- Objective and Risk-based
- Duty of care/Safety Case Philosophy
  - Process Safety Management Focus
    - Focus on high consequence events
  - Licensees are responsible for demonstrating case for safety and Environment Protection
  - Compliance with good industry practice
    - Good industry practice equates to good standards

Bhopal, 1984; Chernobyl, 1986;
Piper Alpha, 1988; Texas City Refinery, 2005







Process Safety Pyramid (CCPS, 2021)

Focussing on compliance to industry standards – forms good basis for leading indicator metrics

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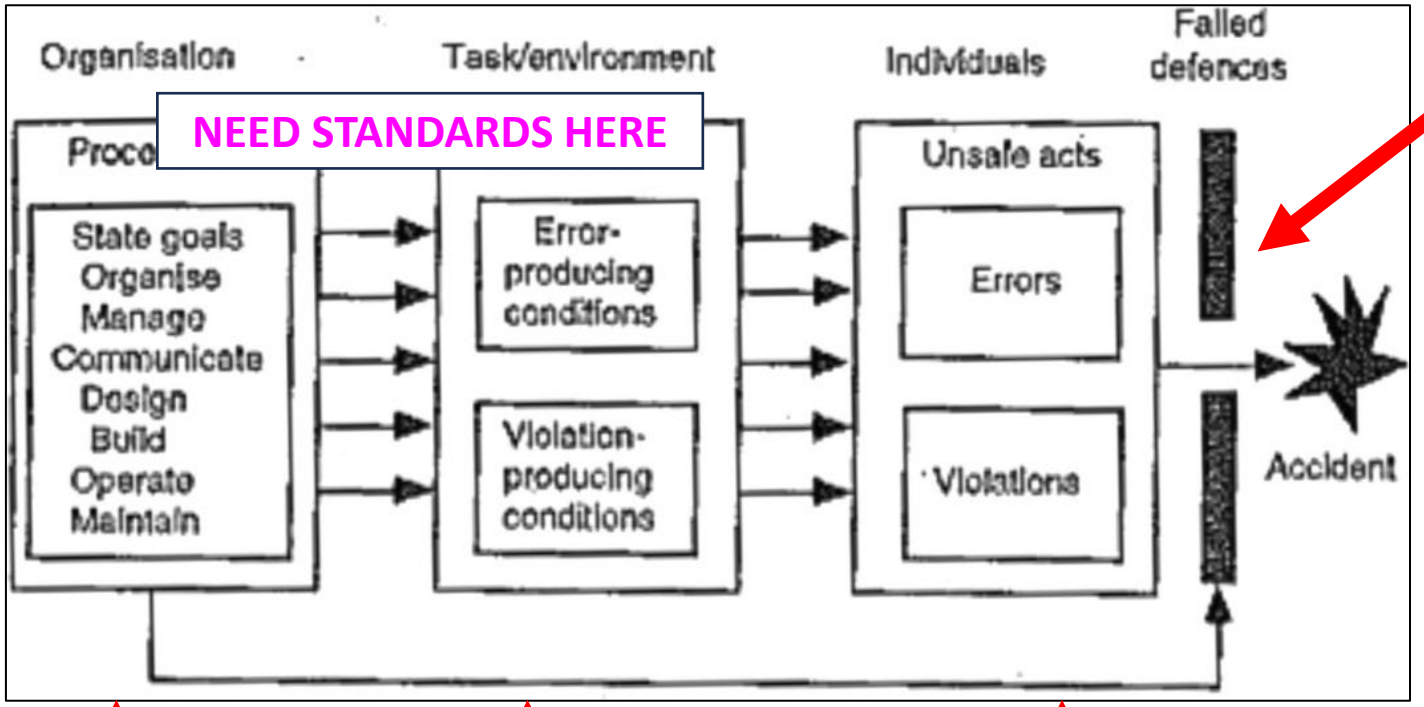
Process Safety Management Philosophy: James Reason Swiss Cheese Model (1993)

"WHY" things Happen

"HOW" things Happen



Example of such defences: SRV's, trip switches, safety XV valves, pipe or vessel containment, BCPS/SIIS, bunds etc.

"WHAT" Happens

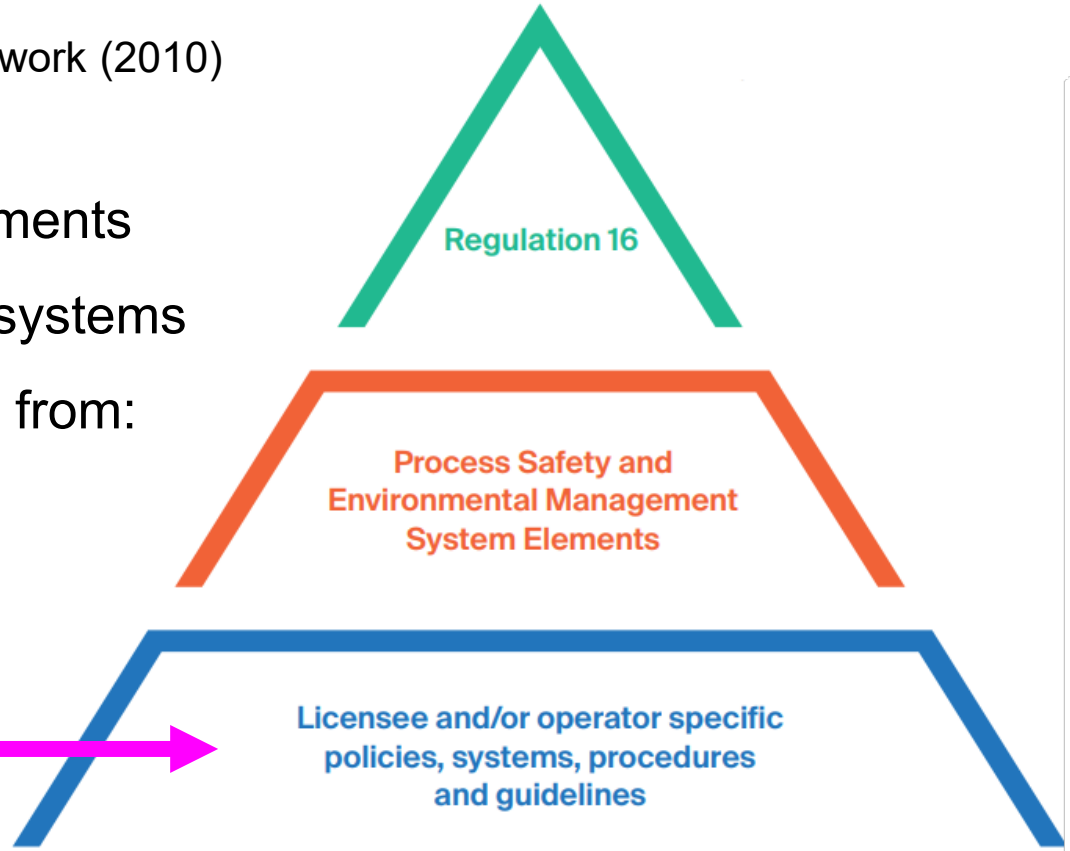
Example of such organisational and systemic conditions include: poor training; poorly written or deficient procedures; poor design; poor construction or commissioning practices; lack of appropriate competencies and training; communication failures; fatigued workers; lack of supervision; inadequate monitoring and maintenance; poor hazard awareness; timeline pressures etc.

Examples of such unsafe acts include failures to: - follow correct procedures; carry out test of SCE; maintain equipment; respond to alarms; check process is not deviating outside safe operating envelope; conform to PTW, undertake MOC.

SEMS Maturity Assessment Framework

- Developed against industry recognised process safety frameworks
  - Energy Institute High Level Process Safety Management Framework (2010)
  - "A recognised industry standard here would be useful"
- 15 PSM Elements, mapped against Regulatory requirements
- Licensees use it as a maturity self-assessment of their systems
- Regulator use it to assess systems using data acquired from:
  - Incident investigations
  - Regulatory inspections/audits
  - Licensee compliance reports (FFP, annual, incident reports etc)
  - Observed licensee behaviours formal and informal

Standards apply here



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System Maturity Assessment Elements

1) Leadership and awareness
2) Identification and compliance with legislation and industry standards
3) Management of change and project management
4) Hazard identification and risk assessment
5) Asset and integrity management
6) Critical equipment management
7) Planning, manuals and procedures
8) Document and records management
9) Work control and task risk management
10) Competency management
11) Communication with stakeholders
12) Contractor and vendor management
13) Monitoring, assurance, audit and review
14) Incident reporting and investigation
15) Emergency arrangements.

Table 1 PSEMS element maturity scoring matrix

Score/Level	Description	Maturity
1	Less than expected performance, urgent attention required.	Requirements of the Act (Regulation 16) are met on paper, but oversight is required by the regulator to ensure implementation.
2	Improvement is required in this area.	Element is implemented but generally at minimum levels, but improvement is required to meet the anticipated performance for a low-level official surveillance activity.
3	Ongoing improvement evident.	Element is mostly implemented; plans are in place to improve performance.
4	Expected outcome and satisfactory.	The element is implemented and fit-for-purpose. There is a commitment to continuous improvement.
5	Better than expected performance.	Performance is beyond fit-for-purpose.

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These elements rely on good industry standards e.g:

- **ISO 29001/29010 – quality and operating management systems incl. MOC**
- **ISO 31000 – risk management and assessment**
- **ISO 17969 Competency for personnel**
- **ISO 16530 Well integrity life cycle governance**
- **API RP 59 – well control operations**
- **AS2885/ISO13623 – pipeline construction and operation standards**
- **IEC 61511 – functional safety system**
- **ISO 16528/AS 3788 – pressure vessel testing and inspection**
- **ISO 10418 – process safety systems**
- **ISO 15544 – Emergency response plans**
- **ISO 21457 – Materials selection**
- **ISO 19277 – qualification testing for coating under insulation**
- **ISO 27913 – Carbon Dioxide Pipeline systems**
- **ISO 13623 – Petroleum and Natural Gas Industries Pipeline transportation systems**

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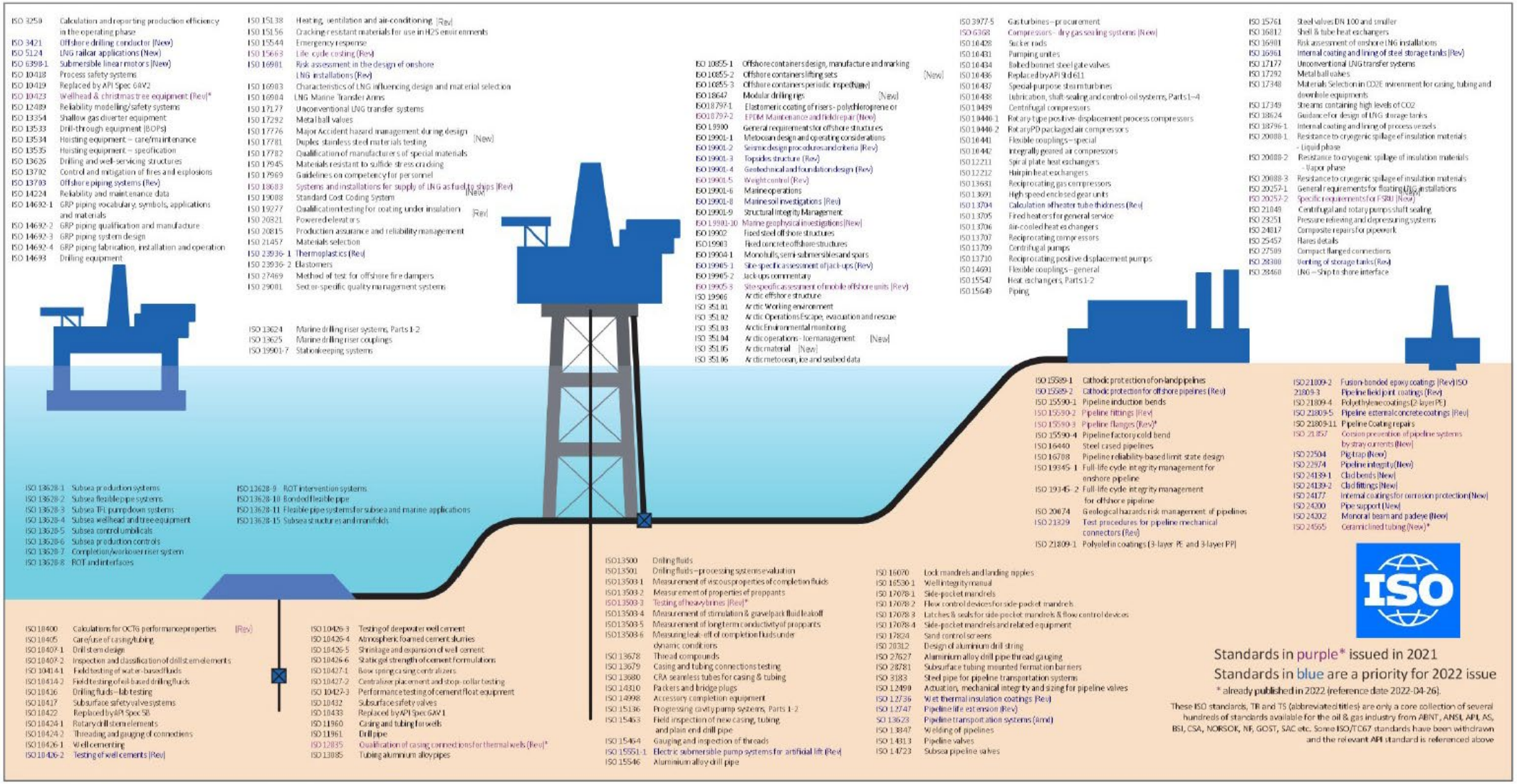
ISO Standards for use in the oil & gas industry



PSM System Self-Assessment Latest Results

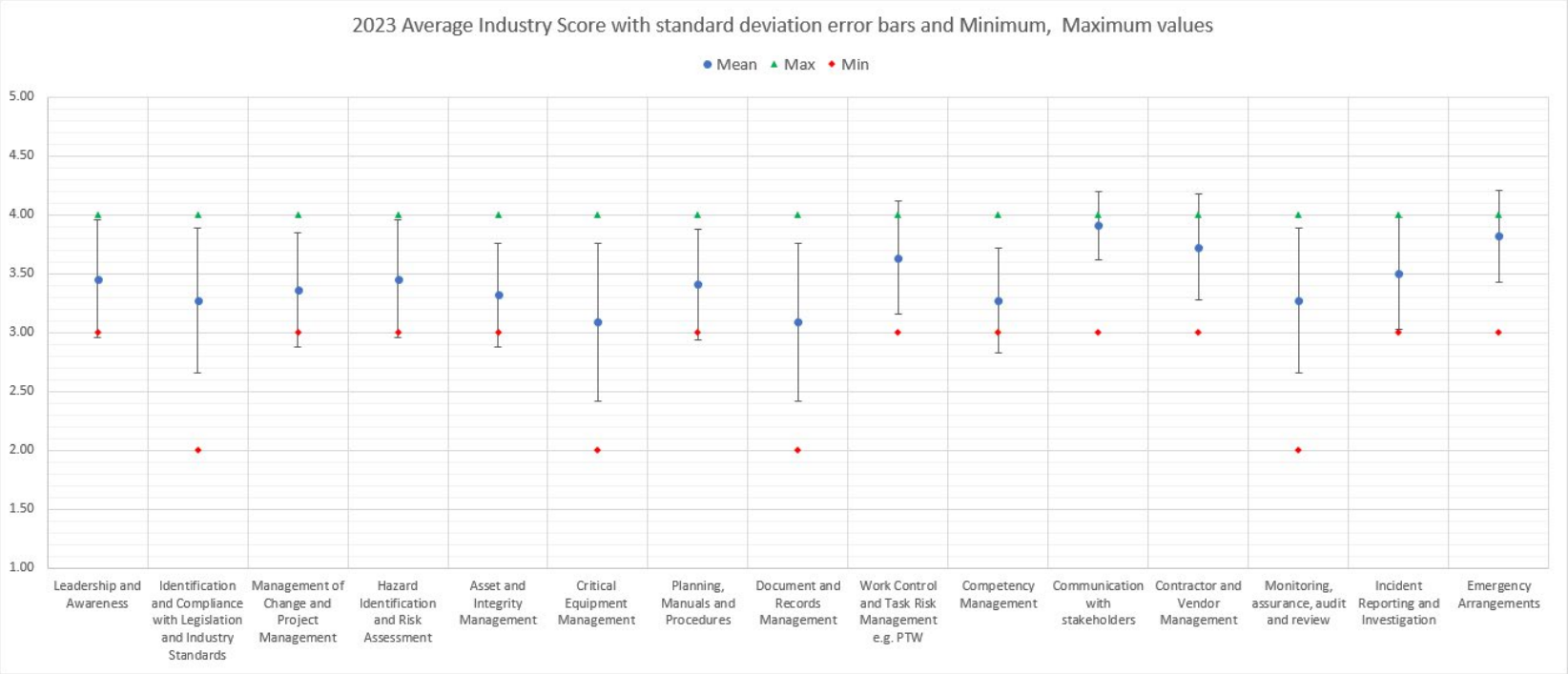
Identified areas for improvement:

- (5) Asset integrity management
- (6) Critical equipment management
- (8) Documents and Records Management
- (13) Monitoring, assurance, audit and review

Results influence regulatory surveillance focus

Regulatory surveillance includes focus on standards:

- **Are they the correct ones?**
- **Are they properly applied?**
- **Do they reflect good practice?**



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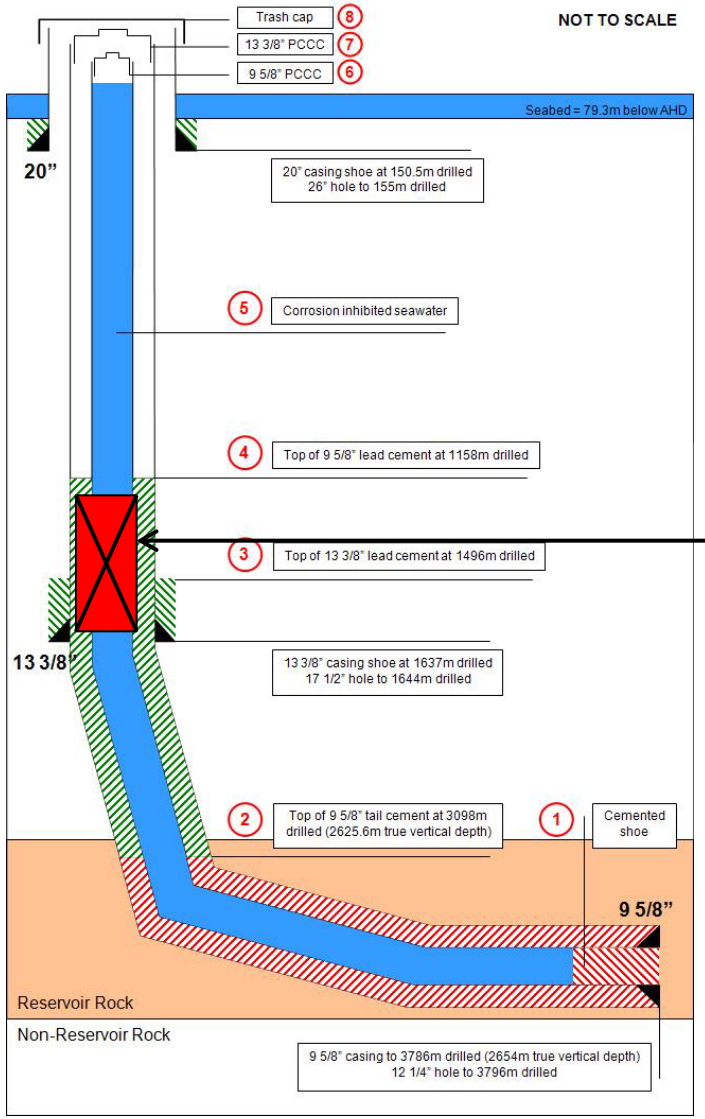
CASE STUDIES: Why standards are important

Well blow out case study:

Well Construction and Suspension Operation
How it should have been done

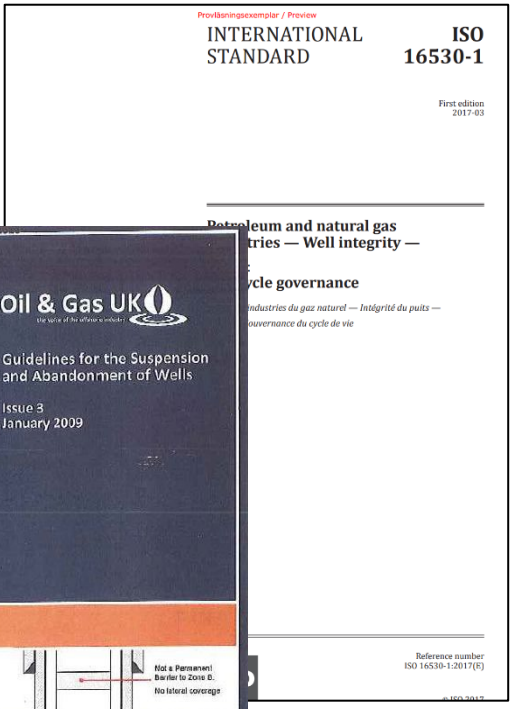


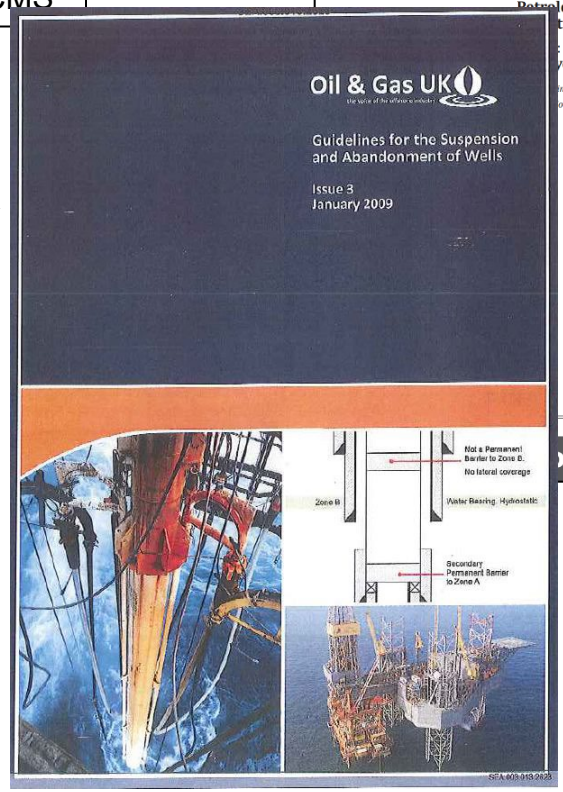
Good Practice entails:

Good Standards to ensure:

- Good Design
- Effective WCMS

Needed MOC to suspend well due to delays in top sides →





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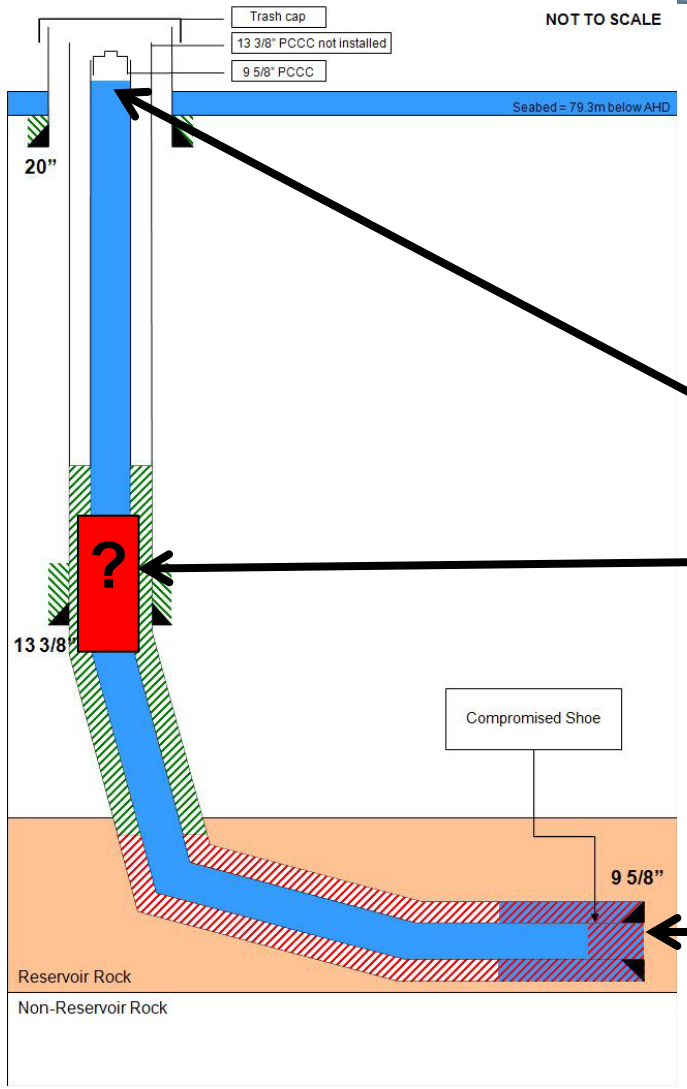
How it was done and Why?



The answers (or lack of) to the "why" questions pointed to significant deficiencies in systemic and organisational factors – poor execution of industry recognised practices and standards being the key element of offence

Why did the second MOC
replace a testable suspension plug with a non-testable PCCC?
Standard requires all such barriers have to be testable

Wet Shoe, why wasn't it recognised, given pressure testing is required by industry standard?

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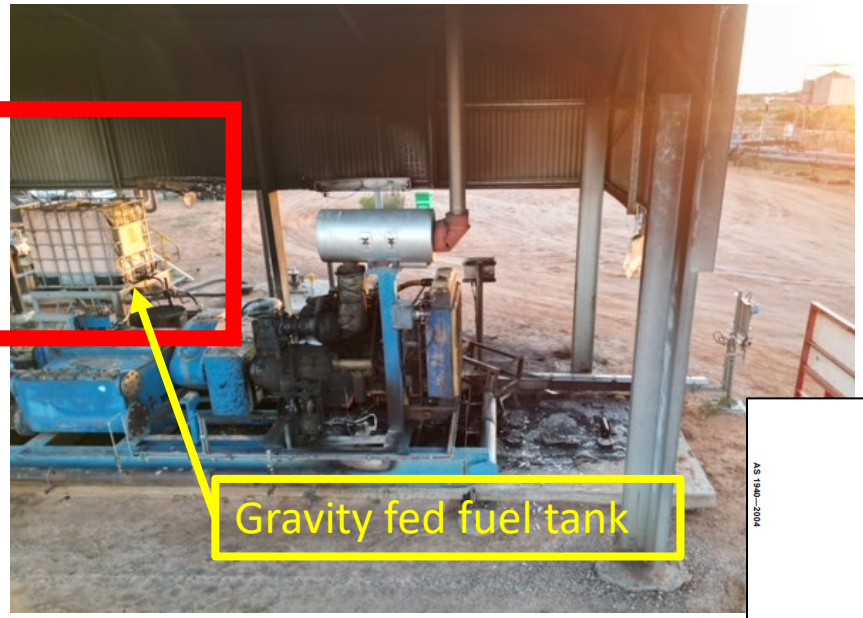
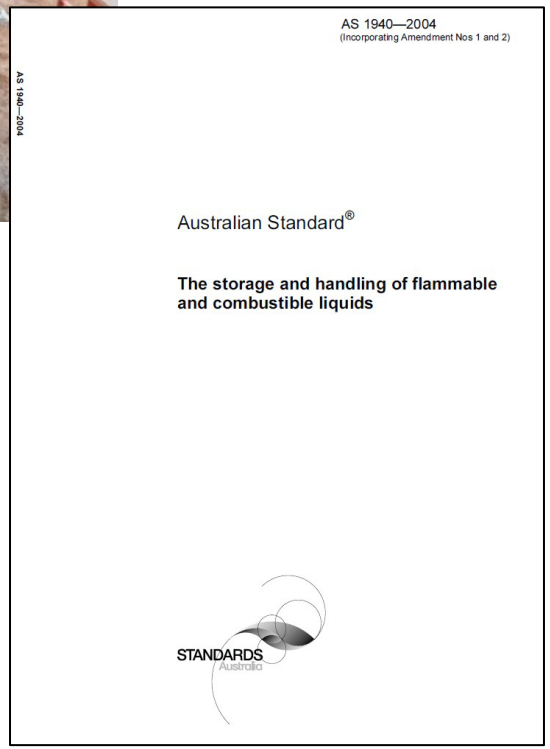
Crude Oil Shipping Pump fire:



Failure of fuel feed line. Diesel ignited once it contacted hot exhaust pipe. Given it had no fail-safe isolation valve installed it kept feeding the fire



AS 1940—2004
(Incorporating Amendment Nos 1 and 2)

AS 1940—2004

Australian Standard®

The storage and handling of flammable and combustible liquids

STANDARDS Australia

7.2.2 High-level tanks

Any tank which is so situated as to produce a gravity head at the dispenser shall be equipped with a fail-safe solenoid valve or other equally effective device which shuts off the supply at the tank outlet except when the dispenser is in use. Where the tank is either Category 1 or 2 and there is no metering dispenser, a manual shut-off valve shall be provided at the tank.

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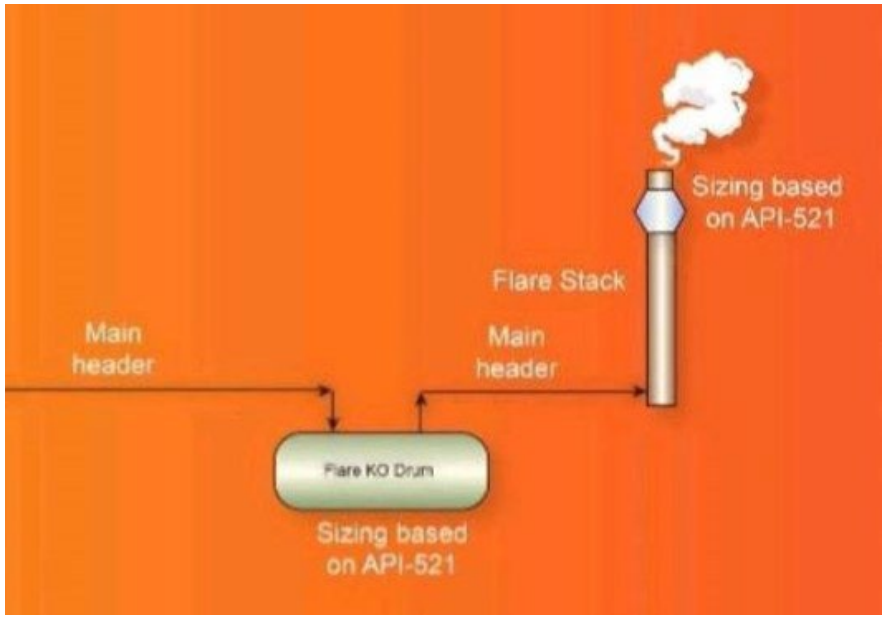
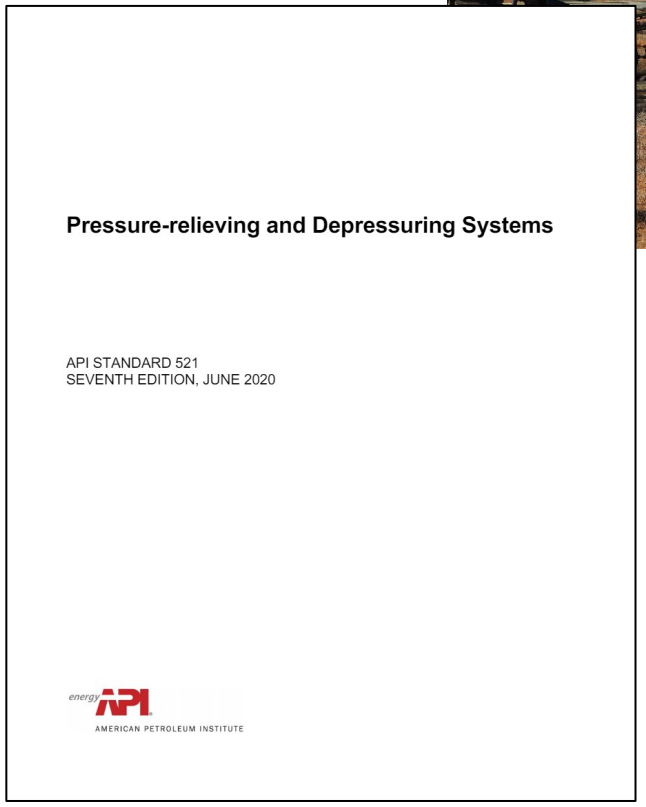
Flare Drum Overflow



Undersized flare KO drum resulted in hydrocarbons expelling into flare stack


Pressure-relieving and Depressuring Systems

API STANDARD 521
SEVENTH EDITION, JUNE 2020

energy API
AMERICAN PETROLEUM INSTITUTE

Section 5.6: Design details for knock out Drums

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Pipeline rupture due to SCC

High pH soil +
tap wrapped pipe +
high temperature +
high hoop stress +
CP range between -625 mV to -850 mV

= Pipeline susceptibility to Stress Corrosion Cracking

Pipelines succumbing to SCC

INTERNATIONAL STANDARD

Petroleum and natural gas industries — Pipeline tran systems

The types of external corrosion damage for consideration shall include the following:

— general metal loss and degradation;

— localized corrosion, e.g. pitting under deposit or crevice attack;

— microbiologically induced corrosion;

— stress-corrosion cracking

9 Corrosion management

9.1 General

Internal and external corrosion of pipeline systems shall be managed to prevent unaccepta failure or loss of operability from corrosion within the specified design life. The corrosion ma should include the following:

NACE INTERNATIONAL

SP0204-2008
(formerly RP0204)
Item No. 21104

Standard Practice

Stress Corrosion Cracking (SCC) Direct Assessment Methodology

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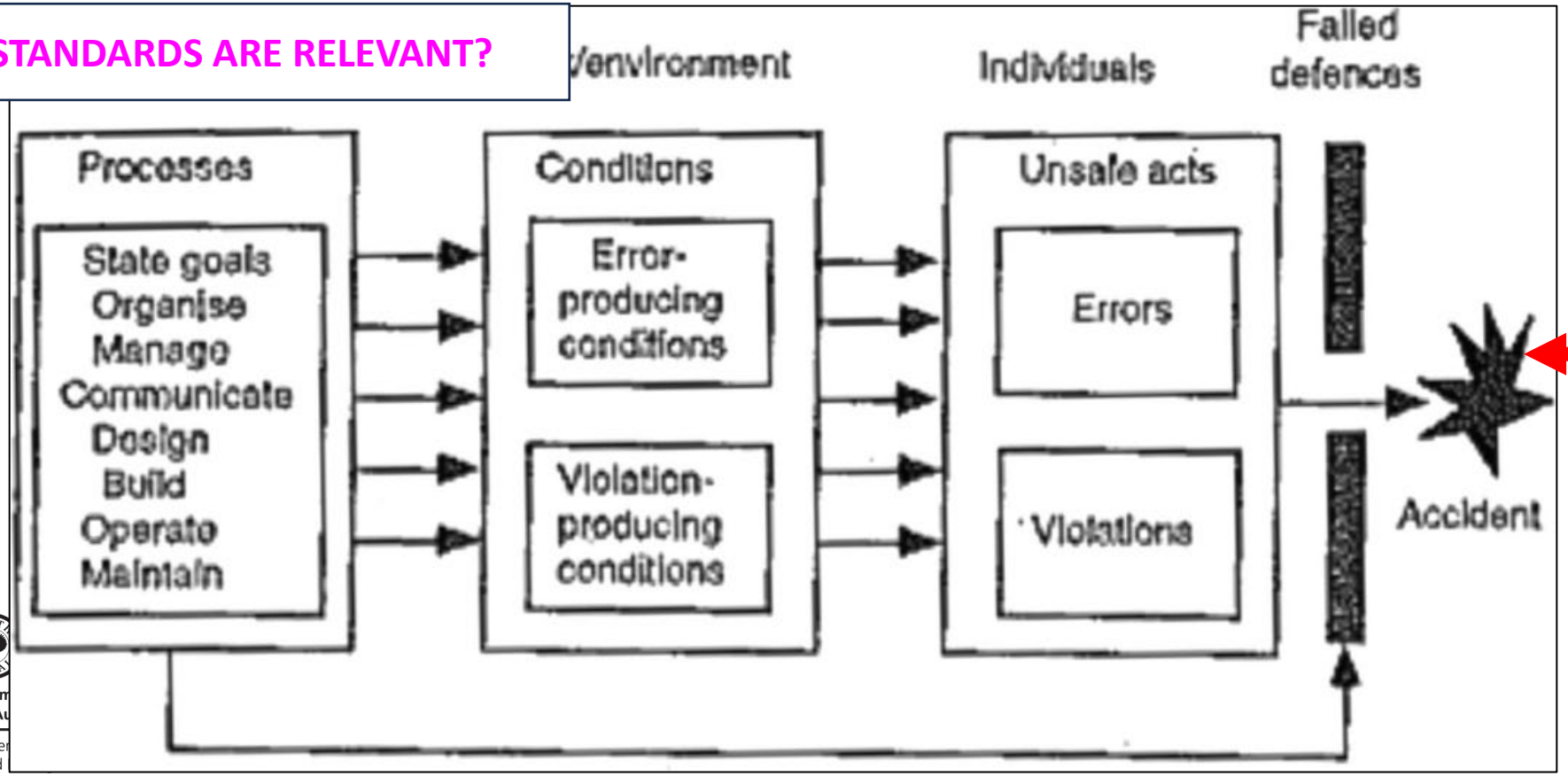
Take away lesson:

When designing or executing an activity, ask yourself the following questions:

"WHY"can it happen?

"HOW"can it happen?

WHAT STANDARDS ARE RELEVANT?



"WHAT" can happen?

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Department for Energy and

Contacts

Michael Malavazos

Director, Engineering Branch

Department for Energy and Mining

11 Waymouth Street,
Adelaide, South Australia 5000
GPO Box 320
Adelaide, South Australia 5001
T: +61 8 8463 3000
E: demreception@sa.gov.au

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