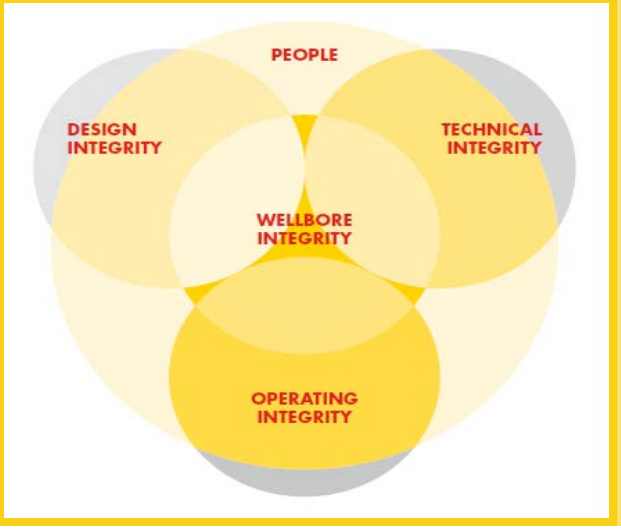
Making Wells Safer

Systematic Approach to Wells Process Safety

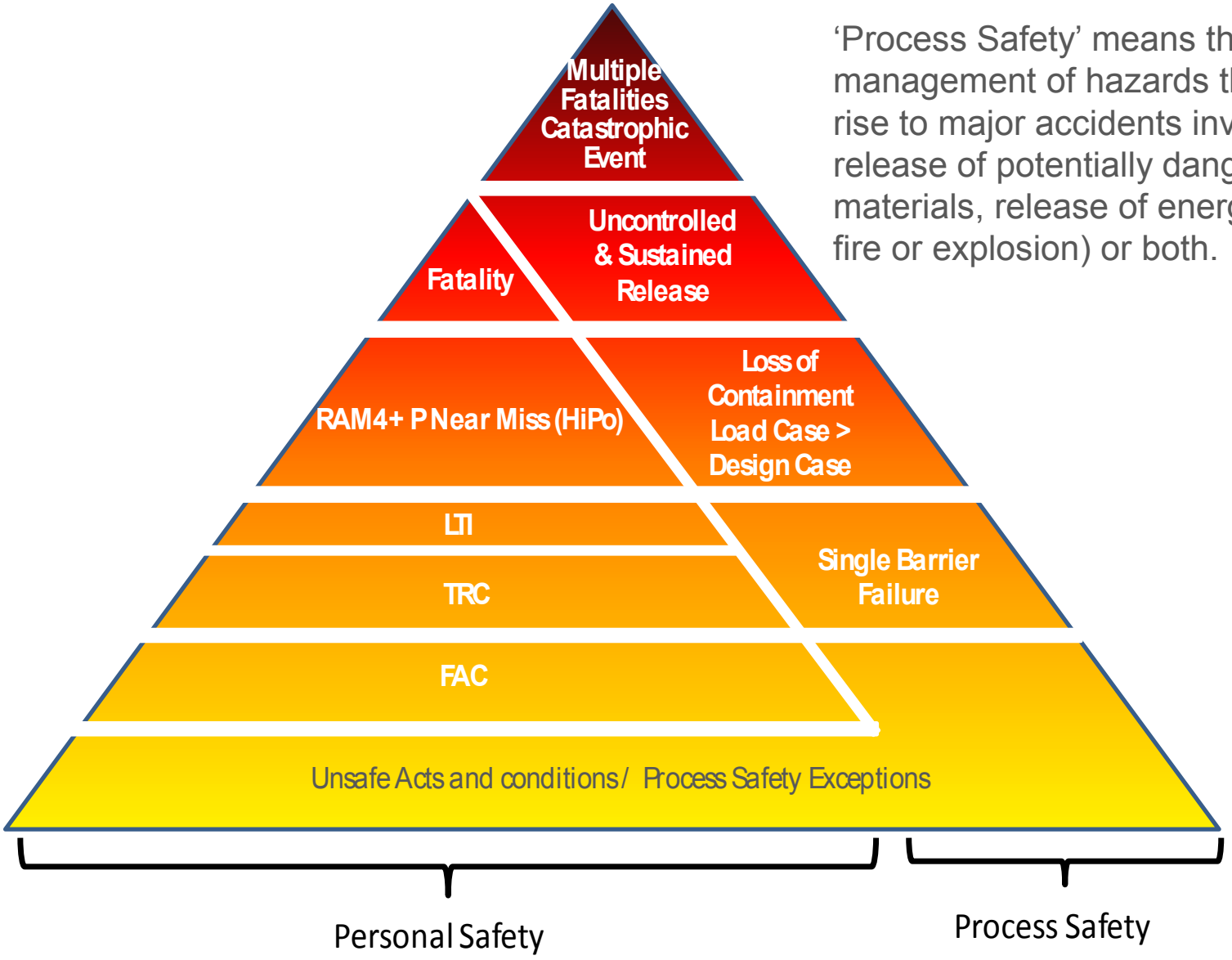


BSEE Forum

May 22nd, 2012

Ken Dupal, Well Delivery Manager, Process Safety Implementation, Deepwater Wells

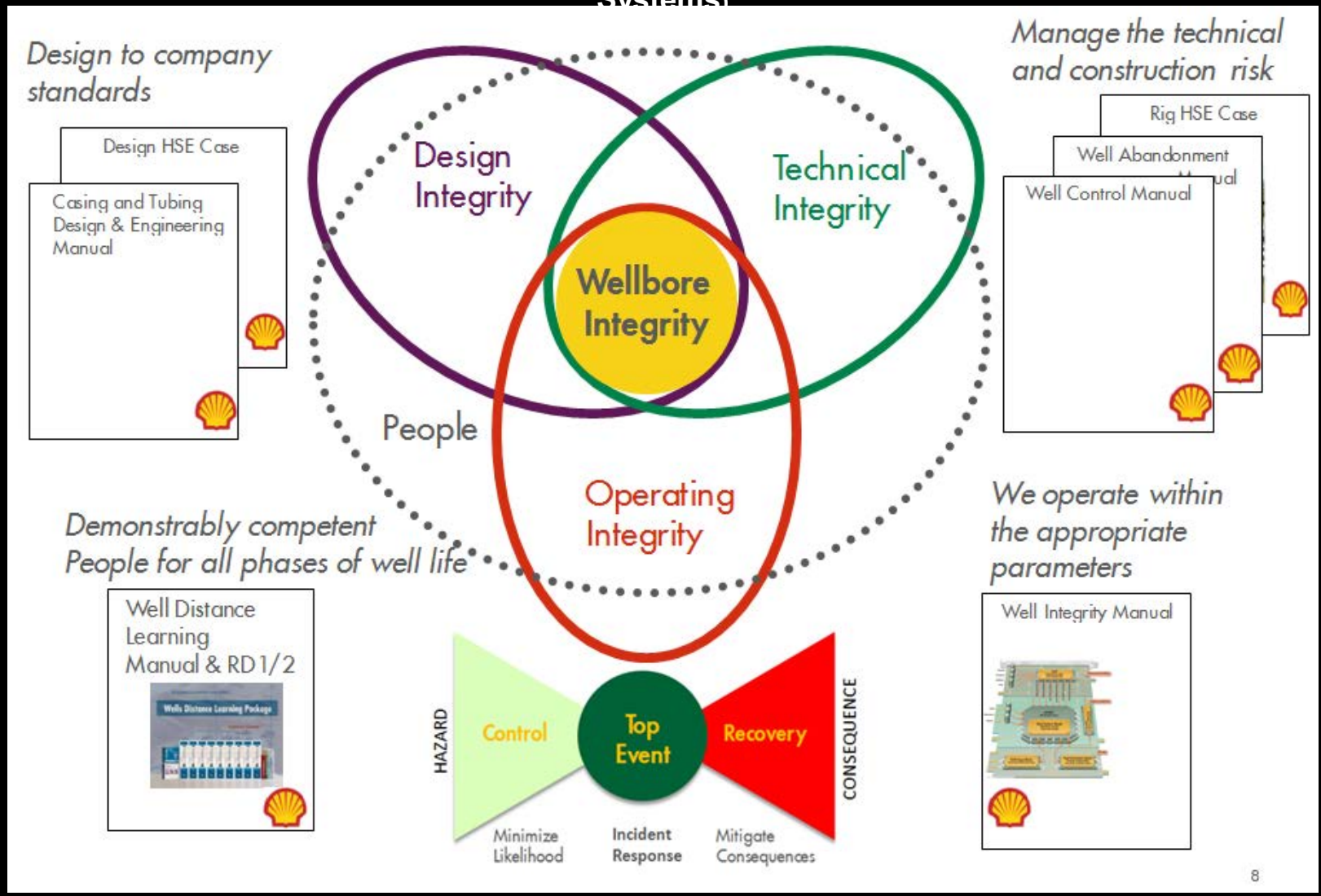
Process Safety



'Process Safety' means the management of hazards that can give rise to major accidents involving release of potentially dangerous materials, release of energy (such as fire or explosion) or both.

Systematic Approach to Wells Process Safety

Process Safety Mandatory Manual Requirements (Asset Integrity, DEM 1, DEM2, Overrides of Safety Systems)



Process Safety Bow Tie

Minimize Likelihood

Standards
- Global Wells Standards
  - Well Design Manual
  - Well Control Manual
  - Well Integrity Manual
- Rig Safety Cases

People
- Competence Testing (rd 1 &rd 2)
- Technical Authorities (DCAF)
- Principal Technical Experts
- Contractor competency

Equipment
- Well Specifications/Design
- Multiple Safety Barriers
- Equipment Qualification and Testing
- Well Integrity Monitoring
- Well Construction – 24/7 Real Time Operating Centre's

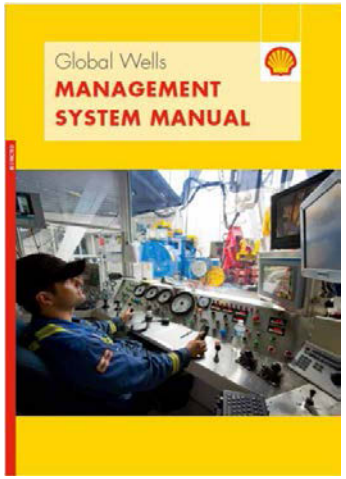
Mitigate Consequences

Standards
- Cap and Contain – Well Design
- Well Control Manual
- Blowout containment plan
- Well Kill Program
- Relief well plan – pre spud

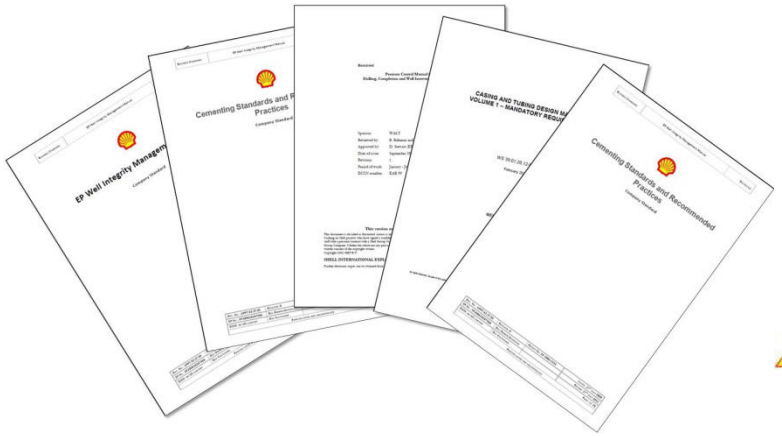
People
- Blowout support contractors
- Technical Authorities (DCAF)
- Principal Technical Experts

Equipment
- Well Control Equipment – Cap and Contain
- Spill containment
- Oil Spill Containment System (Joint Project – required GOM only)

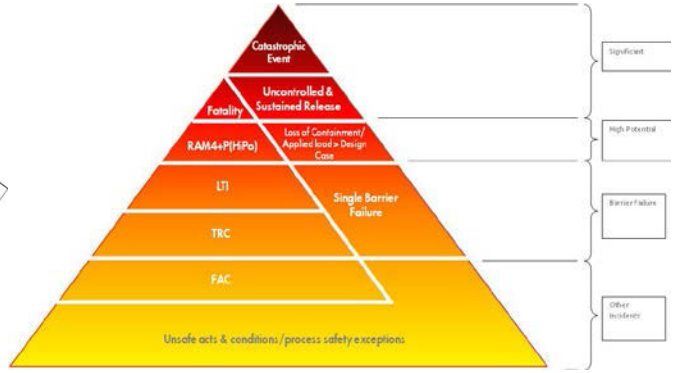
STANDARDS AND PROCESSES - EXAMPLES



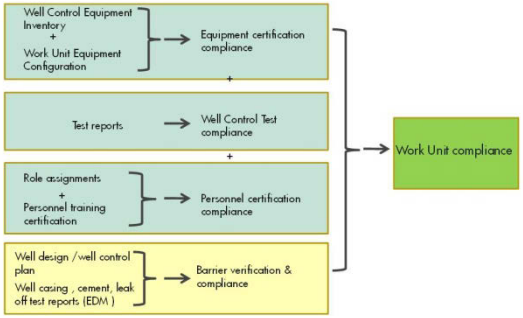
Global Wells Management System Manual



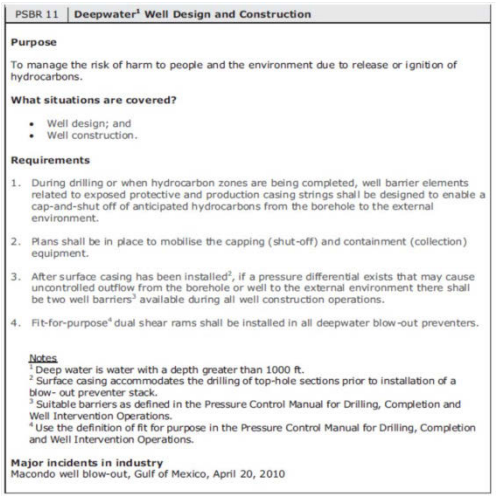
DEM1



Well Process Safety Incidents



eWCAT



PSBR 11 | Deepwater[1] Well Design and Construction

Purpose

To manage the risk of harm to people and the environment due to release or ignition of hydrocarbons.

What situations are covered?

- Well design; and
- Well construction.

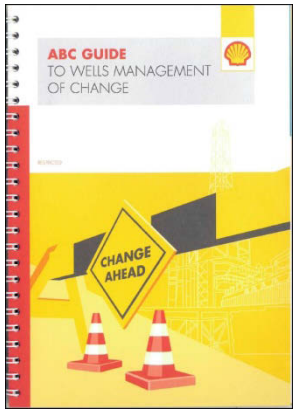
Requirements

1. During drilling or when hydrocarbon zones are being completed, well barrier elements related to exposed protective and production casing strings shall be designed to enable a cap-and-shut off of anticipated hydrocarbons from the borehole to the external environment.
2. Plans shall be in place to mobilise the capping (shut-off) and containment (collection) equipment.
3. After surface casing has been installed[2], if a pressure differential exists that may cause uncontrolled outflow from the borehole or well to the external environment there shall be two well barriers[3] available during all well construction operations.
4. Fit-for-purpose[4] dual shear rams shall be installed in all deepwater blow-out preventers.

Notes
[1] Deep water is water with a depth greater than 1000 ft.
[2] Surface casing accommodates the drilling of top-hole sections prior to installation of a blow- out preventer stack.
[3] Suitable barriers as defined in the Pressure Control Manual for Drilling, Completion and Well Intervention Operations.
[4] Use the definition of fit for purpose in the Pressure Control Manual for Drilling, Completion and Well Intervention Operations.

Major incidents in industry
Macondo well blow-out, Gulf of Mexico, April 20, 2010

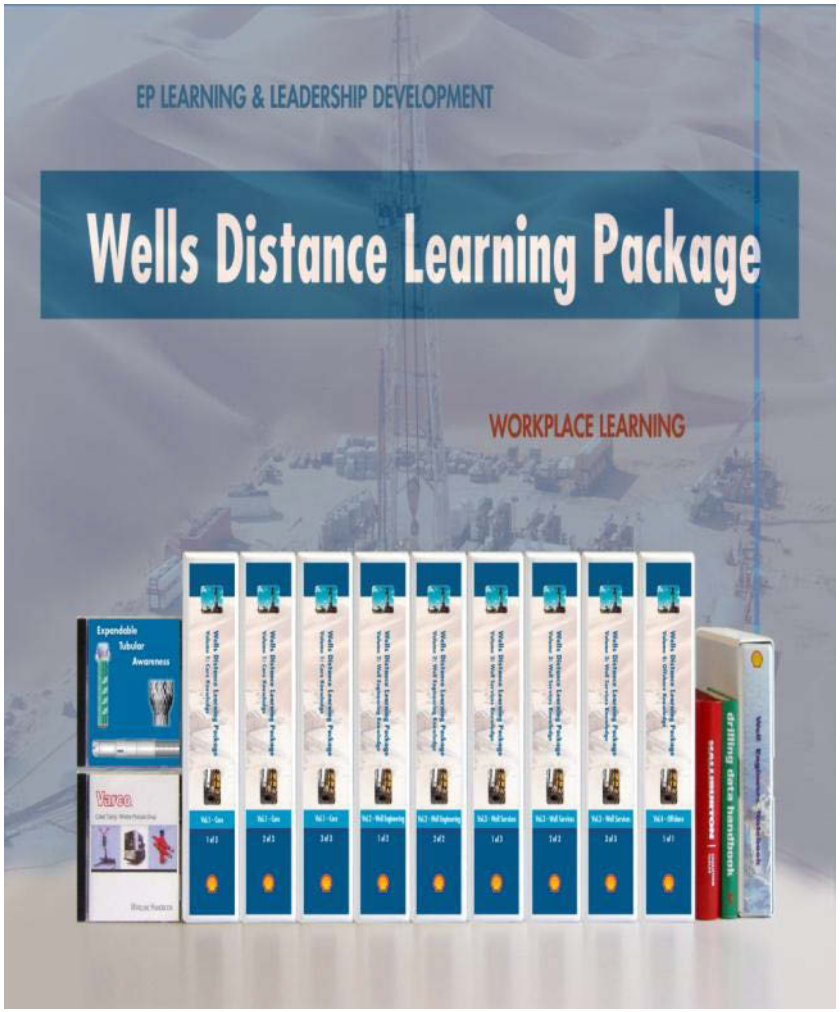
PSBR 11 (DEM2)



ABC Guide to MOC

5

Shell Wells People Competency Development

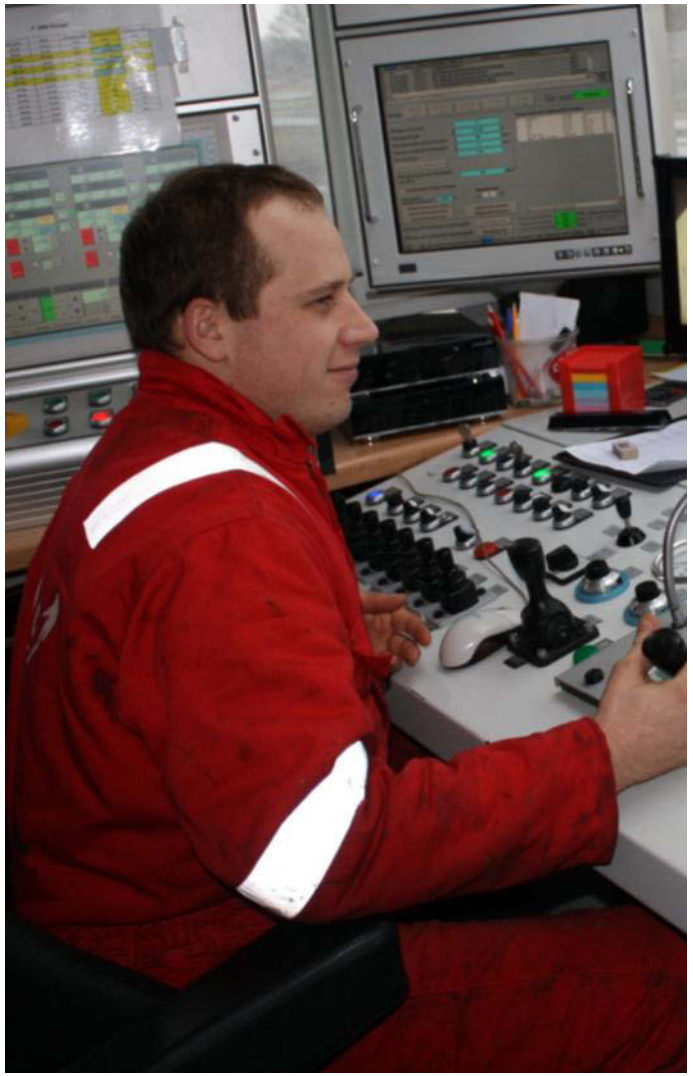


Competency Development:

- Unique to Shell and recognized across the industry
- Established **1973** start of Shell "Drilling" assessment round 1 and round 2, revised 2005 to include Well Intervention.
- **Post Graduate** development managed globally
- Implemented globally for all **Shell Wells staff**
- Syllabus includes practical **field and office** elements
- Individuals have to pass round 1 and round 2 examinations - **"Certified Engineer"** after passing round 2 and global panel audit
- Wells Distance Learning Package (WDLP) is
  - accredited to academic **Masters of Science Degree** level by 2 universities

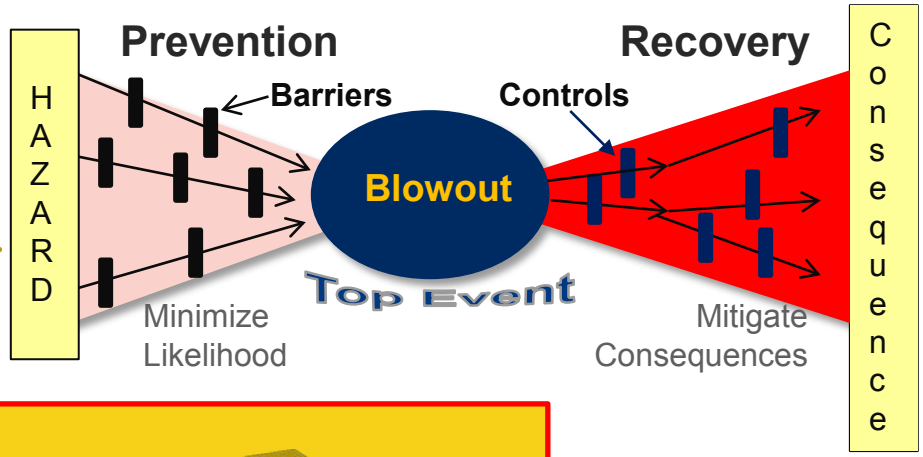
Expertise and Competency Testing

- Round 2 Diploma
- Trade test before hire for all consultants
- Advanced Well Control course & examination - mandatory every 2 years for all operations staff
- Contractor Competency: Well CAP and IWCF well control certification standard
- Principal Technical Experts – network of industry-renowned experts to support and assure Shell's well designs and technical standards

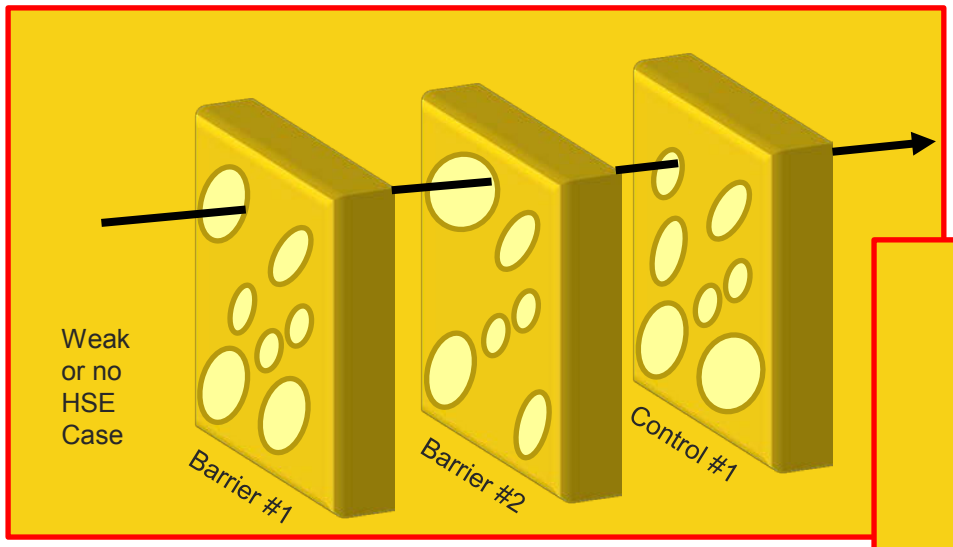


The HSE Case Strengthens Barriers & HSE Systems.

In Well Design "Focus on the Prevention Side of the Bow-Tie…so you never have to "work" on the recovery side"



In Emergency Response "Focus on the Recovery Side of the Bow-Tie…so you never experience the full consequence



The HSE or "Safety Case" is a great tool to ensure proper management of major hazards.

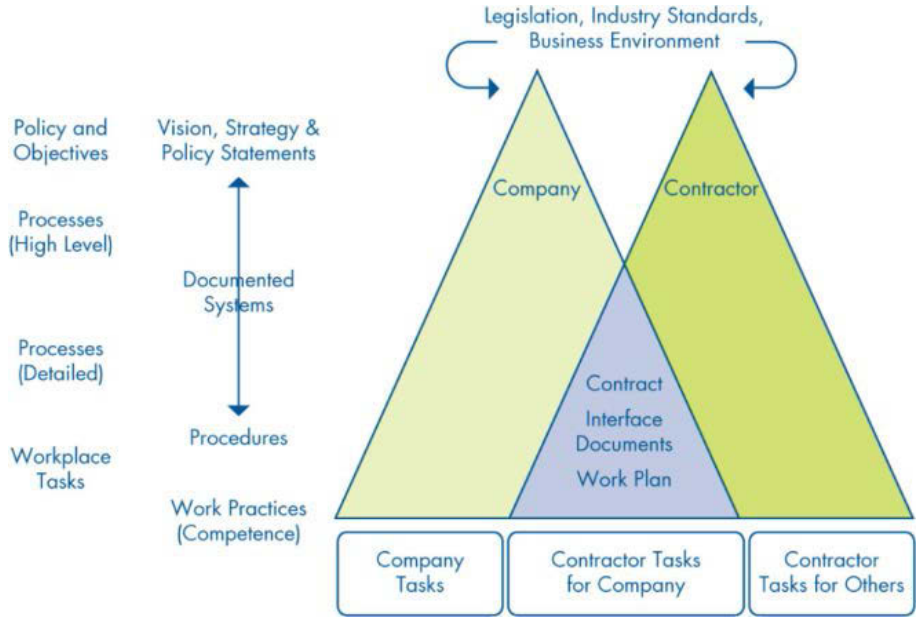
A Case is only effective if people understand their role in "Critical Activities" to maintain Barriers & Controls.

HSE Case Purpose

- Provides a roadmap to the systems and processes used to manage the major accident hazards
- Demonstrates that hazards have been identified, appropriate barriers have been provided and there are robust activities, procedures and competencies in place to ensure these barriers re-main effective for the duration of the activity.

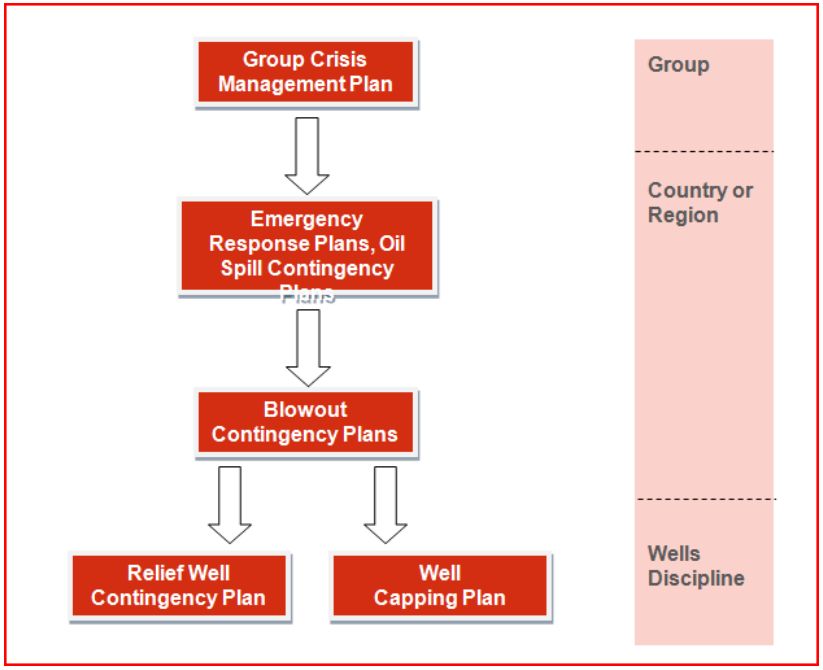
- Bridging documents define the interface between the company's and contractor's HSE-MS, including critical HSE case outputs

SEVERITY	CONSEQUENCES				INCREASING LIKELIHOOD				
	People	Assets	Environment	Reputation	A	B	C	D	E
					Never heard of in the Industry	Heard of in the Industry	Has happened in the Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the Location
0	No injury or health effect	No damage	No effect	No impact					
1	Slight injury or health effect	Slight damage	Slight effect	Slight impact					
2	Minor injury or health effect	Minor damage	Minor effect	Minor impact					
3	Major injury or health effect	Moderate damage	Moderate effect	Moderate impact					
4	PTD or up to 3 fatalities	Major damage	Major effect	Major impact					
5	More than 3 fatalities	Massive damage	Massive effect	Massive impact					



Emergency Response

- Plans include
  - Emergency response
  - Blowout Contingency Planning
    - Relief well Planning
    - Well cap and Contain



Summary: Process Safety for Wells

- Systematic Approach for Wellbore Integrity
  - Design Integrity
  - Technical Integrity
  - Operating Integrity
- Competence of Personnel is required throughout all phases