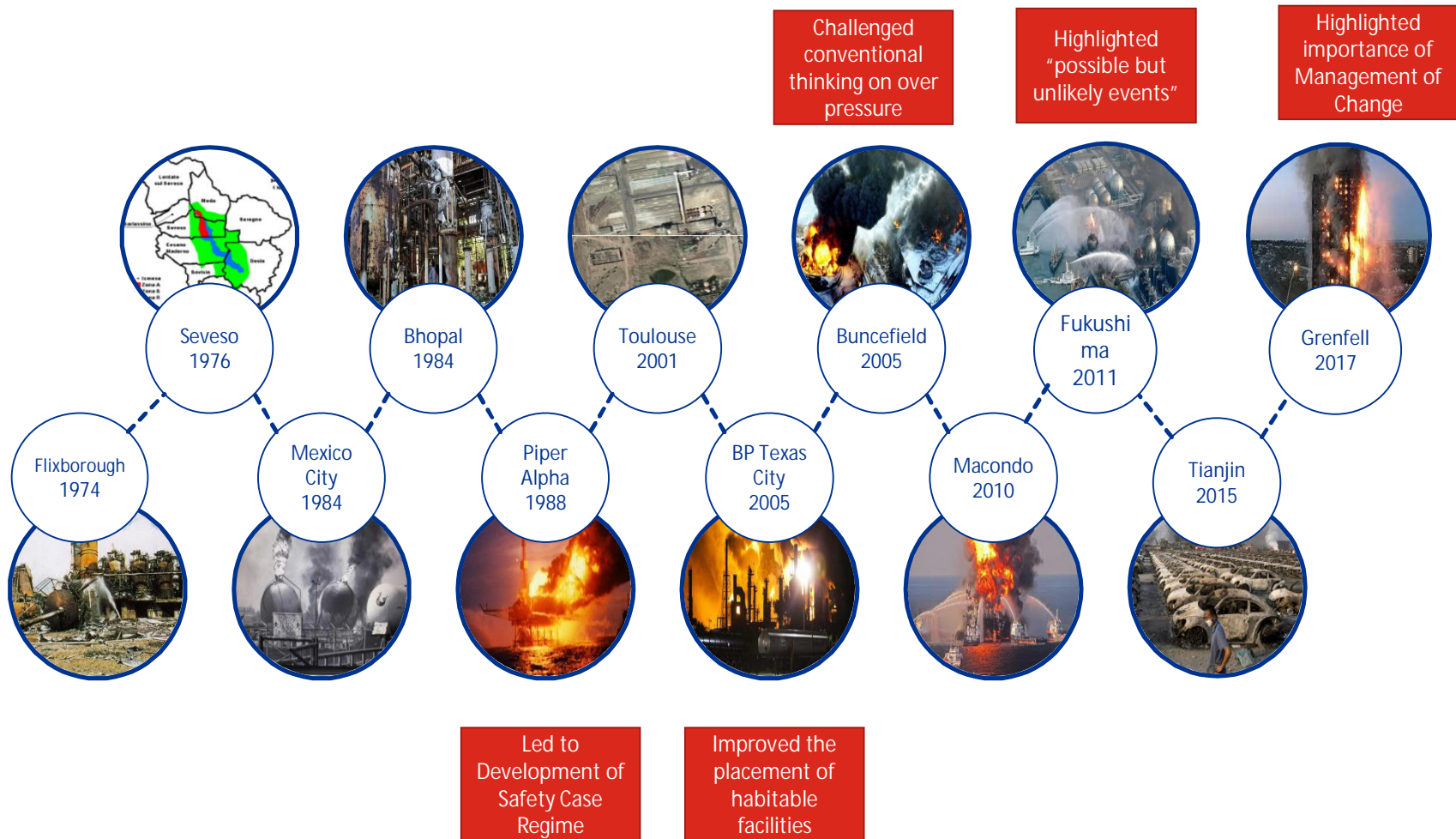


# Safe and Sustainable Engineering for Asset Lifecycle (SEAL)

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Process Safety Conference  
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# Selected Major Incidents Timeline (Past 50 Years)



## BP Texas City

- 23<sup>rd</sup> March, 2005, BP Texas City Refinery industrial disaster
- Was third largest refinery in the U.S.
- Explosions and fires killed 15, injured another 180 and resulted in financial losses exceeding \$1.5 billion
- Incident occurred during start-up of isomerisation (ISOM) unit when a raffinate tower overfilled resulting in flammable release from a blowdown stack
- Houses damaged as far as three quarters of a mile away
- All fatalities occurred in office trailers located nearby release



## BP Texas City – Key Findings

### Major accident potential:

- Major accident risk (MAR) assessment addressed top 80 risks onsite (>3 fatalities)
- Risks due to blowdown drum or ISOM unit not considered

### Hazard evaluation and management:

- Scenario not deemed credible and therefore not assessed within the HAZOP

### Management of Change:

- Hazards to trailer park required to be assessed under the sites MOC procedures
- Standards stated trailers should be located no nearer than 350ft to process buildings, the nearest was found to be only 150ft away
- Site wide study concluded no concerns to trailer from process incidents

## Life, SEAL



Behaviours aligned with the Life value include:

- Prioritizes the safety, health, and wellbeing of ourselves and others
- Chooses what is right over what is quick or easy
- Faces into important issues, looks to understand and learn from them.

- Life is our company's approach to health, safety and well-being. *Without it, nothing else matters!*
- Our projects have implications on the Life of people throughout the Asset Lifecycle; whether it be the construction team that builds the facility, operators that run the facility or the community that lives outside the boundary of the facility
- The engineering we do is a huge opportunity to preserve Life and it is through Safety in Design (SID) that we are able to help make a positive difference.
- Our framework for delivering an enhanced focus on SID is called SEAL.

# SEAL house

SEAL (Safe and Sustainable Engineering for Asset Lifecycle)



# The five SEAL Principles

## 1. Asset Lifecycle

Design in a manner that duly considers the stages of an asset (i.e. design for the Asset Lifecycle)



## 2. Hazard Management

It is an obligation of engineering to recognise potential hazards associated with the design and manage those hazards



# The five SEAL Principles

## 3. Persons in Control

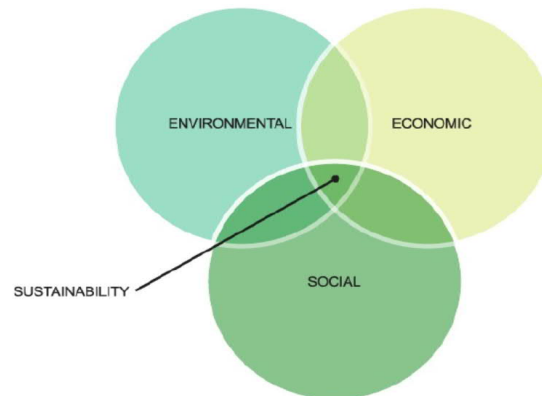
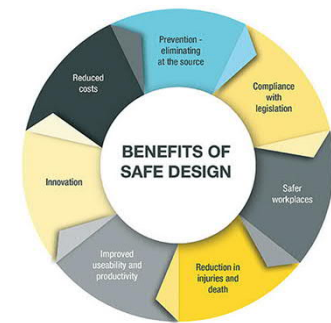
People that have control of the design have a responsibility towards making decisions that have a lasting impact on the designed facilities

## 4. Safety in Design

Apply Safety in Design practices to aid in both Process Safety and Occupational Health & Safety

## 5. Sustainable Design

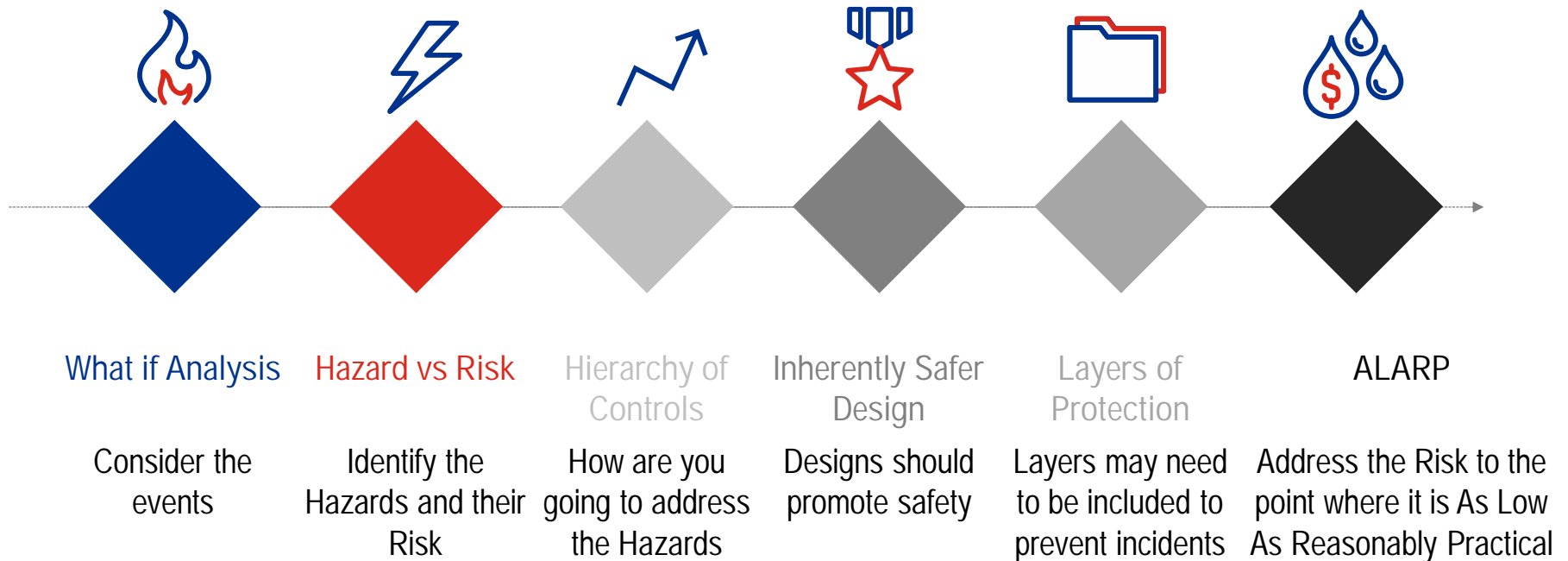
Implement Sustainable Design methodology



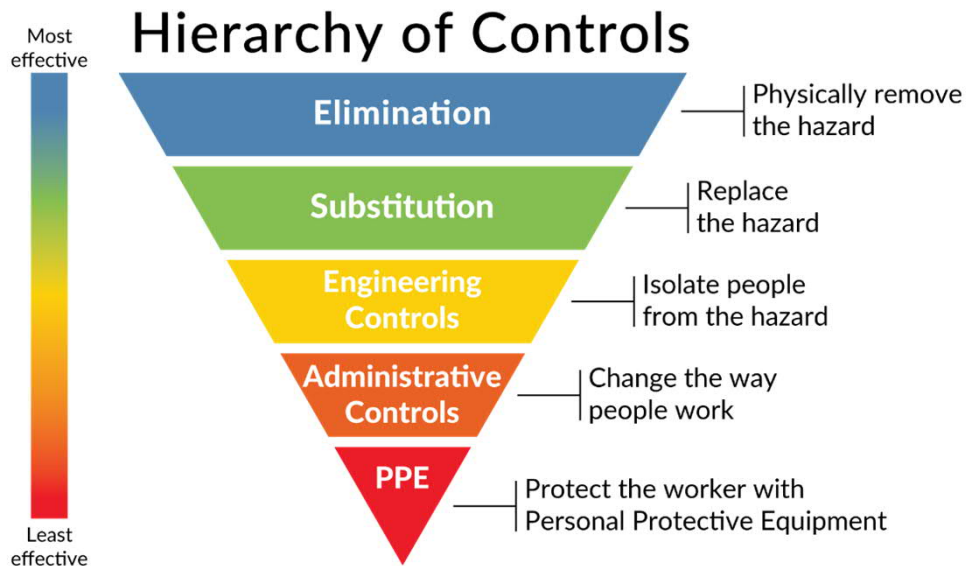


# Overview of Safety in Design (SID) Principles

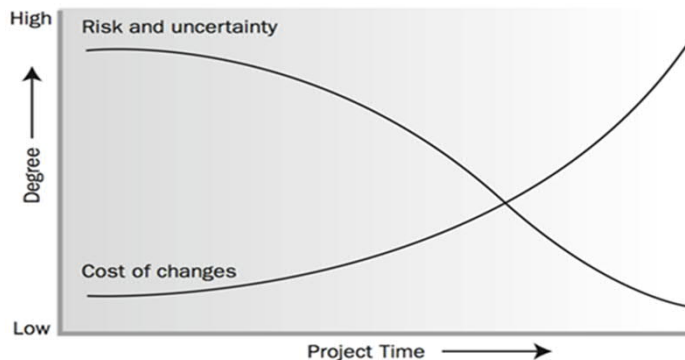
Several Principles are applied as part of SID.



# Hazard Management



- Hierarchy of Controls is an industry framework to manage hazards based on a ranking from most to least effective
- Once a hazards have been identified, the controls to prevent/mitigate the consequences are examined with the aim being to arrive at a control that is highest in the model
- SID should focus on elimination, substitution and engineering controls



# ALARP

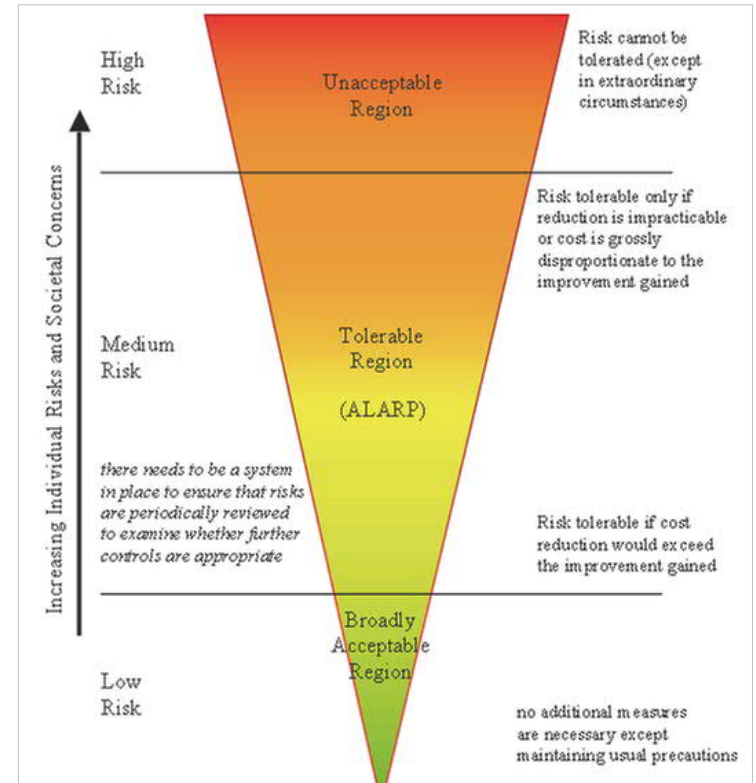
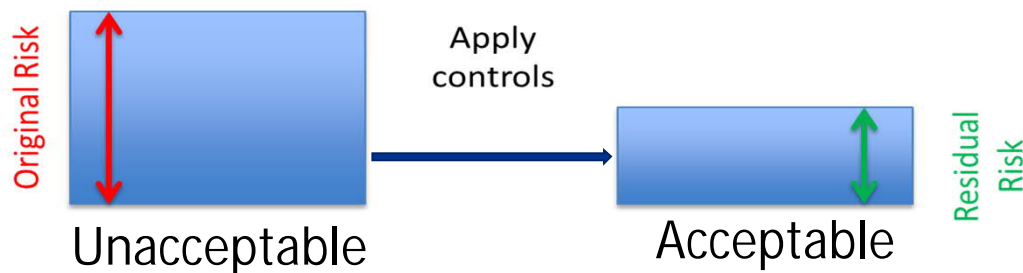
Risk Management involves determining whether the action being taken is adequate to address the risk

Risk Acceptance Criteria – How much protection is enough?

Residual Risk – The risk that is left after our mitigations have been put in place

Assessing sufficient action has been taken involves using the concept of “ALARP” (As Low As Reasonably Practicable)

ALARP tells us where the level of action is reasonable / commensurate with the risk



# Summary and Closure

In Worley, engineering and safety in design is delivered through our SEAL framework;

A strong foundation centred on people and compliance

- Sound culture, the right leaders and properly educated people
- Compliance with laws, obligations and standards

3 pillars that support the outcome

- A focus on Technical Integrity, SID and Sustainable Design
- The outcome being **S**afe and sustainable **E**ngineering for **A**sset **L**ife Cycle (SEAL)

The right systems to instruct our approach

- Customer systems and Worley systems are applied



**Worley**  
energy | chemicals | resources