



# Barrier Thinking meets Bushfires



# About the presenter



# Part 1. Important Risk Management concepts

Safety Management System (ISO 45000), HSSE Culture & Hierarchy of Controls (HoC)

Planning, Preparation, Response & Recovery (PPRR)

Swiss Cheese Model (Incident Investigation)

Risk Assessments, Loss of Control & Top event

Risk, ALARP & Tolerability



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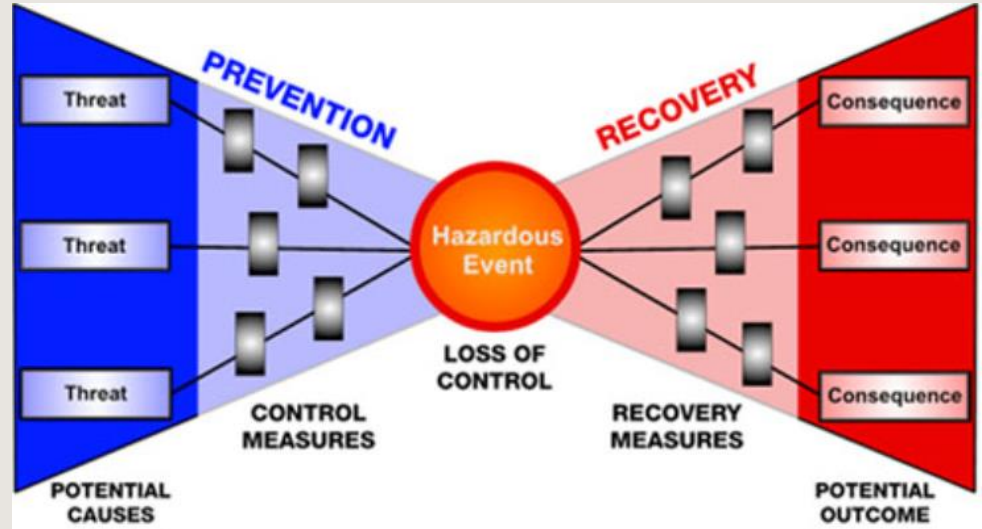
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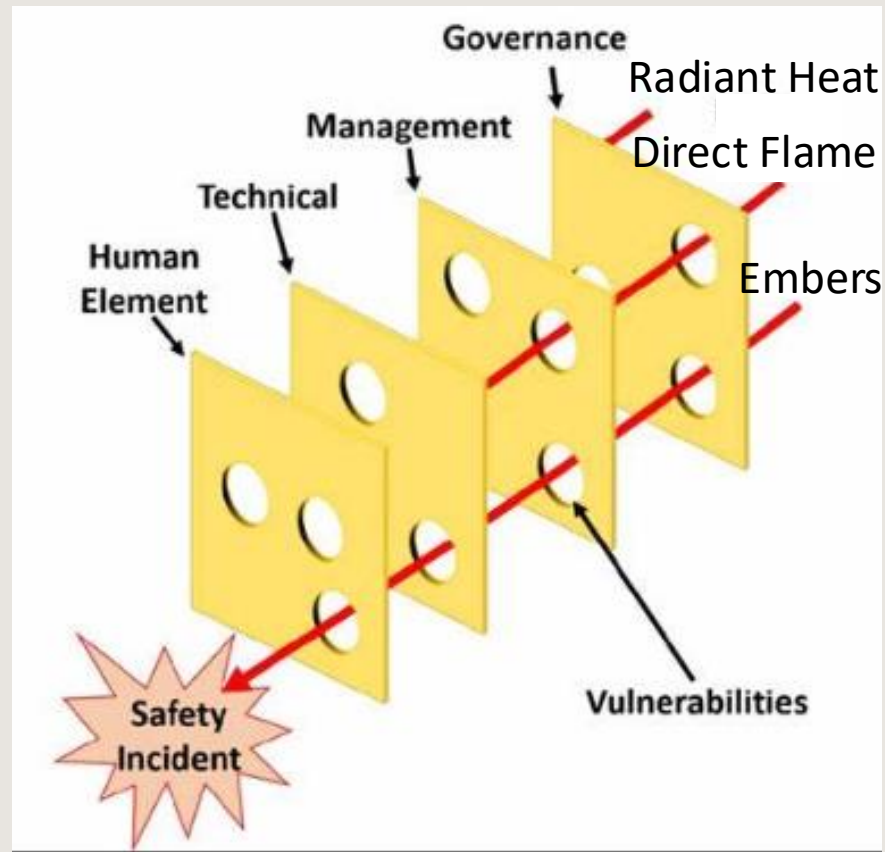


# PPRR Models



# Swiss Cheese Model: Bushfires & the 3 Threats

- Building Catches Fire
- People
- Environment
- Assets



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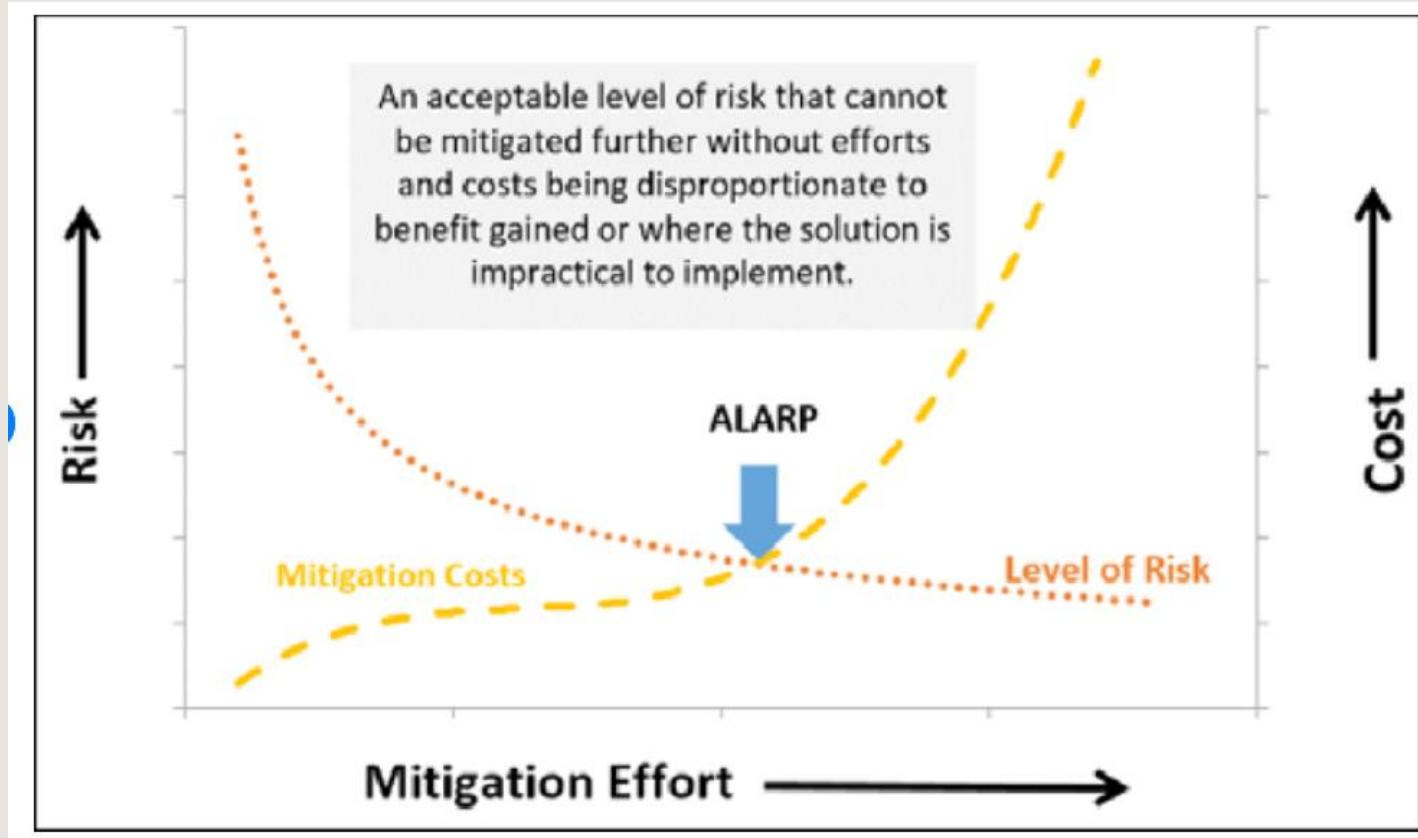
# Risk Assessment Matrix (RAM)

- Mapping the Consequence shows they are all in the same Likelihood column.
- When applying Controls the Risk severity changes.
- Once the Controls are applied the new Severity is determined and called the “Residual Risk”
- The residual Risk is then assessed to determine compliance
- Single House Fire is assessed as RAM C5
  - Increase the risk sees an increase in the need to protect against the threat

Risk Assessment Matrix									
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 our Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in our 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	Massive impact					
5	More than 3 fatalities	Massive damage	Massive effect	Massive impact					

\*Permanent total disability

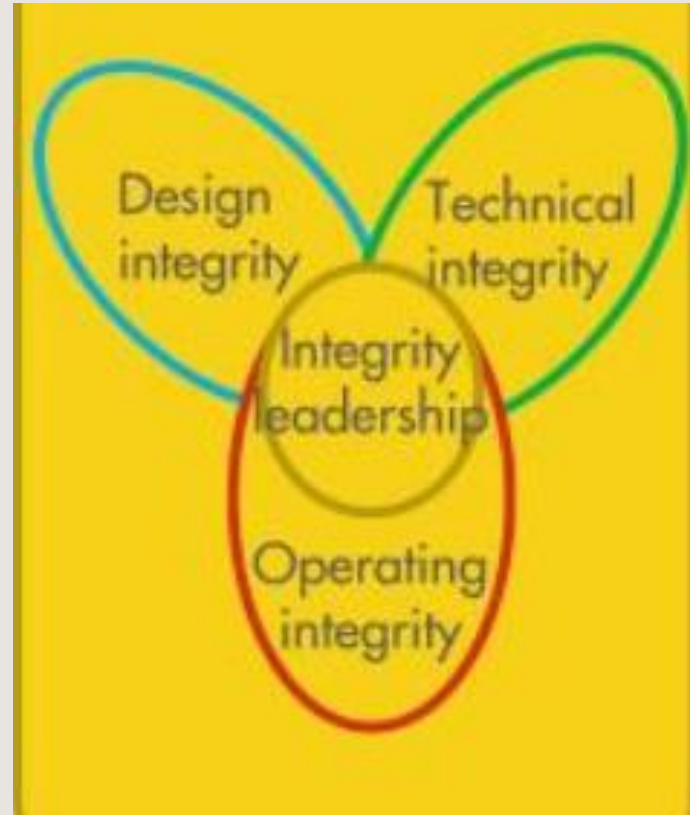
# Risk, ALARP & Tolerability



# Part 2 – Process Safety

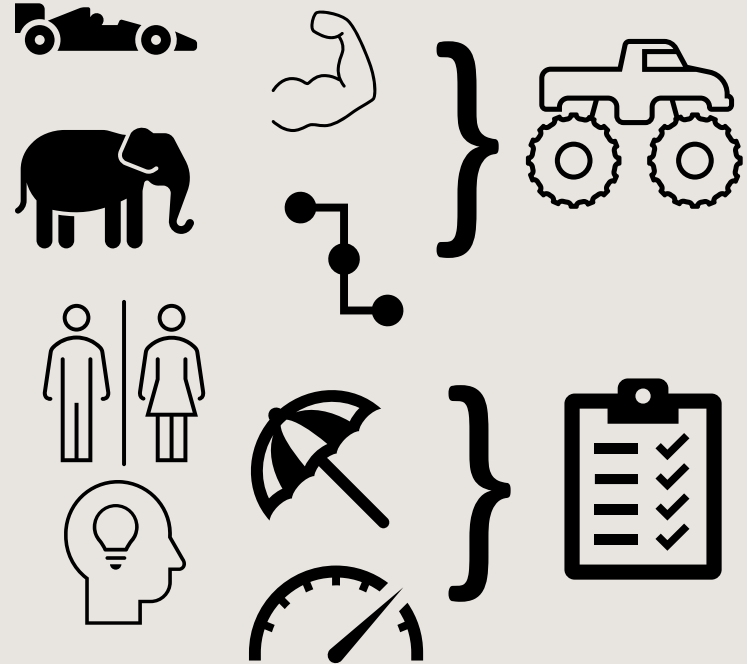
## Four Elements

- Design Integrity (DI)
  - Risk Based (HAZID)
  - Effective
- Technical Integrity (TI)
  - Maintenance & Testing
  - Standards
  - Change management
- Operating Integrity (OI)
  - Procedures (HAZOP)
  - Training
  - Resources
- Integrity Leadership (IL)
  - Review
  - Reporting
  - Escalation
  - Recommends

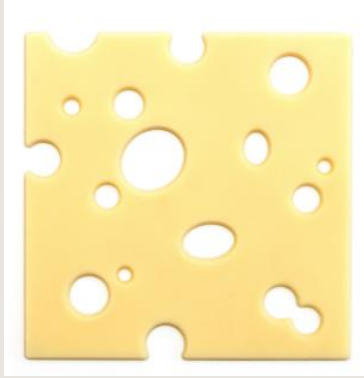


# Process Safety Barriers – Effective & Valid

- Fast Enough (to respond)
- Strong Enough (force to open/close)
- Big Enough (capacity)
- Sensor, Logic & Activation
- Independent (from other controls)
- Protected (from Threat)
- Understood (Competency)
- Measurable (checked to show it works)



# Vulnerabilities in Barriers



## Controls:

- Reviews, Surveys and Audits
- Incident & Near Miss Reports
- Competency Framework
- Process Safety Field Observations
- Assurance Process

## Often Hidden or Hard to See:

- Corrosion & Metal Fatigue
- Operating outside of Limits
- Poor Culture & Communication
- Stretching Maintenance Cycle
- Poor Quality Workmanship
- Conflict of Interests

## Organisational related:

- Poor Change Management
- Budget Constraints
- Outsourcing Or Cost cutting
- Competency of Employees
  - Authorised & Unproductive



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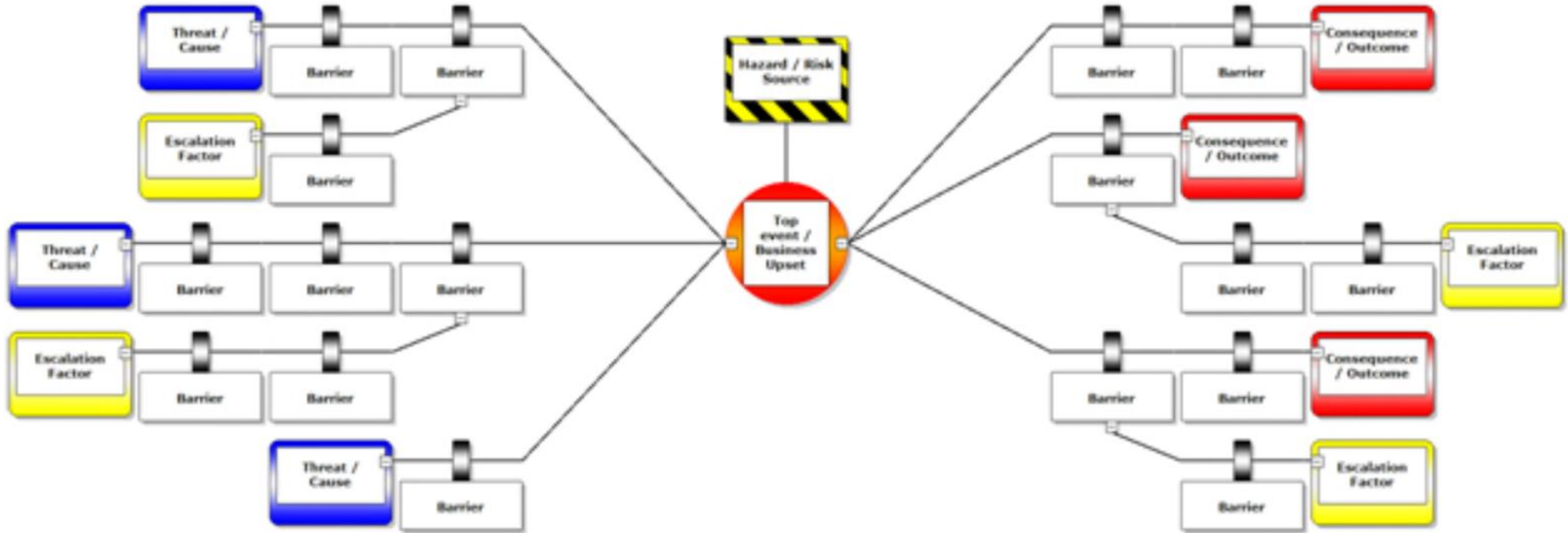


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# Part 3 - Putting the pieces Together



# Bush Fire Bow Tie: Assets C5 Red Risk – Barrier Count 3 + 2



# Barriers & Escalation Factors:

Royal Commission Findings

Countless University & Research studies

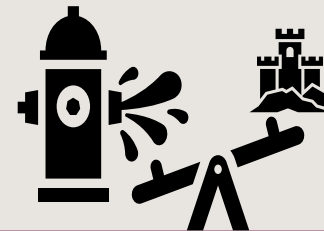
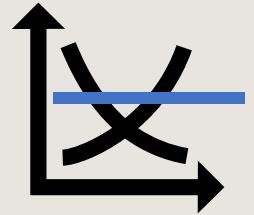
Learnings from other (IBHS)

Time to introduce Change

No Incentive to Change for Preparation

Poor understanding of Tolerability & ALARP

Effort going into areas of PPRR



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# Building Barriers need to contain Bushfire Threats:



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# SSWM Bushfire Mesh – An Effective & Valid Barrier

- Tested for Embers (USQ with Mini-Dragon)
- Tested for Direct Flame (ASTM 2886)
- Tested for Radiant Heat (CSIRO )
- Different wire diameters for different BAL ratings
- Risk Reduction Industry Data



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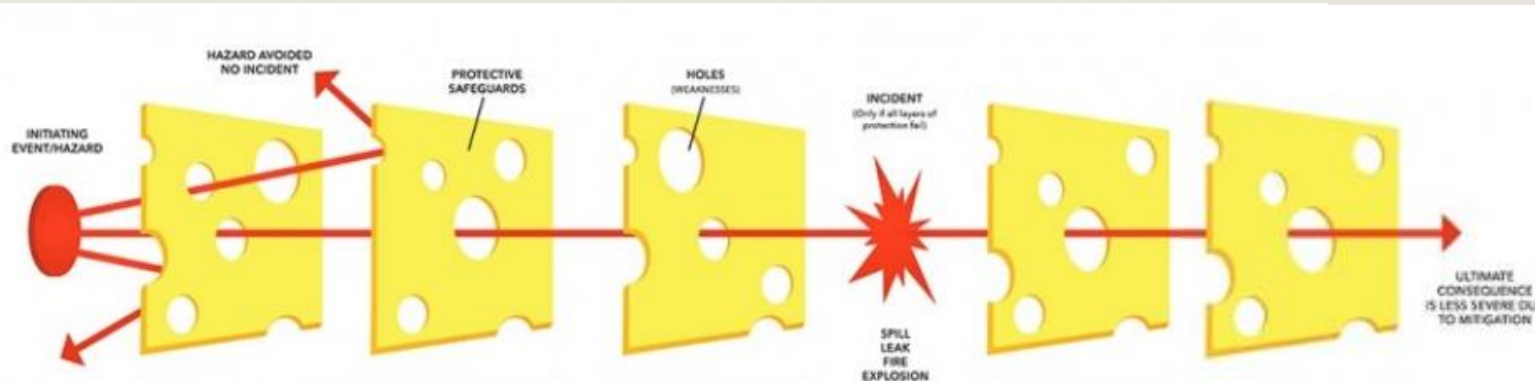
# Part 4 - Bushfires: Effective & Valid Barriers

Barriers are not 100% effective if they:

1. Fail to operate when required (Water runs out)
2. Take too long to arrive (Fire appliance response time)
3. Rely on behaviours to follow a procedure (HoC)
4. People are not Competent to use generators (Esc factor)
5. Are not maintained to the right level (can't be checked)

Barriers are not valid if they:

1. Are impacted by the fire itself (petrol generator doesn't start)
2. Sensor, Logic & Actuation relies on common power supply that may be isolated during fire
3. Rely on common assets such as fire appliance to arrive (are not independent)
4. Rely on a individual to be an active barrier (they may not be available)



# Comparisons between High-Risk Indust & Bushfires:

	High Risk Industry	Bushfire Environment
Management System	Yes	No
Design Standards	Yes	AS 3959
Technical Standards	Yes	AS 1530 series Bushfire Practitioners (L1-3)
Operating Standards	Yes	No*
Controls are Assessed	Ongoing	Once
RAM Rating (Assets)	C5 (Red)	Catastrophic
Average no of barriers	3 + 2	1 + 0
Review Process	Yes	No
Incentives to change	Yes	No
Managing to ALARP	Yes	No
Learning organisations	Yes	No



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# Conclusions / Takeaways

- Need to improve the Effectiveness & Validity of our controls
- Need to design for the future today to build resilience
- Government needs to incentivise these changes
- Focus need to be placed on Preparedness Controls

