



Developing Adequate Barriers for Safe Operations

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Learning Outcomes



At the end of the presentation, participants should know:

- What Safety means in Operations
- Why Barriers are needed
- Areas of Application
- Categories of Barriers
- Why Barriers fail and Remedies

Safety in Operations

A case of the
Chicken or the Egg
– which came first?

Do we work safely or safely work?





HAZARDS

Anything (including processes) with the potential of causing harm to persons, equipment or the environment.

Hmmm...



RISKS

The possibility (or probability) P, of releasing a hazard in a particular situation and the consequent C, of that release.

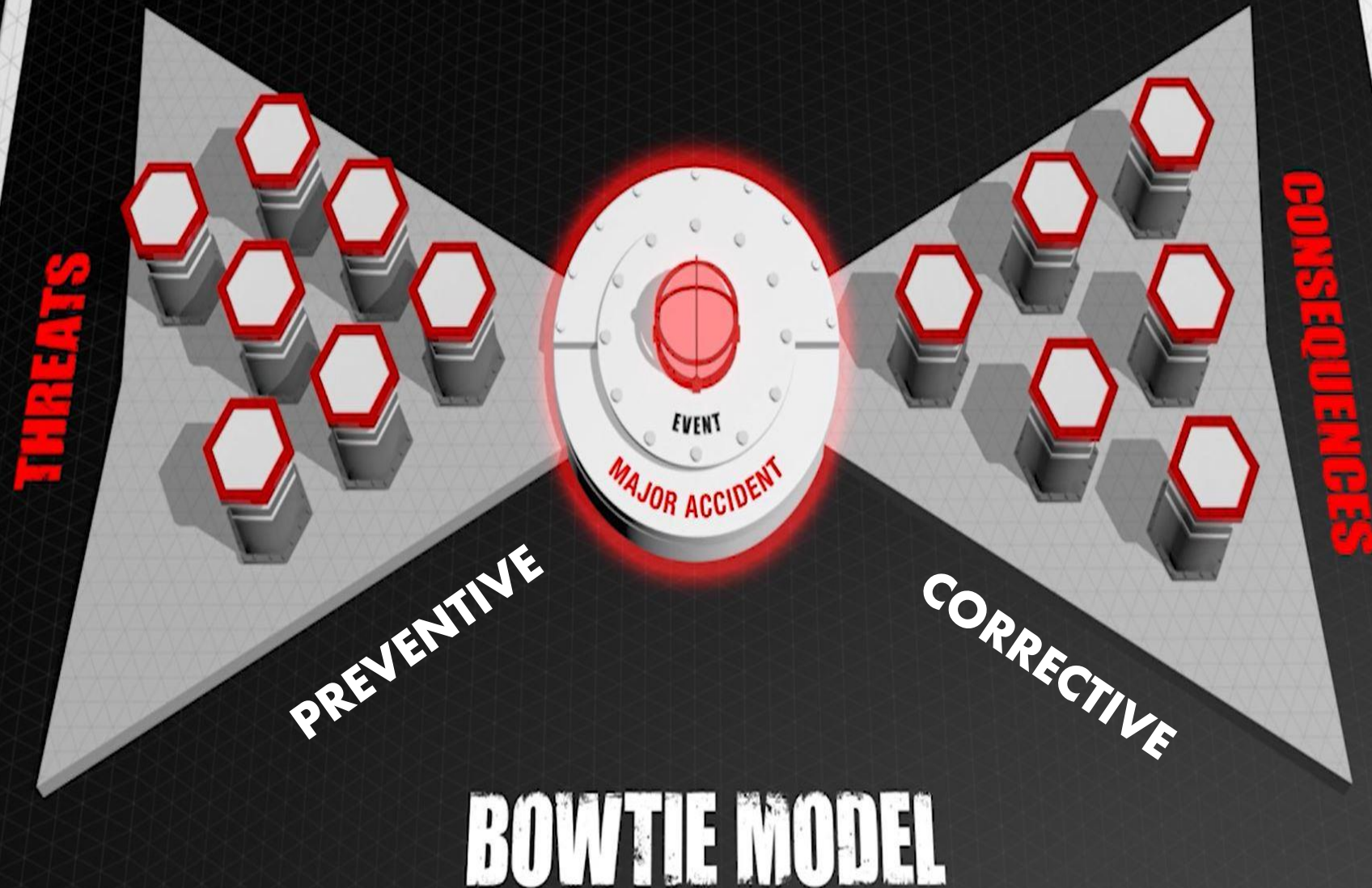
$$R = P \times C$$

So what do we use to prevent such release or minimise the impact of such release?....

BARRIERS



AREAS OF APPLICATION



Barriers to address THREATS are PREVENTIVE.

While Barriers to address CONSEQUENCES of a release of Hazard are CORRECTIVE or MITIGATIVE.

LAYERS OF PROTECTION



Barriers must work independently but multiple barriers can work together to create Layers of Protection

BARRIERS

Categories
of Barriers



PLANT

PROCESS

PEOPLE



PLANT

**SAFETY AND
ENVIRONMENTAL
CRITICAL ELEMENTS**

SECES

SECES

HVAC

ESDVs

**TEMPORARY
REFUGE**

**FIRE & GAS
SYSTEMS**

PROCESS



COMPETENT PEOPLE



PEOPLE

COMPETENT PEOPLE

KNOWLEDGE

EDUCATION

TRAINING

SKILLS

EXPERIENCE

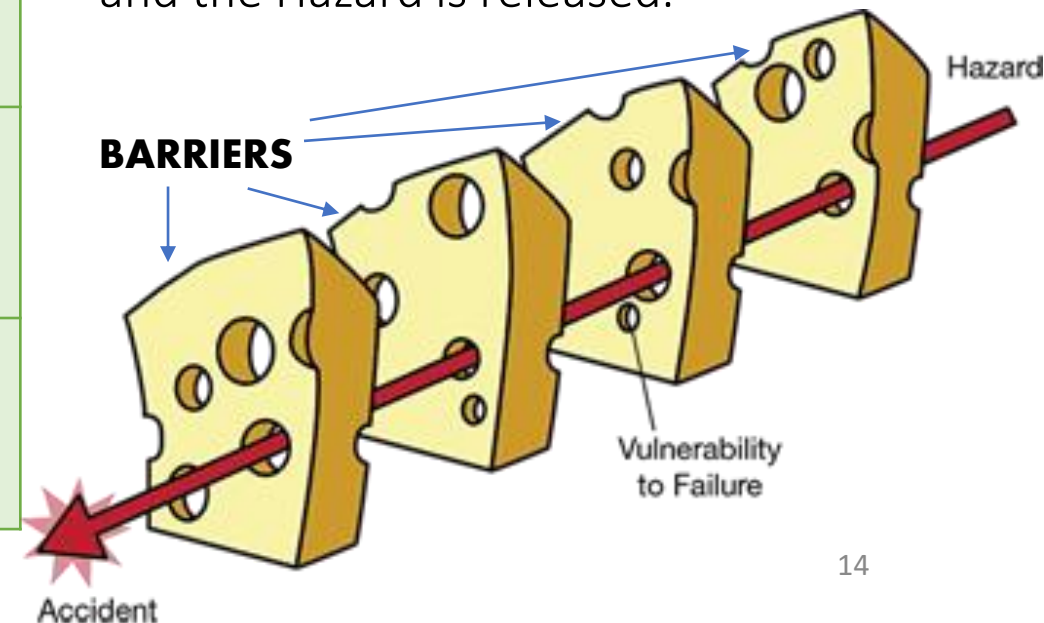
BEHAVIOUR

Why Barriers Fail

	FAILURES	REMEDIES
1	Absence: Required Barrier is missing or removed	Risk Assessment: To identify the right Barrier required and how important
2	Inadequacy: Barrier installed in not the right one or not sufficient.	Regular Reviews: Checking for changes and necessary adjustments required.
3	Inefficiency: Barrier installed can not perform expected function.	Preventive and Corrective Maintenance: Regular and adequate
4	Inherent vulnerability: The Swiss Cheese effect of Barriers.	Continuous Monitoring: To ensure the holes don't align via adequate supervision, etc.

The Swiss Cheese Model:

No Barrier is 100% efficient or full-proof. There are vulnerable points referred to as **holes** that can aid the release of Hazard and realization of a Top Event or Accident. Hence, the need for multiple layers of protection. However there are situations where holes in the various barriers align and the Hazard is released.



CUMULATIVE ACT EFFECT (SWISS CHEESE MODEL)



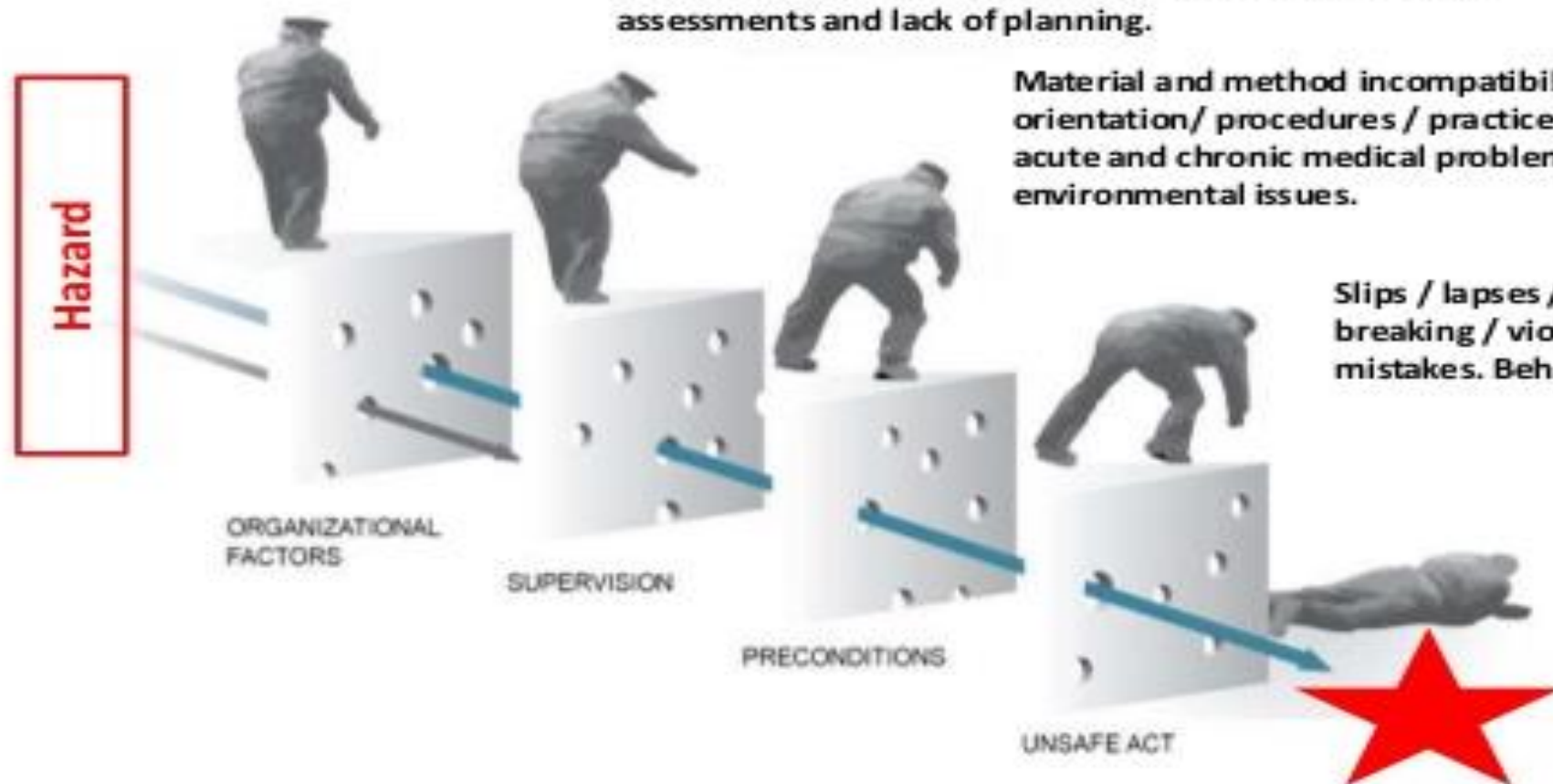
Latent failures of decision making by top management in recruiting, purchasing and policy matters

Latent failures of Line management including lack of supervision/competencies / control and co-operation, communication failures, unrealistic targets, lack of risk assessments and lack of planning.

Material and method incompatibilities / instructions/ orientation/ procedures / practice / knowledge and training/ acute and chronic medical problems / bad weather and other environmental issues.

Slips / lapses / mistakes. Deliberate rule breaking / violations, knowledge base mistakes. Behavioral issues Etc..

Active failures



Any Questions...
Just Ask!

