Making Risk Based Decisions

(A Supplement to Chapter 6)

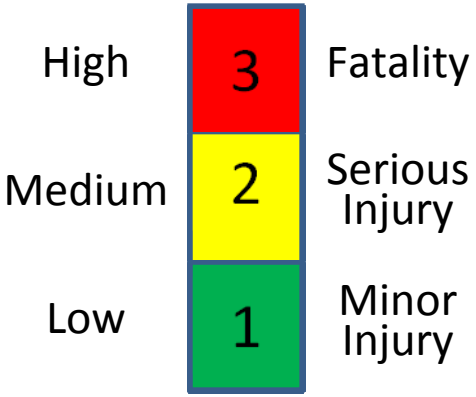
Evaluating Hazards in the field

- What is the condition (the hazard) that could cause harm?
- How bad could the harm be?
- Is it a danger now or is another event or condition required for it to become a danger?
- What safeguards are protecting you against the danger?
- Are those safeguards adequate?
- Identify the safest alternative do deal with the hazard

Relating Hazard to Risk

- At the job location, consider the hazards, the likelihood of potential exposure and the potential consequences
- The following is a simple representation of the relationship between hazard and risk:

Hazard Scale related to severity of harm



Risk Matrix relating Hazard Exposure Likelihood and Consequence

Severity	Likelihood: Frequent	Likelihood: Occasional	Likelihood: Unlikely
High	A	A	B
Medium	A	B	C
Low	B	C	C

- Remember that when doing a job, you are close to a potential exposure so that active measures must be taken to prevent that exposure and minimize severity if it should occur

Understanding consequence severity

- An incident can affect more than the people directly involved

	Injury	Environmental	Business interruption / Asset Damage	Reputation
Major	One or more fatalities	Offsite release - short or long term damage	Unit destroyed, long down time	Extended national media coverage
Serious	Serious multiple injuries	Offsite release, quick remediation	Significant damage and downtime	Limited national media coverage
Minor	Single injury, not severe	Onsite, contained release	Short term damage/ downtime	Extended local media coverage
Incidental	Minor or no injury	No impact	Limited or no downtime	Minor local media coverage

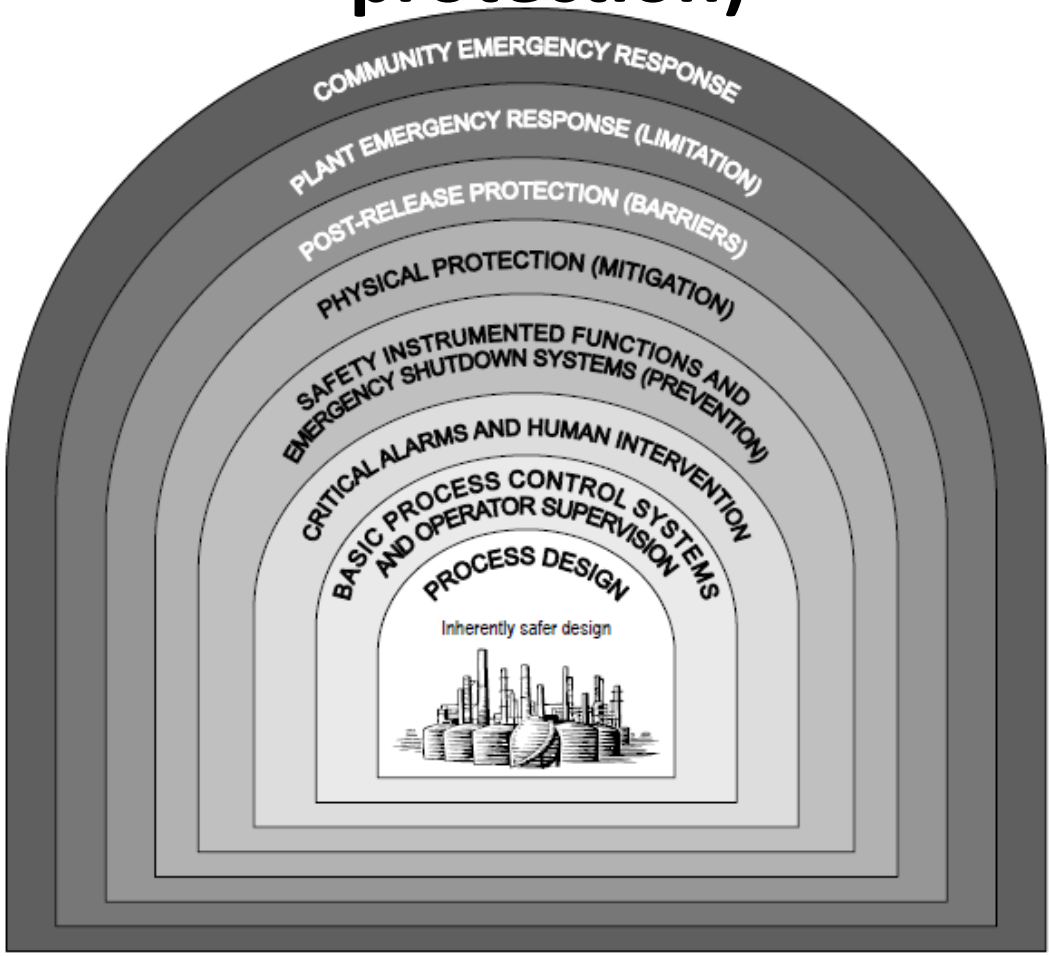
Recognizing Risk

When might you take a risk?

- Don't "see" the hazard
  - No experience?
- Don't understand potential consequences
  - Haven't discussed what could happen
  - Nothing happened last time
  - Complacency
- Normalizing the Abnormal
  - "It's the way we do things"

Risk is reduced by layers of protection

Process Safeguards Hierarchy (Layers of protection)



- Field activities need to reinforce the safety that is built into the process

Field activities that reduce risk by reinforcing the layers of protection (1)

- Inherent Safety should be a part of the process
  - Effective plant design
    - **Minimizes** quantities of hazardous materials
    - **Substitutes** using lower hazard materials
    - **Moderates** process conditions
    - **Simplifies** design where possible
  - Field activities should use the same principles to:
    - Optimize normal operating procedures
    - Prepare and carry out shutdown and start up
    - Decontaminate equipment
    - Prepare for maintenance

Field activities that reduce risk by reinforcing the layers of protection (2)

- Critical alarms / human intervention
  - Understand their purpose in giving an opportunity to restore normal process control
  - Periodically check they are functional, both in the control room and the field.
  - Periodically confirm they are not blocked in anywhere
- Safety Instrumented Functions / Automatic Emergency Shutdowns
  - Understand their purpose to safely shut down a system
  - Periodically check they are functional, both in the control room and the field.
  - Periodically confirm they are not blocked in anywhere

Field activities that reduce risk by reinforcing the layers of protection (3)

- Physical protection – evaluate periodically:
  - Piping / equipment is designed so that any corrosion / erosion based leak is likely to be from a point rather than a catastrophic failure. If it appears abnormal, get help before working with it (under insulation corrosion, leaking flange)
- Barriers – check integrity periodically:
  - Passive barriers include curbs, dykes, fire proofing and distance
  - Active barriers include deluge and firewater systems

Field activities that reduce risk by reinforcing the layers of protection (4)

- Incident consequences are limited by having:
  - Plant Emergency Response
    - Fire trucks, monitors, foam application
    - Trained responders who practice scenarios
  - Community Emergency Response
    - Additional resources and communications
- Participate in drills to:
  - Find any system defects
  - Become familiar with the required response if you do have to take part

How layers of protection are used in design to reduce risk

- Consider a pump transferring a highly flammable material that if released will vaporize into a cloud that could explode
- Adding layers of protection to prevent a seal failure will lower the risk of a release

Pump has single seal	Severity - High	Likelihood - frequent	Risk - Very High
Pump has Tandem seal	Severity - High	Likelihood - seldom	Risk - High
Critical alarm on seal pot	Severity - High	Likelihood - unlikely	Risk - Moderate

- The severity of the release does not reduce but the likelihood does
- Note that these are active layers of protection. To ensure the risk is reduced as intended, they must be actively checked and maintained

An extreme combustible dust hazard

- The hazard (dust) had escaped from the process
- The significance of the hazard was not understood
- An initial event suspended the dust in air, creating a large explosive fuel / air mixture

In Summary

- Risk increases as hazards get closer
  - Do not increase risks further by taking short cuts
- Layers of protection provide a guard against the hazards – but must pro-actively be maintained
- Consciously evaluate the risks on an ongoing basis:
  - Keep a critical watch out for hazards in and around your work location
  - Get help to “See the hazards that you don’t see” – to reduce the risk.
  - Recognize that hazards change as the work changes

Maintain awareness to help you reduce risk

Albert Einstein said: "You only see what you know."

Near miss events are like little lamps lighting the way to a hazards that we cannot see for the darkness of ignorance.

Once illuminated it is up to management to remove it or fall victim to its awful potential.