

BAE 2113 -- Safety in Design

Session II

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Next Session:

- 10 minutes discussion
- Conducting a detailed hazard analysis
- Sources of additional information
–(including engineering standards)

Take Home Assignment - For Your Design, Identify:

- Primary hazards – list them, explain how energy transfer could occur
- At least two factors each for:
 - host
 - agent
 - environment

Designs, Projects?

- What hazards did you identify?
- How important are they?
- What host-agent-environment factors did you identify?



Six Volunteers

6
5
4
3
2
1
K

Stress and Human Factors

- 6 What happens when people are under pressure to “perform?”
- 5
- 4
- 3
- 2
- 1
- K



Does This Mean We're Stupid?



Safety and Energy

- All injuries and most “property loss” accidents are caused by energy transfer.
- Kinetic Energy ($\frac{1}{2} \cdot m \cdot v^2$)
 - Common method – is to place a barrier between components with KE and person
 - Other common method is to alter the rate at which velocities change by altering the distance or time over which a change in velocity occurs.
 - Examples of this??
- Electrical Energy ($W=V \cdot I$)



People Are People

- We make mistakes
- We forget things
- We do things in the wrong order
- We do things we should not do
- We get distracted
- We get overloaded
- We are motivated by simple concepts of pain and pleasure!

Hazard Analysis



A Typical Risk Assessment Matrix*...

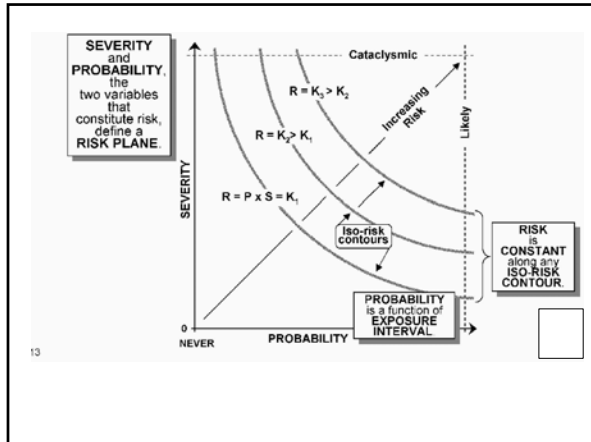
A guide for applying subjective judgment...

Severity of Consequences	Probability of Mishap**					
	F Impossible	E Improbable	D Remote	C Occasional	B Probable	A Frequent
I Catastrophic					①	
II Critical				②		
III Marginal			③			
IV Negligible						

Risk Code/Action → ① Imperative to suppress risk to their levels ② Operation requires written, limited waiver, endorsed by management. ③ Operation permissible

*Adapted from MIL-STD-882C **Life Cycle: Personnel: 30 yrs / Others: Project Life

More...



What Factors go Into “Rating” Risk??

- Values and culture of the organization.
- Financial status.
- Risk tolerance.
- Ability to control the hazard.

THERE ARE TOUGH CHOICES TO MAKE ANYTIME YOU DESIGN AND SELL A PRODUCT.

Dependency

- An issue to consider when you “design in” a safeguarding device.
- Examples:
 - Elevator doors
 - Washing machine lids
 - Warning buzzer at the tip of a crane’s boom
- What can happen if the user becomes dependent?

Engineering Standards

- Based on a “consensus” within groups like ASAE, SAE, ASME, and others.
- Not “laws” themselves, but sometimes imbedded in laws and regulations.
- Be aware, there are also standards for warning labels, decals, and signs.

A Good Warning Has:

- Signal word
- Description of hazard
- Brief, but honest consequences
- Explanation of correct (or incorrect) behavior
- A graphic that depicts encounter with hazard

**Questions?
Comments?
Concerns?**

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