



Collaborative Bachelor's Degree Program of Fire Protection and Safety
Engineering Technology between Southwest Jiaotong University and
Oklahoma State University, U.S.A.




FPST 1213 Fire and Safety Hazard Recognition

Safety Hazard Recognition

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History Incident Causation




- Incidents used to be thought of as
 - Happening by chance
 - Acts of God
 - Inherent to production...just part of doing business
- WWII - Human element
 - Incident proneness
- '50's and '60's
 - Engineering controls for machines and equipment
- '70's
 - OSH Act
- '80's
 - Balance approach between machines and people
 - Engineering
 - Behavior

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Is Safety Reactive or Proactive?

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Two Approaches to Safety



- Approach #1 – Reactive
 - After the fact
 - Evaluating information from incident reports and insurance audits
- Approach #2 – Proactive
 - Before the fact
 - Inspections for unsafe conditions or practices
 - Analyze management systems
 - Behavioral observations
 - Hazard identification and evaluation

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Hazard



- Hazard
 - A condition or set of conditions that have the potential to produce injury, illness, and/or property damage
 - The condition does not have to exist at the moment to be a hazard
 - Evaluate potential
 - Example: Chemical reaction

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Effects Of Hazards



- A hazard requires exposure and a sequence of events before damage can occur
- The event is called an incident
 - An unplanned, undesired event, not necessarily resulting in injury, but damaging to property and or interrupting the activity in process
- Results of incidents
 - Increase time needed to perform task
 - Cost money
 - Interrupt production
 - Equipment damage

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Incident Causes



- Unsafe practices
 - Making safety devices inoperative
 - Using tools incorrectly
 - Using defective tools
 - Failure to use engineering controls
 - Failure to use PPE
- Situational factors
 - Improper equipment available
 - Equipment improperly maintained
 - Improper storage of equipment
 - Improper layout of equipment
 - Inadequate design of facility or equipment
 - Poor construction
- Environmental factors
 - Noise
 - Vibration
 - Improper lighting
 - Heat or cold
 - Radiation
 - Chemical factors
 - Ergonomic factors

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Unsafe Practices



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Unsafe Practices



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Unsafe Practices



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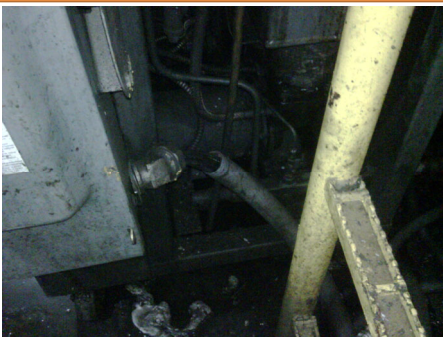
Unsafe Practices



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Situational Factors



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Situational Factors



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Situational Factors



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Environmental Factors



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Environmental Factors



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Environmental Factors



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Loss Control



- Function directed toward recognizing, evaluating, eliminating or controlling the effects of hazards
 - Think of it as looking for defects
- Process
 1. Hazard identification and evaluation
 2. Ranking hazards by risk
 3. Management decision-making
 4. Establishing preventive and corrective measures
 5. Monitoring
 6. Evaluating program effectiveness

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Hazard Identification



- Multiple ways to identify hazards
 - Insurance claim history
 - Old inspection reports
 - Old incident reports
 - Employee interactions
 - Hazard analysis**

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Hazard Analysis



- An analysis performed to identify and evaluate hazards in order to eliminate or control them
 - Review each operation as part of a system
- Two methods
 - Begin with failure of the system and examine components together to see how each can contribute to system failure
 - Begin with a component of the system and look at how each component of a system can contribute to system failure
 - JHA (Job Hazard Analysis)**

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JHA



JOB SAFETY ANALYSIS		JOB TITLE (and number if applicable)	PAGE ____ OF ____	JSA NO. JSS	DATE	REVIEW
INSTRUCTIONS ON REVERSE SIDE		Shooting Police			10/10/00	REVIEWED
COMPANY/ORGANIZATION		Shooting Police	SUPERVISOR	James Smith	ANALYST BY	James Smith
PLANT/LOCATION		Chicago	DEPARTMENT	Firefighting	APPROVED BY	James Smith
REQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT		Fire Protection - Long Sleeve - Safety Shoes				
SEQUENCE OF BASIC JOB STEPS		POTENTIAL HAZARDS	RECOMMENDED ACTION OR PROCEDURE			
1. Position portable hoisting		1. Feet positioned too close to pallet (airline body & legs)	1. Lower engine crane between unit and pallet.			
2. Withdraw strapping and		2. Sharp edges of strapping	2. Wear gloves, eye protection & long sleeves -			
3. Walk around load while		3. Feet caught in strapping	3. Wear fire proof on strapping - hold end between			
4. Pull and feed strap		4. Splinters on pallet (puncture to hands & fingers)	4. Wear gloves - eye protection - long sleeves -			
5. With arm and		5. Projecting sharp corners on	5. Assume a clear path between pallet and			
6. Turn, position and		6. Splinter and sharp strapping	6. Wear fire proof on strapping - hold end between			
7. Tighten strap to gun.		7. Splinter and sharp strapping	7. Assume a clear path - watch sharp metal -			

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Advantages of JHAs



- Assist in new hire orientation and job training
- Used in behavioral observations
- Should an incident occur, reviewed to determine missing safeguards

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Inspections



Detect potential hazards
before incidents occur

Remember, it's not about finding
fault, issues, problems, violations
areas of non-conformance...etc.
• It's about finding **opportunities
to improve**...nothing more.



Inspection items

Safety devices (e.g. machine
guards)
Electrical parts
Implemented controls



IDLH situations

Immediately Dangerous to Life or
Health
• Handle immediately

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Hazard Evaluation



- Risk-Ranking
 - What is risk?
 - Severity
 - How bad
 - Probability
 - How often
 - Remember...probable...not possible

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PERSONAL INJURY RISK ASSESSMENT
Probability vs. Severity Matrix

PROBABILITY OF OCCURRENCE	SEVERITY OF HARM			
	Critical	Serious	Moderate	Minor
Frequent	High 1	High 3	High 7	Low 13
Probable	High 2	High 5	Medium 9	Low 16
Occasional	High 4	Medium 6	Medium 11	-
Remote	Medium 8	Medium 10	Low 14	-
Improbable	Low 12	Low 15	Low 17	-

Adapted from: Harold E. Roland and Brian Moriarty, *System Safety Engineering Management* (John Wiley & Sons Inc., New York, 1990): 17.



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Risk Matrix

Gravity (G)				Probability (P)					
Safety of people	Environment	Installation stop	Material damages	Value	Occurrence during the life time of the equipment (<100 years)				
					Unlikely but still possible	± one time every 10 years	± one time every year	± one time every month	Several times a year
Several persons injured or 1 death	Important consequences outside the site	> 1 month	> 1 millions €	5	M	H	H	H	H
1 person injured with permanent incapacity	Incident with important consequences on site	> 7days & <1 month	> 500k€	4	M	M	H	H	H
1 person injured with work incapacity of a few weeks	Incident with light consequences on site	>3d & <7days	> 100k€	3	L	M	M	H	H
1 person injured with work incapacity of a few days	Incident with no consequences on site	> 1day & <3days	> 20k€	2	L	M	M	M	H
1 person injured without incapacity	No environmental impact	< 1 day	< 20k€	1	L	L	L	M	M

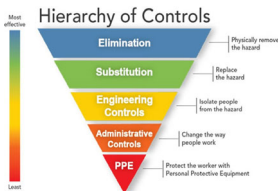
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Corrective Actions and Controls

- Set a definite time limit for correction and implement system to track and follow-up to see if it was corrected
- Elimination and substitution are typically lumped in this category

Hierarchy of Controls



Most effective

Least effective

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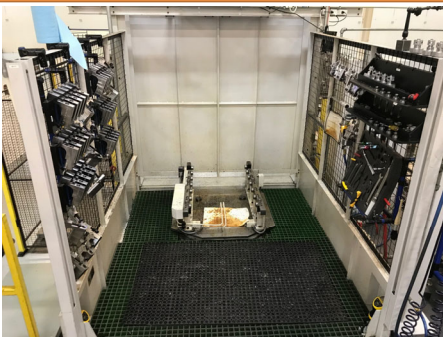
Corrective Actions and Controls

- Set a definite time limit for correction and implement system to track and follow-up to see if it was corrected
- Management Decision Making
 - Modify the workplace
 - Redesign the workplace
 - Discuss hazard with workers
 - Take no action

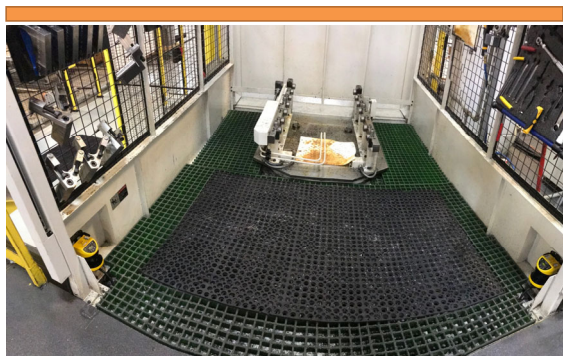
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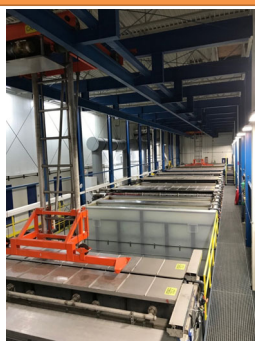
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Hazard identification and
assessment is the main thing a
safety professional does...


...but how do you know where to start?


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Know the Law





29 CFR 1910

"General Industry" safety regulations



29 CFR 1926

"Construction" safety regulations
