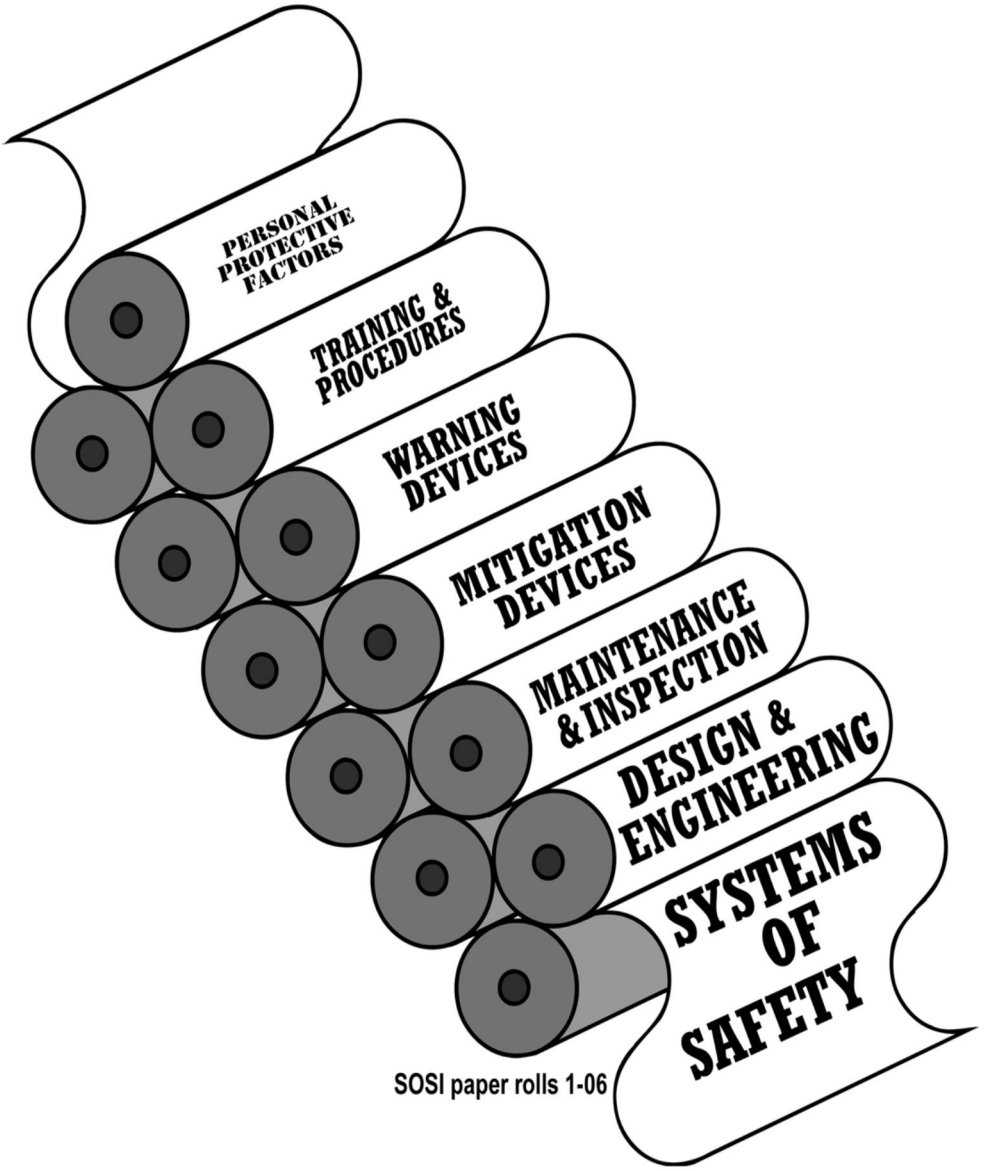
Activity 3: Systems of Safety

Purpose

To introduce the concept of Systems of Safety and accident prevention.

This Activity has three tasks.



1. What Are Systems of Safety?

Systems of Safety are proactive systems that actively seek to identify, control and/or eliminate workplace hazards.

Let's look at an incident where a worker bumped his head on a low pipe. How could this hazard be addressed by each of our Systems of Safety? (See the next six Factsheets.)

2. The Personal Protective Factors System

1. Personal Decision-making and Actions

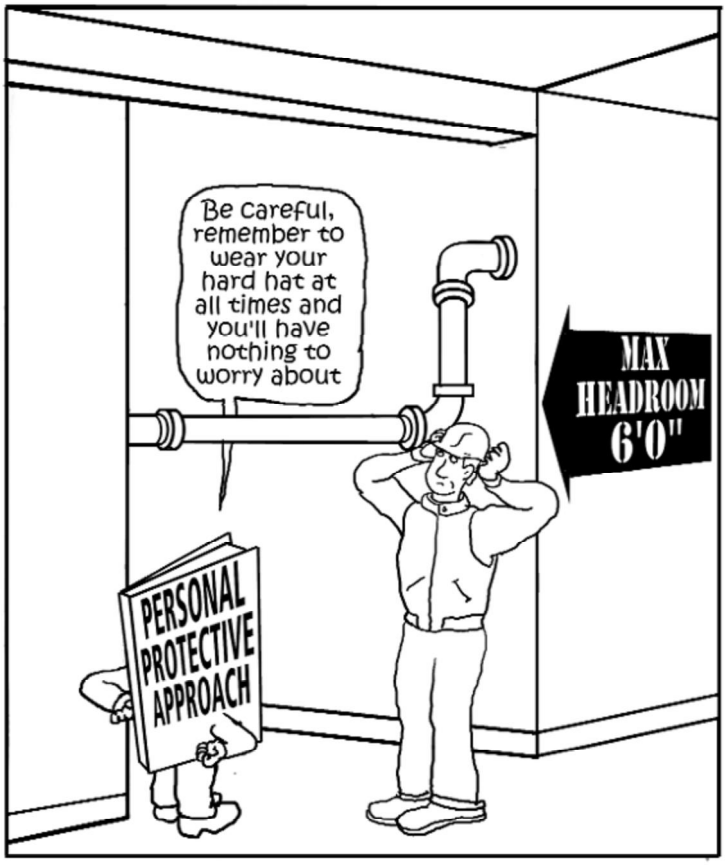
- Look and think critically at the workplace;
- Work collectively to identify hazards; and
- Contribute ideas, experience and know-how that will lead to correcting the systems flaws.

2. Personal Protective Equipment (PPE) and Devices

- Wear PPE as necessary and required when higher levels of protection are not feasible.

3. Stop Work Authority

- Authority is given to all individuals, and they are encouraged, to stop work, equipment or processes due to unsafe conditions until a thorough Hazard Analysis can be performed.

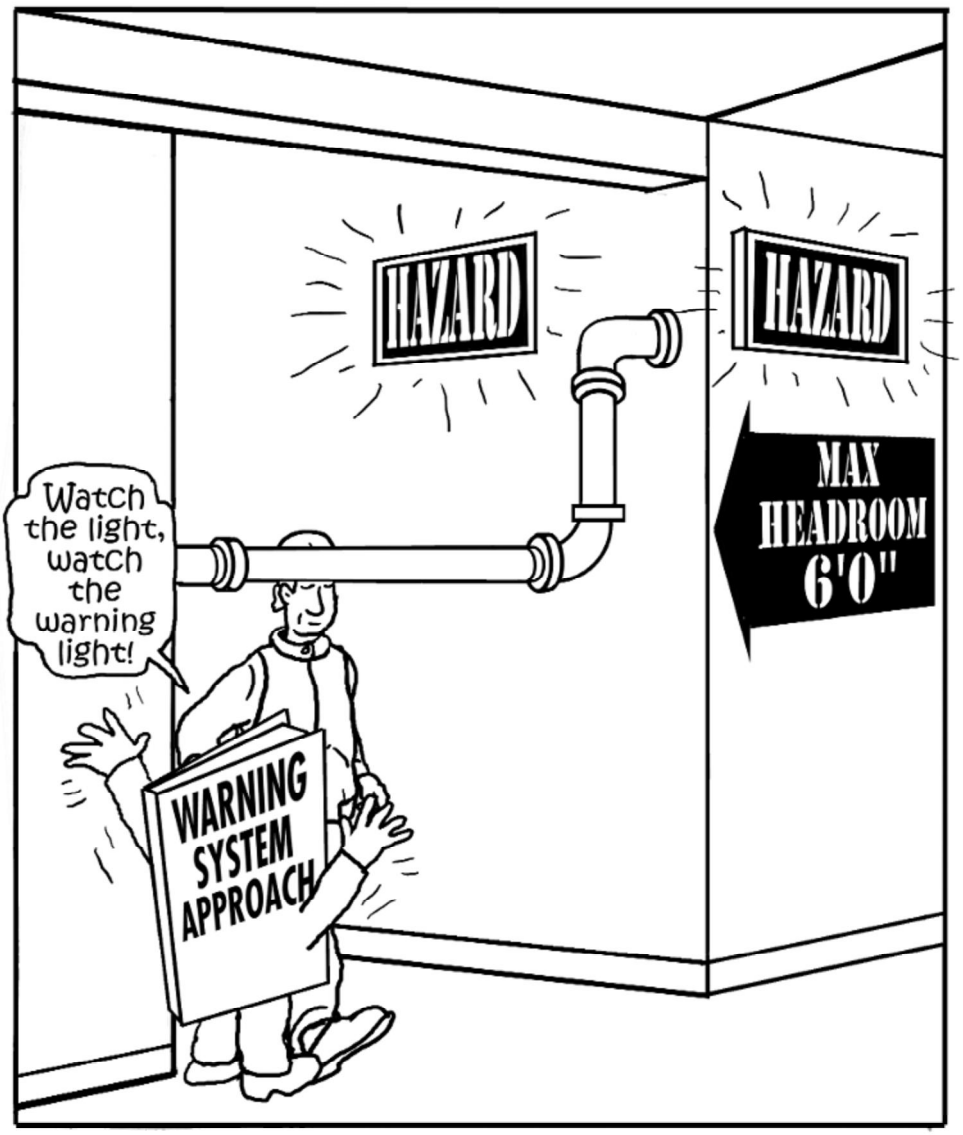


3. The Procedures and Training System

The operation and maintenance of processes that are dangerous require a system of written procedures and training. The greater the hazard, the greater is the need for Procedures and Training.

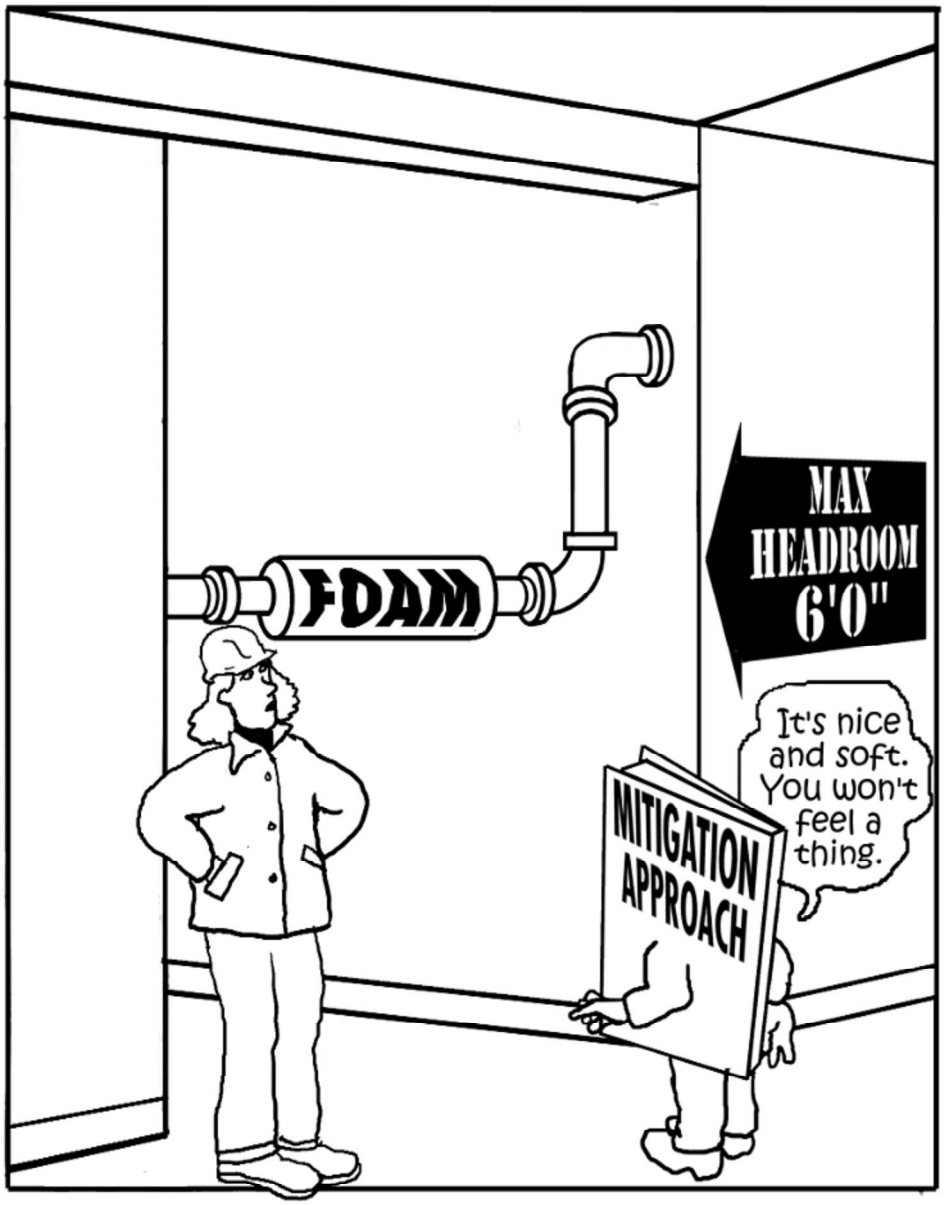
4. The Warning System

The Warning System of Safety includes the use of devices that warn of a dangerous or potentially dangerous situation. These devices require a person's intervention to control or mitigate the hazardous situation.



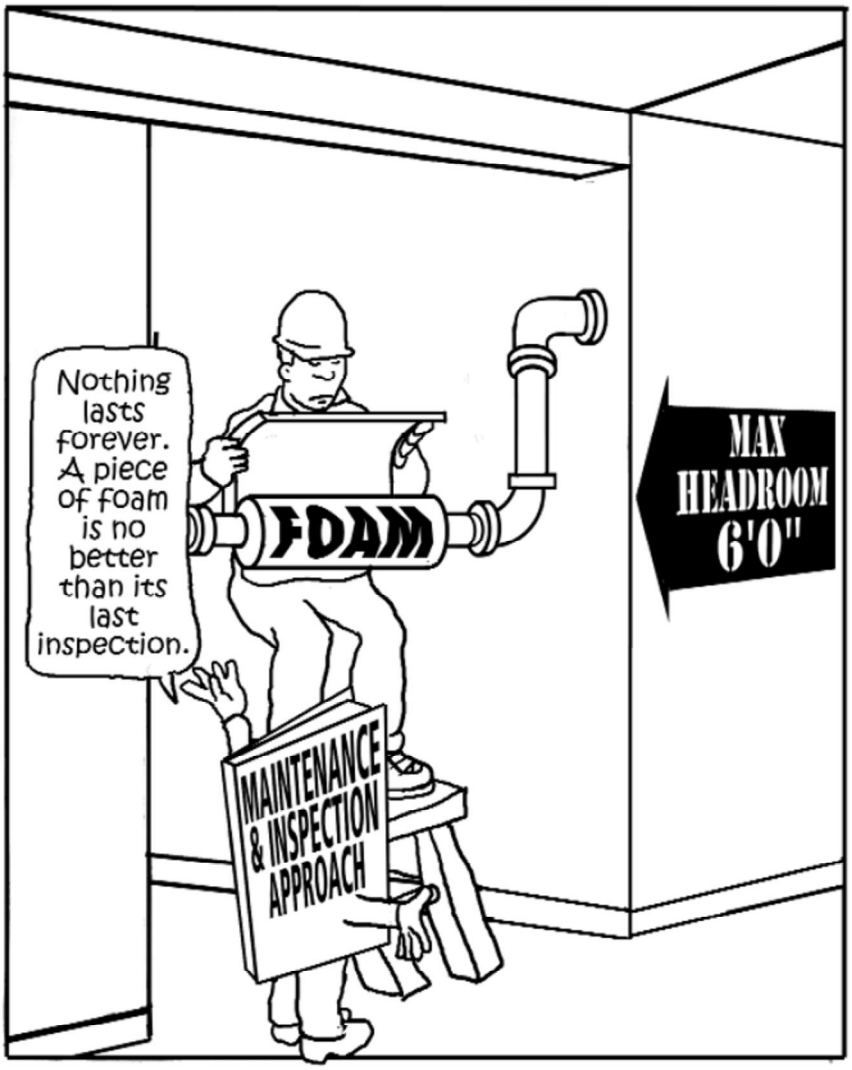
5. The Mitigation System

The Mitigation System of Safety involves the use of equipment that automatically acts to control or reduce the harmful consequences of hazardous incidents. Mitigation should be automatic and reliable.



6. The Maintenance and Inspection System

Properly designed equipment can turn into unsafe junk if it isn't properly maintained, inspected, and repaired. If the phrase "if it ain't broke, don't fix it" is used within a plant, the Maintenance and Inspection System is a failure. If you don't use preventive maintenance, then you end up doing breakdown maintenance.



7. Design and Engineering System of Safety

A central purpose of the Design System of Safety is to eliminate hazards through the selection of safe or low-risk processes and chemicals whenever possible.

One example of good design safety is the substitution of a less hazardous chemical such as sodium hypo-chlorite (bleach), for chlorine in treating cooling water. A release of toxic chlorine gas can travel in the wind for miles, whereas a spill of bleach is inherently less dangerous.

8. Systems and Sub-Systems (Examples)

Major Safety System	Design and Engineering	Maintenance and Inspection	Mitigation Devices	Warning Devices	Training and Procedures	Personal Protective Factors
Level of Prevention	**Highest—the first line of defense**	**Middle—the second line of defense**				**Lowest—the last line of defense**
Effectiveness	**Most Effective**					**Least Effective**
Goal	*To eliminate hazards*	*To further minimize and control hazards*				*To protect when higher level systems fail*
EXAMPLES OF SAFETY SUB-SYSTEMS**	**Technical** Design and Engineering of Equipment, Processes and Software Management of Change (MOC)** Chemical Selection and Substitution Safe Siting Work Environment HF **Organizational *(must address a root cause)*** Staffing HF Skills and Qualifications HF Management of Personnel Change (MOPC) Work Organization and Scheduling HF Workload Allocation of Resources Buddy System Codes, Standards, and Policies**	Preventive Maintenance Inspection and Testing Maintenance Quality Control Turnarounds and Overhauls Mechanical Integrity	Enclosures, Barriers Dikes and Containment Relief and Check Valves Shutdown and Isolation Devices Fire and Chemical Suppression Devices Machine Guarding	Monitors Process Alarms Facility Alarms Community Alarms Emergency Notification Systems	Operating Manuals and Procedures Process Safety Information Process, Job and Other Types of Hazard Assessment and Analysis Permit Programs Emergency Preparedness and Response Training Refresher Training Information Resources Communications Investigations and Lessons Learned Maintenance Procedures Pre-Startup Safety Review	Personal Decision-making and Actions HF Personal Protective Equipment and Devices HF Stop Work Authority

HF - Indicates that this subsystem is often included in a category called **Human Factors.**

* There may be additional subsystems that are not included in this chart. Also, in the workplace many subsystems are interrelated. It may not always be clear that an issue belongs to one subsystem rather than another.

** The Codes, Standards and Policies and Management of Change subsystems listed here are related to Design and Engineering. These subsystems may also be relevant to other systems; for example, Mitigation Devices. When these subsystems relate to systems other than Design and Engineering, they should be considered as part of those other systems, not Design and Engineering.

Revised October 2006

Summary: Systems of Safety

1. Proactive Systems of Safety are the key to preventing disasters and injuries.
2. Major Systems of Safety include:
   - Design and Engineering;
   - Maintenance and Inspection;
   - Mitigation Devices;
   - Warning Devices;
   - Procedures and Training; and
   - Personal Protective Factors.
3. The Design and Engineering System can provide primary prevention by eliminating the possibility of a serious accident. The other Systems of Safety provide secondary prevention by reducing the probability or severity of an accident.
4. Each plant may have different structures and names for its Systems of Safety, but all plants have Systems of Safety.
5. Active worker, union and community involvement in Systems of Safety are essential for these systems to be effective.