Identifying Hazards through Procedures

Identifying Hazards through Procedures and Eliminating Them with Systems of Safety

Purpose

To help identify and fix workplace hazards at their source by naming the personal risks associated with them.

To practice using Systems of Safety to eliminate hazards identified in procedures.

This Activity has two tasks.

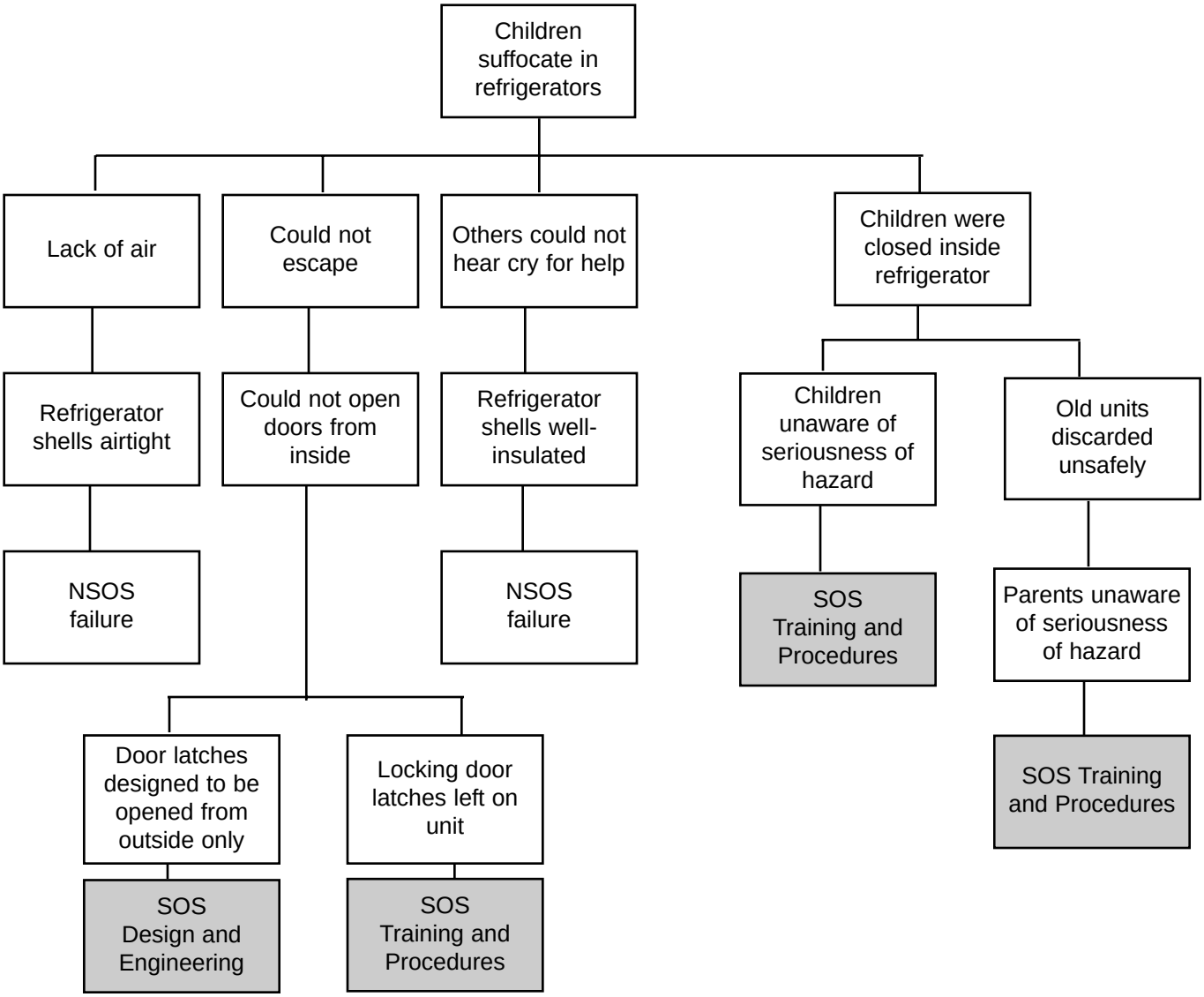
Task 1

Scenario

The introduction of affordable, electric refrigeration directly into the consumer's home was a big step in reducing food-related illness and death. But there was an unforeseen downside. As old units wore out and were replaced, they were often discarded carelessly or put into use as storage units. By the early 1950s, an alarming statistic came to public attention. Annually, dozens of children were being suffocated because they became trapped inside these old discarded refrigerators.

Double deaths were not uncommon because children naturally enjoy playing together, and old refrigerators provided an interesting place to play. But when the door on those old units slammed shut, they became a death trap. Air could not get in and the well-insulated shell prevented cries for help from being heard.

A first response by the industry and consumer groups was to issue warnings about the danger. Still the deaths continued to mount until finally Congress passed the Refrigerator Safety Act of 1956. This legislation required a redesign of the door latch so that it could be opened from the inside (the origin of the common magnetic latch used today). Also, discarded units with the old style latches were required to be rendered safe by having the doors or latches removed.



SOS = Systems of Safety
NSOS = No Systems of Safety

Task 1 *(continued)*

Using your experience and knowledge of Systems of Safety and Factsheets 1 through 10 on pages 5 through 15, discuss and answer the following questions. Please appoint a scribe from your table to record your answers and to report back to the class.

1. Two Systems of Safety (Training and Procedures and Design and Engineering) were identified in the scenario and by the Logic Tree on page 3. List reasons why redesigning the door latch was more effective in preventing child fatalities than training parents and children on the hazards of playing in these old refrigerators and posting rules (procedures?) that doors or latches on old units be removed.

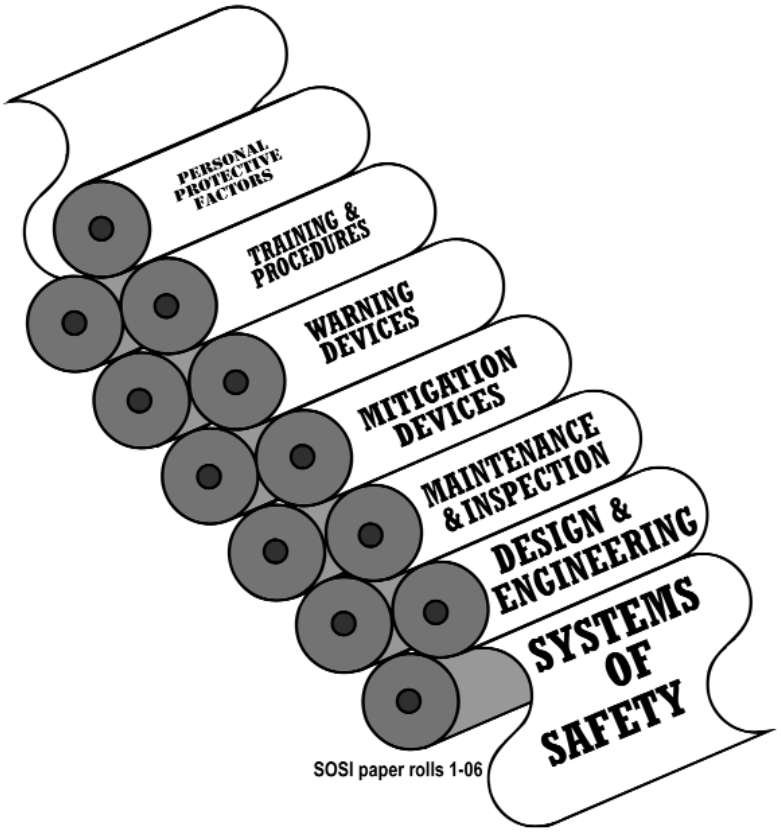
2. List reasons the Design and Engineering System is considered to be the primary System of Safety.

3. Think about your own job. Are there places where a hazard could be completely removed by redesign? Please explain.

1. What Are Systems of Safety and Why Should I Care?

Our work sites are made up of many systems: Purchasing, Maintenance, Sales, Security, Safety, etc. Systems of Safety focus on those systems important to running a plant site safely. USW has identified the six Major Systems of Safety as follows:

- Design and Engineering;
- Maintenance and Inspection;
- Mitigation Devices;
- Warning Devices;
- Training and Procedures; and
- Personal Protective Factors.



continued

1. What Are Systems of Safety and Why Should I Care? *(continued)*

When an incident occurs, the reason for that incident can be found in one or more of these systems. In other words, **the root cause of any incident at your plant or facility can be traced back to a flaw in one or more of these Systems of Safety.**

Why is that important? Because until you can identify and correct a SOS flaw, you have not addressed the hazard and the incident may be repeated later—perhaps with much more serious consequences.

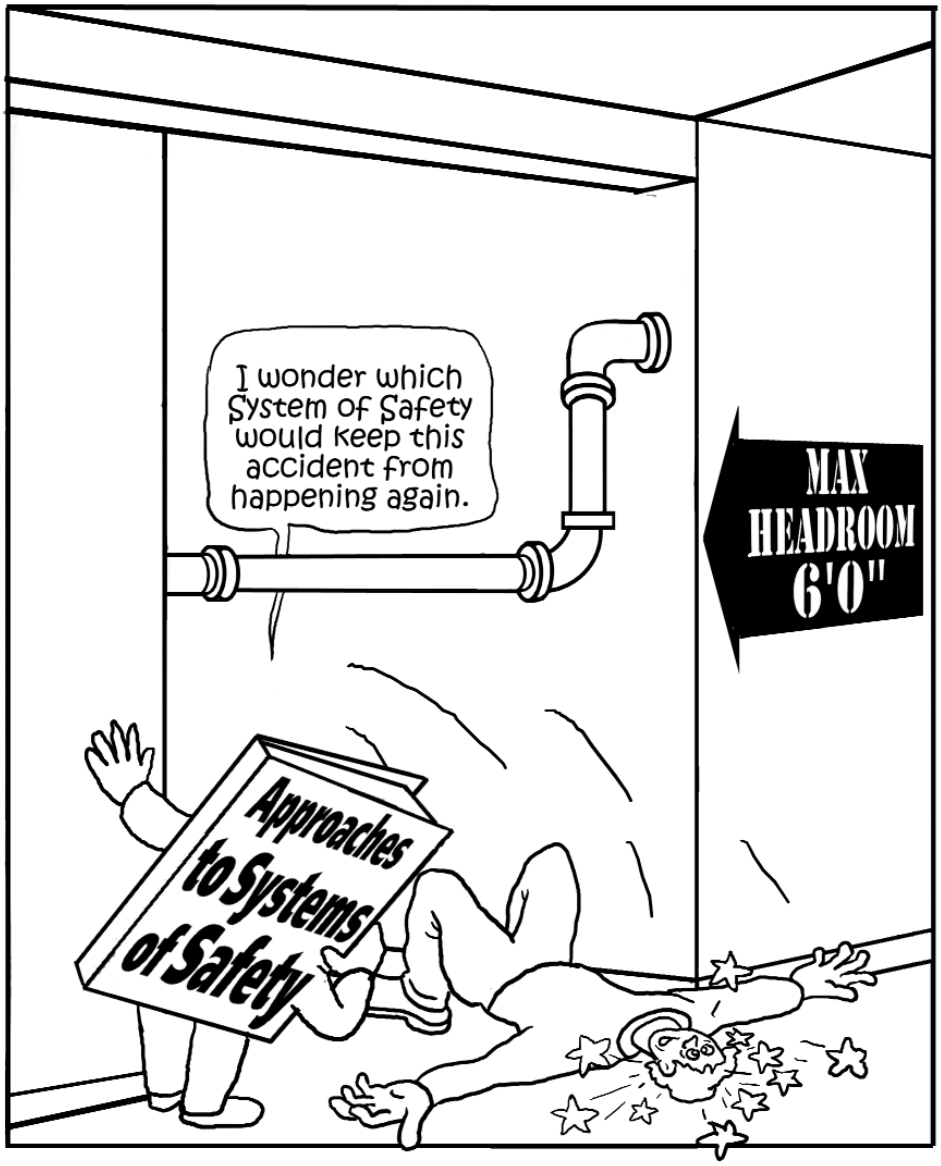
A Systems Thinker asks, **"What failed in our Systems of Safety to allow this to happen?"**

A Non-Systems Thinker asks, **"Who messed up?"**

Source: Adapted in part from Harold Roland and Brian Moriarty, *System Safety Engineering and Management*, New York: John Wiley and Sons, 1983, p. 202; and *Systems of Safety TOP Training Workbook.*

2. 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.)

3. 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

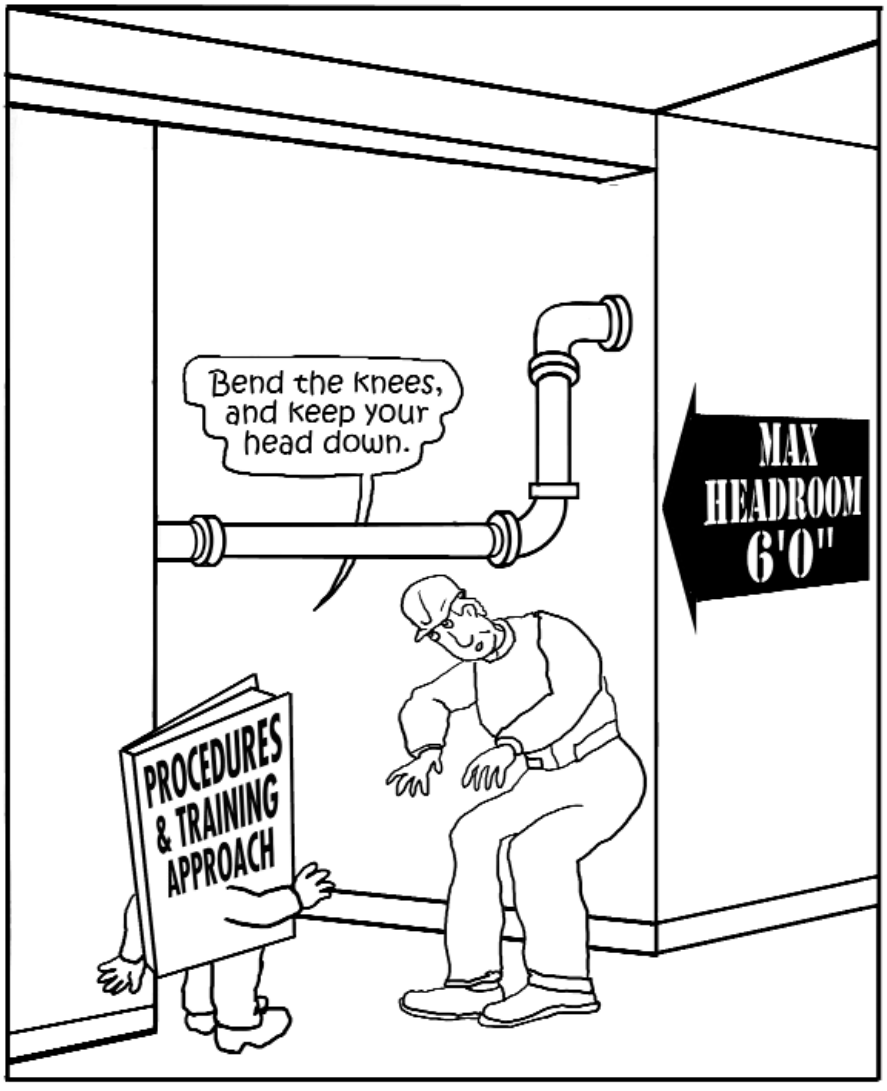
- Wear PPE as necessary and required when higher levels of protection are not feasible.

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.

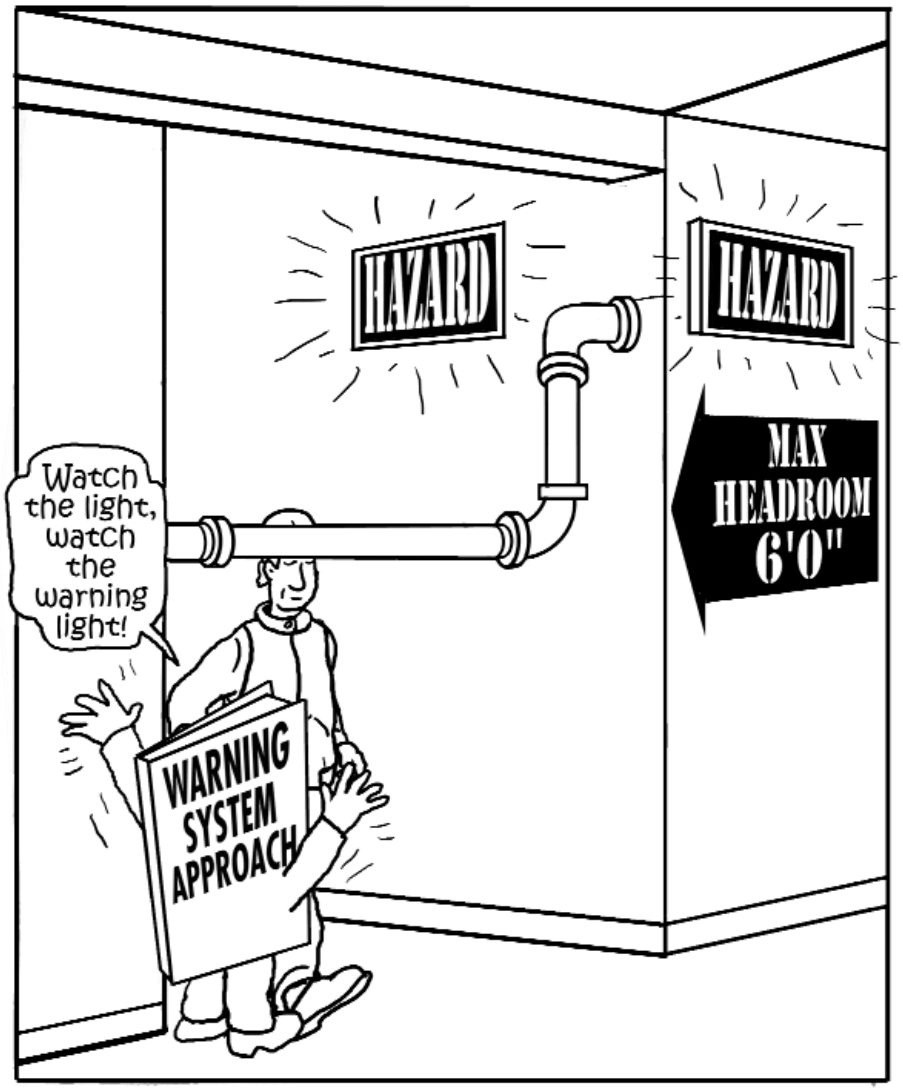
4. The Procedures and Training System

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.



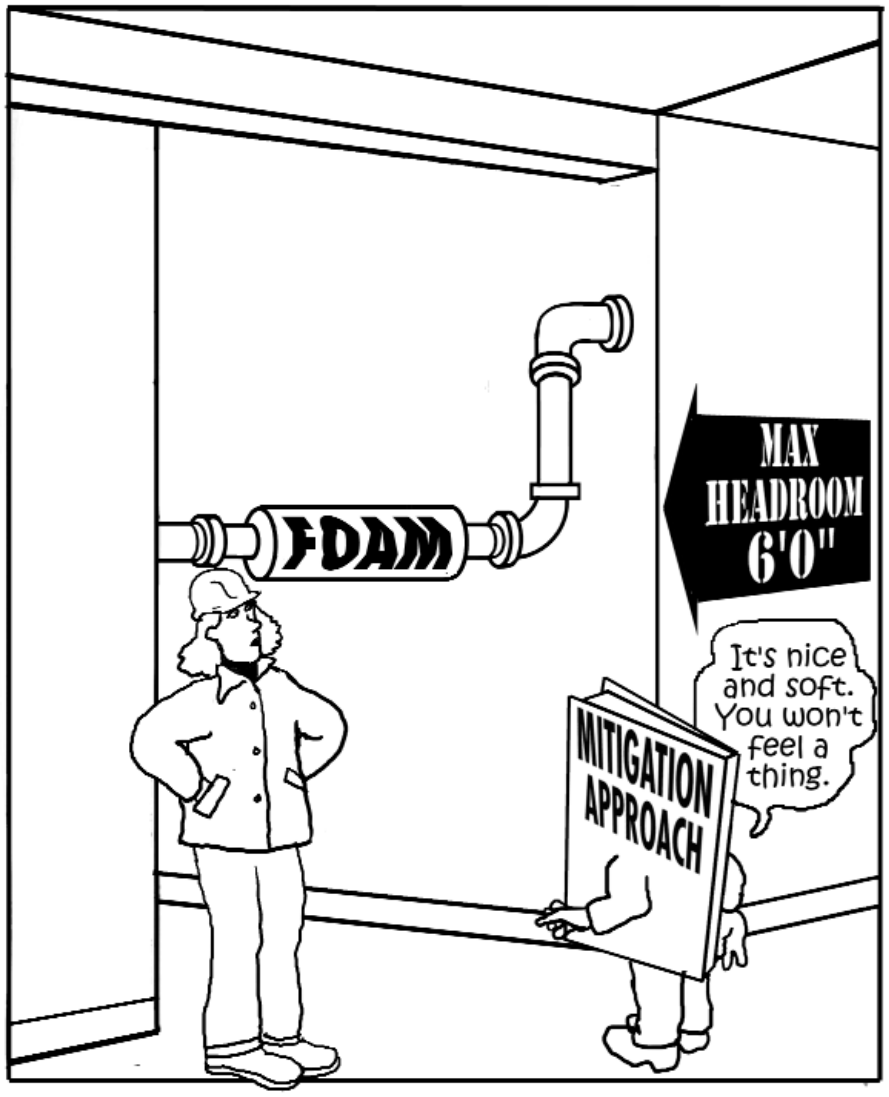
5. The Warning System

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.



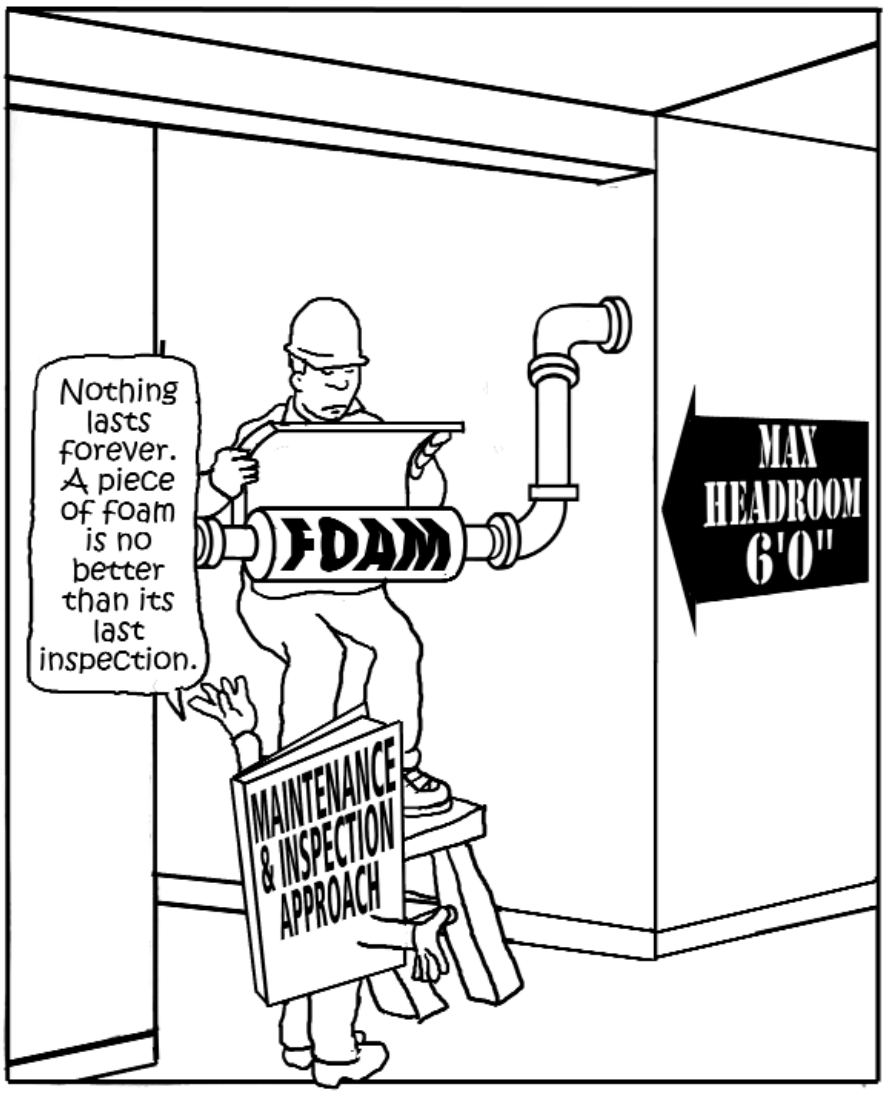
6. The Mitigation System

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.



7. 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.

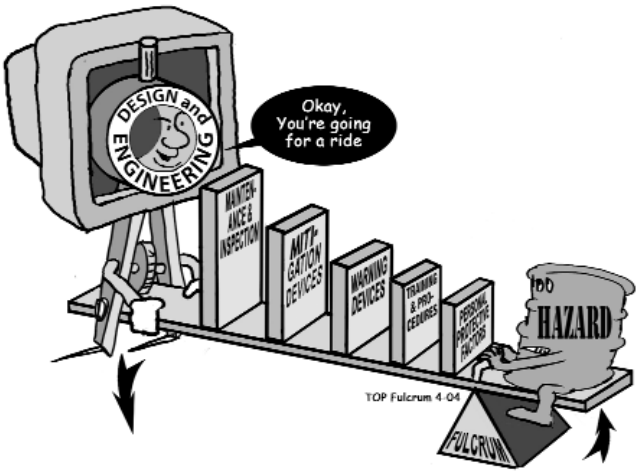


8. Design and Engineering System of Safety

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.

9. The Increasing Weight of Systems



Not equal in protection and not equal in prevention. Using our Systems Focus to uncover system flaws or root causes is only one part of controlling hazards. We also need to look at the systems involved to decide on the best way to deal with the problem. The most effective way to control a hazard is close to its source. The least effective is usually at the level of the person being exposed. The system of safety in which the flaw is identified, is not necessarily the system in which you would attempt to correct the flaw.

Think of it this way: **Scenario**: Assume your safety committee has just performed a systems analysis on an incident in which a security guard was sprayed with hot oil from an overhead line while performing his rounds. Your investigation revealed that the line was flanged right above the walkway and that the guard wore no Personal Protective Equipment (PPE), other than a hard hat and glasses. We can require Security to wear rain suits (PPE) while on rounds and they should be pretty well protected from this happening again; assuming they are wearing the suit correctly, it's in good condition and they can get out from under the hot oil spray immediately. But what about others in the area: pumpers, operators, mechanics, etc.?

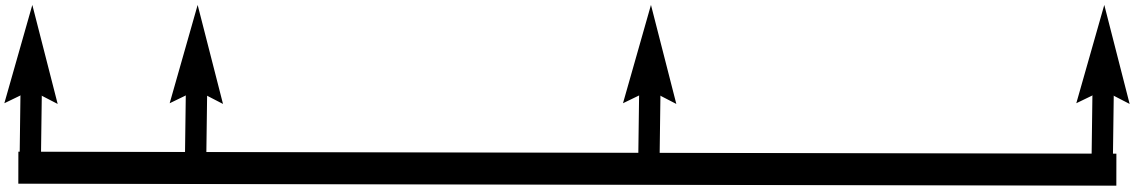
Each person who walks through that same walkway must also be put in a rain suit to be protected. If we install flange guards and a drain system **(Mitigation),** we have a much better chance of preventing the event from happening again. And if we change the design of the piping **(Design)**, we might be able to eliminate the hazard entirely.

10. Levels of Prevention within Systems of Safety

USW's Systems of Safety (SOS) Chart divides the six major systems of safety into three Levels of Prevention:

1. **Highest Level System—the first line of defense**
   - Design and Engineering
2. **Middle Level Systems—the second line of defense**
   - Maintenance and Inspection;
   - Mitigation Devices;
   - Warning Devices; and
   - Training and Procedures.
3. **Lowest Level System—the last line of defense**
   - Personal Protective Factors

Major Safety Systems	Design & Engineering	Maintenance & Inspection	Mitigation Devices	Warning Devices	Training & 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**
Goal	***To eliminate hazards***	***To further minimize and control hazards.***				***To protect when higher level systems fail***



Task 2

There are all kinds of risks at the workplace. By risk we mean some sort of condition or threat to our individual safety; something that we have to take an individual action to guard against.

Risks are not new to us. We deal with risks in all aspects of our lives. For example, when we move into a new home or apartment, it is not perfect. There are risks involved. Some of the risks are there because of bad or non-existing maintenance or just the way something is designed. For example there may be a tripping hazard out front due to a damaged sidewalk, or a poorly-designed, steep stairway up to the attic with no hand rails. Some of these things we fix and some we just learn to deal with.

But the workplace is not our home. The risks associated with the workplace are much greater.

For example, is there a risk of my loose sleeve being caught in a machine or of acid spraying out of a leaky valve? Risks are like traps just waiting to be sprung. They are very individual and personal.

Where do risks come from? They are a result of workplace hazards, hazards which are caused by failures or flaws in management Systems of Safety.

Therefore, as a starting point, we can say that a risk results from failures in management Systems of Safety.

Now there are some risks we have to accept. Not all risk is avoidable. We all know this but we are concerned with the level of risk and also what actions we need to take to avoid those risks. The real danger is that we just accept risk as part of doing business.

What we want to do in this exercise is to create a questioning attitude. What risks have we accepted? Do we have to accept them? Can we find ways through improved design, maintenance or through better protections built into the systems (mitigation devices) to deal with these risks so that their threat is reduced or eliminated?

The first step in this process is to identify these personal risks in the workplace. One way to do this is to look at the warnings or cautions that are written into our workplace procedures or that we have learned through on-the-job training. These cautions or warnings can be identified in the following three ways:

- **First** and easiest is when the words "caution, "alert" or "be careful" are used with a step in the procedure.
- **Second** is when the worker is asked to use Personal Protective Equipment. This often indicates there is a hazard that should be eliminated or reduced.
- **Third** is when there is a step in the procedure in which the worker clearly identifies a danger in the step the worker is asked to perform.

continued

Task 2 *(continued)*

Your facilitator will now review with you the procedure for transferring acid which begins below. Note the diagram on page 19 which may help you to better understand this procedure.

Transfer of Acid Solution from "Tank C" (Storage and Supply Tank) to "Tank A" (Acid Distribution Tank)

Introduction

This procedure will be used when acid solution is transferred from the Storage/Supply Tank C to Acid Solution Distribution Tank A. This area is an around-the-clock operation and requires communication between the shifts.

Safety/Environmental

MSDS
Acid Handling H&S
Operating Manual

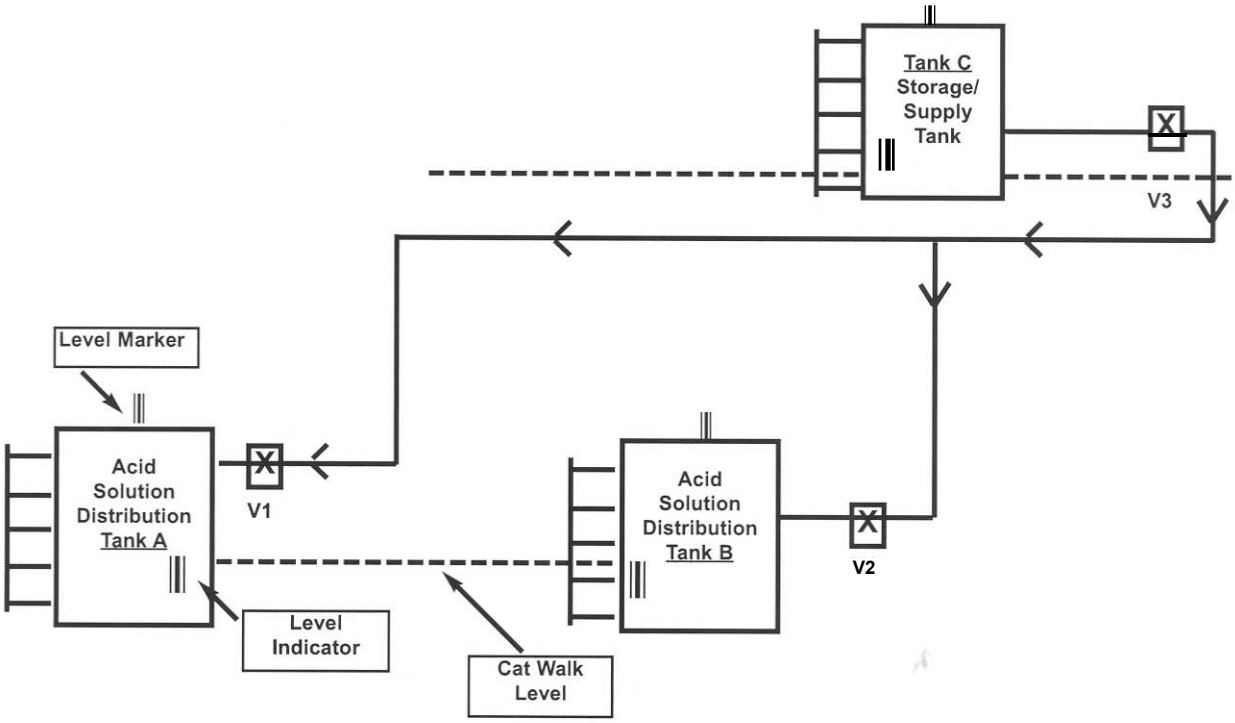
(The caution below will be used as an example in Task 2.)

All required PPE should be worn. The supply, make-up and distribution piping is beginning to age and contains sulfuric acid; therefore, be on the lookout for leaks.

Communications

Emergency Numbers	6-4444
UCC	6-6272
Environmental	6-7212
CFH	6-6238
PSA	6-6675

Caution: Make sure area is clear of unnecessary personnel before beginning the transfer.



Detailed Procedure

_____ Step 1. Read shift turnover log to obtain position of valves and tank levels. This information is not always current as operators are many times on jobs in other parts of the facility at shift change.

_____ Step 2. Verify that the Storage/Supply Tank C has a sufficient level to supply the amount of acid that the work order calls for.
(Caution: As the level indicator at catwalk level is unreliable when acid has solid particles, this requires climbing the ladder to top of tank and reading the level marker. In wet or humid conditions the ladder is quite slick; be sure of your footing.)

continued

Task 2 *(continued)*

_____ Step 3. Verify that the valve V-2 to Tank B is in the closed position. It is important that operator sign the checklist to verify this valve is closed.
(Caution: This valve controls the flow to Tank B and shares a common manifold with Tank C. Tank B could be full and would overflow if added to.)

_____ Step 4. Verify that the level in Tank A is such that the tank can accommodate the amount of acid to be transferred.
(Caution: As the level indicator at catwalk level is unreliable when acid has solid particles, this requires climbing the ladder to top of tank and reading the level marker. In wet or humid conditions the ladder is quite slick; be sure of your footing.)

_____ Step 5. Open Valve V-3 located at catwalk level of Supply Tank C. Wear PPE (gloves, apron and face shield) when opening. When valve opens there have been reports of small amount of acid spraying from packing of valve.

_____ Step 6. Open Valve V-1 located at catwalk level of Distribution Tank A and allow proper amount of acid to flow from Tank C to Tank A.
(Caution: Do not attempt to open valve V-1 from catwalk level. This would require leaning over handrail to get proper leverage. Climb down the fixed steel ladder to the pit area directly below the valve to operate the pull chain.)

_____ Step 7. Close Valve V-1 at Distribution Tank A.

_____ Step 8. Close Valve V-3 at Storage/Supply Tank C.

(Example answers, in italics, are given for the caution contained on page 18 (reprinted below) which will not be assigned to any table. Your facilitator will explain example answers as questions are read).

> All required PPE should be worn. The supply, make-up and distribution piping is beginning to age and contains sulfuric acid; therefore, be on lookout for leaks. **(Caution from page 18.)**

1. What is the Caution to the worker that the example caution identifies? ***(Be on the lookout for leaks.)***

2. A. What is the *Risk* to the worker (what could happen to the worker)? ***(Being burned with sulfuric acid.)***

B. What *Action* is the procedure asking the worker to take in order to avoid the risk? ***(Wear PPE.)***

C. Write your identified *Risk and Action* in the space provided on the *Risk/Action* Post-it Note provided on your table. ***(See page 23.)***

D. Again review the System of Safety Factsheets beginning on page 5 and determine in which System of Safety the procedure is asking you to take action. ***(Personal Protective Factors)***

E. Name the hazard that is causing the risk ***(Old Leaky Pipes)*****; then write the hazard in the space provided on the "Hazard" Post-it Note on your table.** ***(See page 23.)***

F. Again, review the Systems of Safety Factsheets beginning on page 5 and determine in which System of Safety the "Hazard" resides. ***(Maintenance and Inspection) (See page 23.)***

Next, we need to determine in what SOS we can fix the hazard so we get the highest level of prevention possible. In other words, how can we best eliminate the "hazard" to limit our risk of being injured?

continued

Task 2 *(continued)*

3. How would you fix the hazard that you have identified?
(Design and Install new piping in locations safer for workers.)

A. Write your fix in the space provided on the *"Fix"* Post-it Note on your table. ***(See page 23.)***

B. In which SOS does the fix reside? *(Design and Engineering)*
(See page 23.)

C. Does it eliminate the need to take the "Action" you identified?
(Yes; see page 24.)

D. Does the fix that you chose eliminate the "Hazard" that you identified? ***(Yes; see page 24.)***

During the report-back:

1. Your trainer will ask your Table Scribe to bring your Risk/Action Post-it Note, the Hazard Post-it Note and the "Fix" Post-it Note up to the front of the room and place them in their appropriate Square. (See example on page 23.)
2. While still at the wall, your trainer will ask if the fix that you identified eliminates either the "Hazard" and/or the "Risk/Action." If this is the case, your scribe will ask you to draw a line through those Post-it's and place them under the SOS Fix Post-it Note in the box on the wall. (See example on page 24.)

Trainer Note: Turn to page 25 to begin Task.

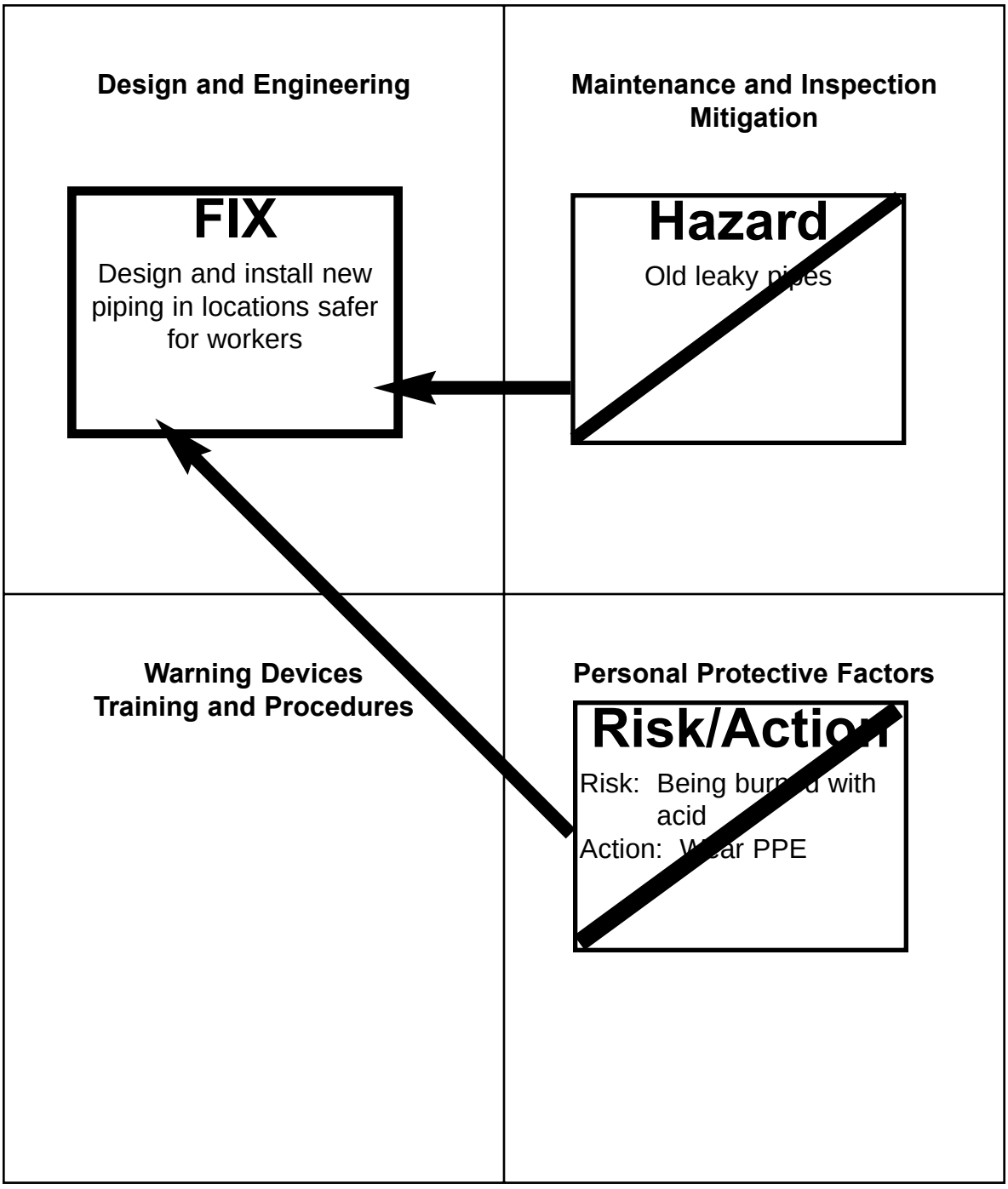
Report Back 1

Design and Engineering **FIX** Design and install new piping in locations safer for workers	**Maintenance and Inspection Mitigation** **Hazard** Old leaky pipes
Warning Devices Training and Procedures	**Personal Protective Factors** **Risk/Action** Risk: Being burned with acid Action: Wear PPE

continued

Task 2 *(continued)*

Report Back 2



There are eight identified steps in the procedure on pages 19 and 20. Your facilitator will assign your table one or more of the steps to use in answering the questions below. You may refer to the example we just completed as a guide.

1. What is the *Caution* to the worker in the step your group was assigned? _____

_____

2. A. What is the *Risk* to the worker (what could happen to the worker)? _____

B. What *Action* is the procedure asking the worker to take in order to avoid the risk? _____

_____

C. Write your identified *Risk and Action* in the space provided on the *Risk/Action* Post-it Note provided on your table.

D. Again, review the Systems of Safety Factsheets beginning on page 5 and determine in which System of Safety the procedure is asking you to take action. _____

E. Name the hazard that is causing the risk. _____

_____

F. Write the hazard in the space provided on the "Hazard" Post-it Note on your table.

G. Again, review the Systems of Safety Factsheets beginning on page 5. In which System of Safety does the "Hazard" reside?

_____

Next, we need to determine in what SOS we can fix the hazard so we get the highest level of prevention possible. In other words, how can we best eliminate the "hazard" to limit our risk of being injured?

continued

Task 2 *(continued)*

3. How would you fix the hazard that you have identified?

A. Write your fix in the space provided on the "Fix" Post-it Note on your table.

B. In which SOS does the fix reside? _____

C. Does the fix that you chose eliminate the "Hazard" that you identified?_____

D. Does it eliminate the need to take the "Action" you identified? _____

During the report-back:

1. Your trainer will ask your Table Scribe to bring your Risk/Action Post-it Note, the Hazard Post-it Note and the "Fix" Post-it Note up to the front of the room and place them in their appropriate Square.

2. While still at the wall your trainer will ask if the fix that you chose eliminates either the "Hazard" and/or the "Risk/Action." If this is the case your scribe will ask you to draw a line through those Post-it's and place them under the SOS Fix Post-it Note in the box on the wall.

Summary: Identifying Hazards through Procedures and Eliminating Them with Systems of Safety

1 Proactive Systems of Safety are the key to eliminating hazards and preventing 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. A risk is a condition or threat that we have to take an individual action to guard against.

5. Risks are all around us in our personal and work lives. Some risk is unavoidable, but it is the level of risk we accept that is controllable.

6. Workplace risks are the result of hazards that are failed systems of safety.

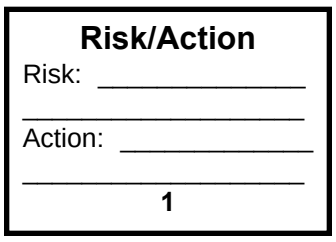
7. By fixing the failed systems which cause safety hazards, workplace risks can be eliminated or controlled.

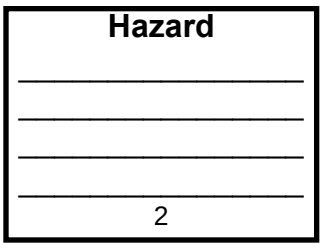
Supplemental Information:

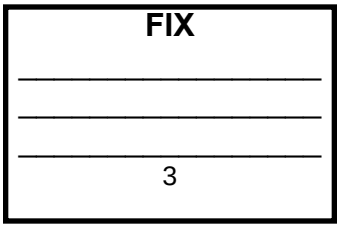
Trainer Note: Read all of Task 2, including the procedure, all steps of the example and do example Post-it Notes on the wall.

Example of how Trainer should prepare Post-it Notes for the tables:

- Use separate color for each table.
- Three Post-it Notes (all the same color) for each table.
- Use Post-it Notes 1, 2 and 3 with Task 2.
- You should put them on tables before Task 2 begins.







Example of how Trainer should prepare wall station for report-back:

- Prepare wall station with four full sheets of flipchart paper. (See example below. All tables will use the same wall station.)

Design and Engineering	**Maintenance and Inspection Mitigation**
Warning Devices Training and Procedures	**Personal Protective Factors**

Evaluation

Identifying Hazards through Procedures and Eliminating Them with Systems of Safety

1. How important is this Activity for the workers at your facility? Please circle one number.

Activity Is Not Important				Activity Is Very Important
1	2	3	4	5

2. What would you suggest to improve this Activity: