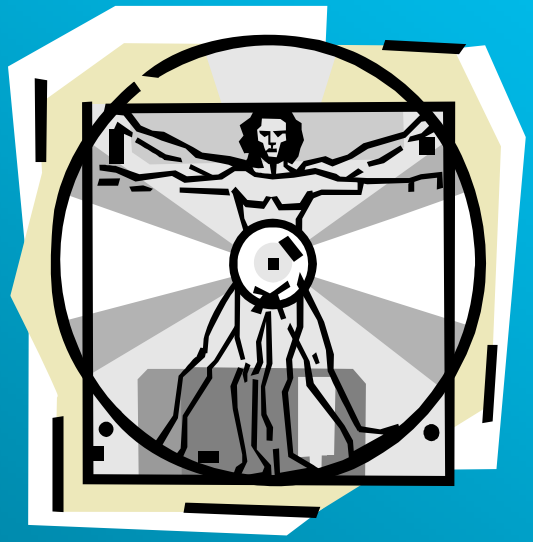
Human Factors Training

Cal/OSHA Human Factors Training Objective

1. Introduction to Human Factors
2. Finding Solutions
3. Applying Human Factors
4. Golden Eagle's Program

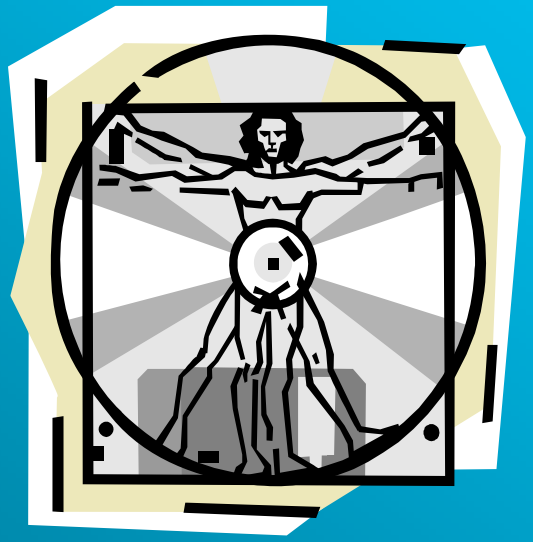
Human Factors Training - Lesson 1

1. Introduction to Human Factors



What is Human Factors?

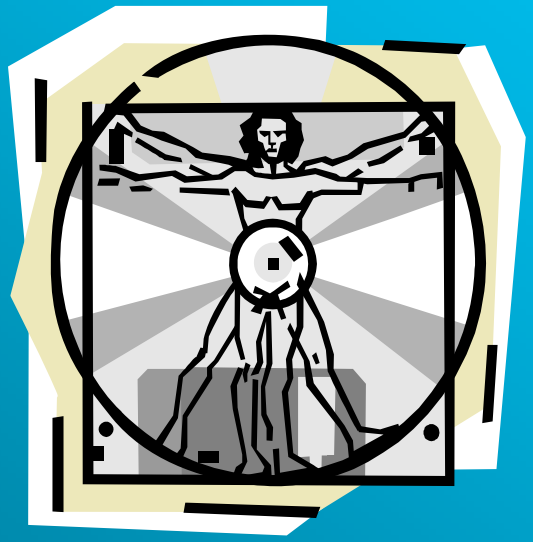
Human Factors is the science of matching the workplace to the worker.



Human Factors Method What does it do?

- ✓ Studies Accidents
  - -To find causes

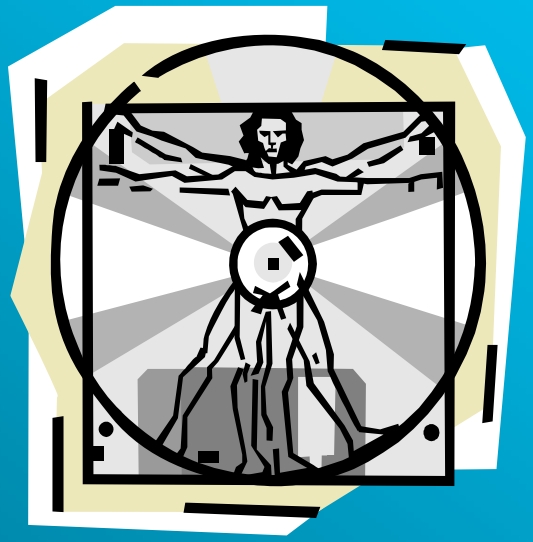
(Incident Investigation Program)



Human Factors Method What does it do?

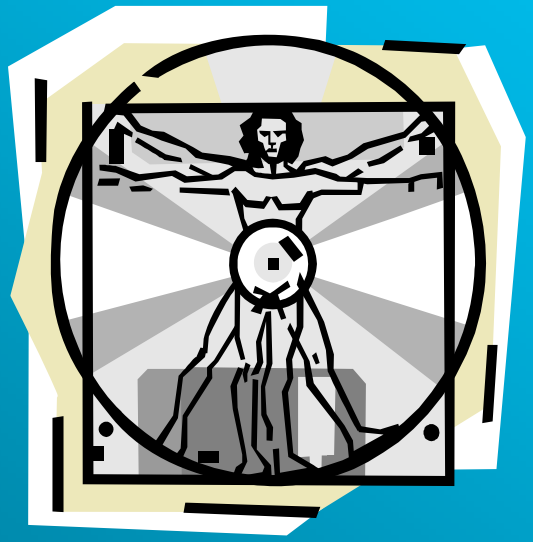
- ✓Studies the Workplace
  - -To find hazardous conditions

(Latent Condition Checklists)



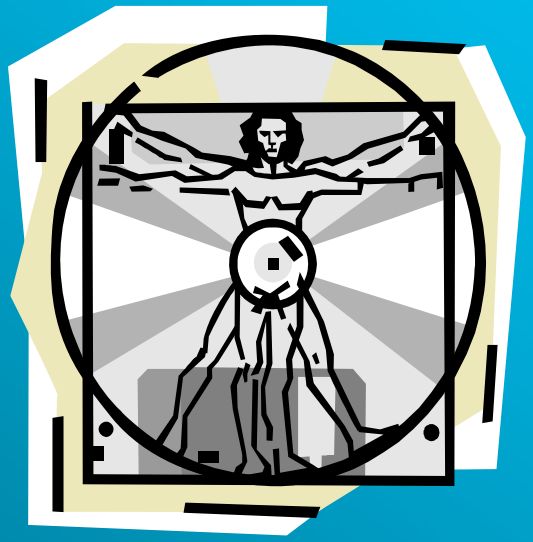
Human Factors Method Why is it used?

- ✓ To remove hazards
- ✓ To improve safety
- ✓ To prevent accidents



Human Factors Method How does it work?

Matches equipment and work processes to human limits, capabilities, and needs.



Human Factors Method

In other words…

Human Factors makes a PSM Facility user friendly.

What do these accidents have in common?

Bhopal Plant
India - 1984

Chernobyl Reactor
Ukraine - 1986

Three Mile Island
Pennsylvania - 1979

Initial investigations listed worker errors as prime cause.

Three Mile Island Accident Investigation

A federal commission found:

"The major cause of the accident was due to inappropriate actions by those who were operating the plant"

In The News

San Francisco Chronicle

Unocal Says Error Caused Blaze

Plant investigates whether employees were overworked

By Erin Hallissy
Chronicle East Bay Bureau

The 3½-hour fire at Unocal's Rodeo refinery last week erupted

retrofitting or repairing hazardous material facilities.

The proposed ordinance was opposed by industry officials and business organizations who said it

San Francisco Examiner

PG&E punishing workers for Dec. 8 blackout

The New York Times

Disaster in Bhopal: Where Does Blame Lie?

By ROBERT REINHOLD
Special to The New York Times

BHOPAL, India, Jan. 24 — A few weeks before the gas leak at the Union

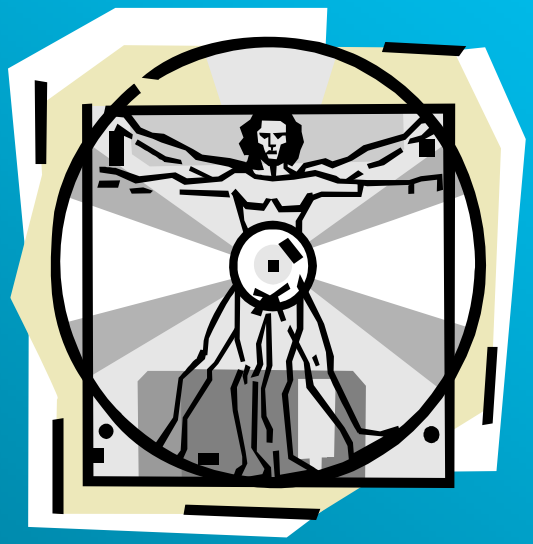
tral Indian city in the early hours of Dec. 3, leaving more than 2,000 dead and 200,000 others injured.

The aftermath has brought much

cuse the state pollution board — as well as many other agencies of the state and central Government responsible for monitoring industry — for not having

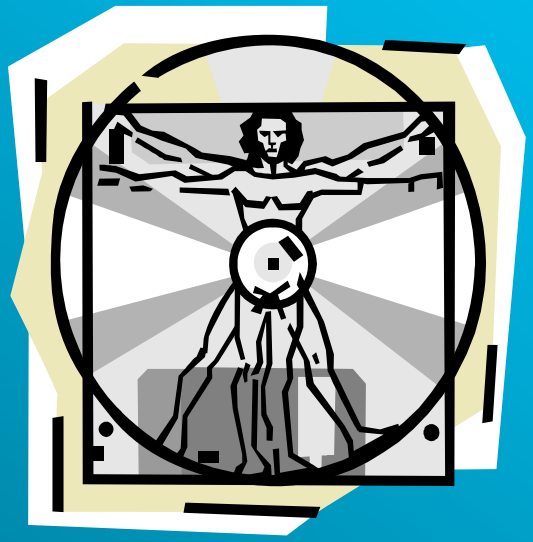
Looking Deeper
-Underlying Causes-

- ✓ Graveyard Shift
- ✓ Worker Training
- ✓ Lack of Maintenance



Who Might Make an Error?

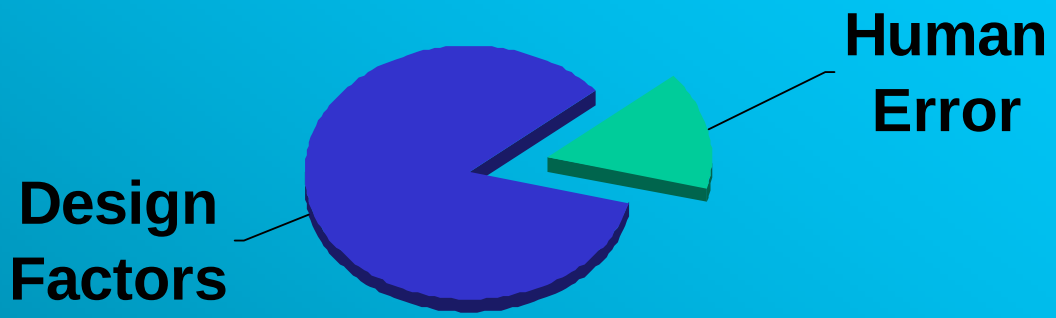
- ✓ Anyone in the entire system can make a human error - not just the frontline worker.
- ✓ Who else could make an error?



Human Error Happens at All Levels

- ✓ Process Development
- ✓ Engineering, Design, or Construction
- ✓ Operations or Training
- ✓ Maintenance or Inspection
- ✓ Corporate or Plant Management

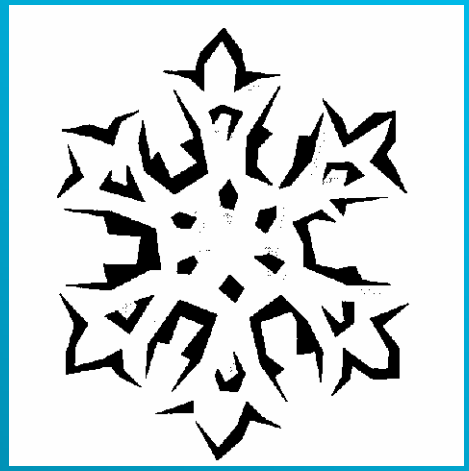
Labor and Management Agree



- ✓80 - 85% of human errors result from the design of the task, equipment, or environment.
- ✓Management can control these factors.

Labor and Management Agree

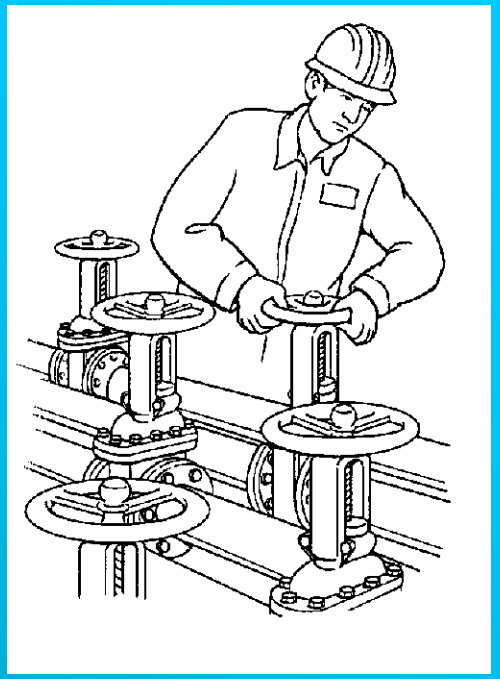
"Blaming the workers for safety failures is like blaming a snowflake for the avalanche."

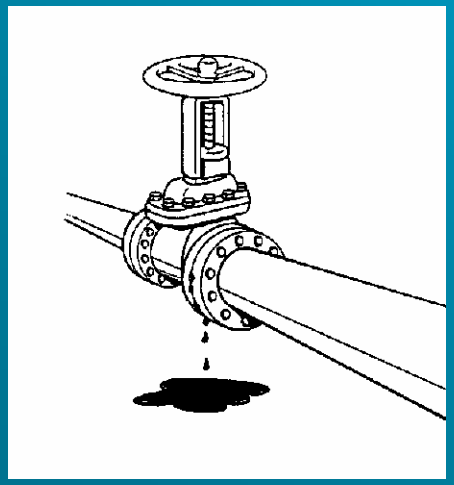


Direct Causes

Active Human Errors

- ✓ Opened wrong valve
- ✓ Pushed wrong button
- ✓ Failed to follow procedure



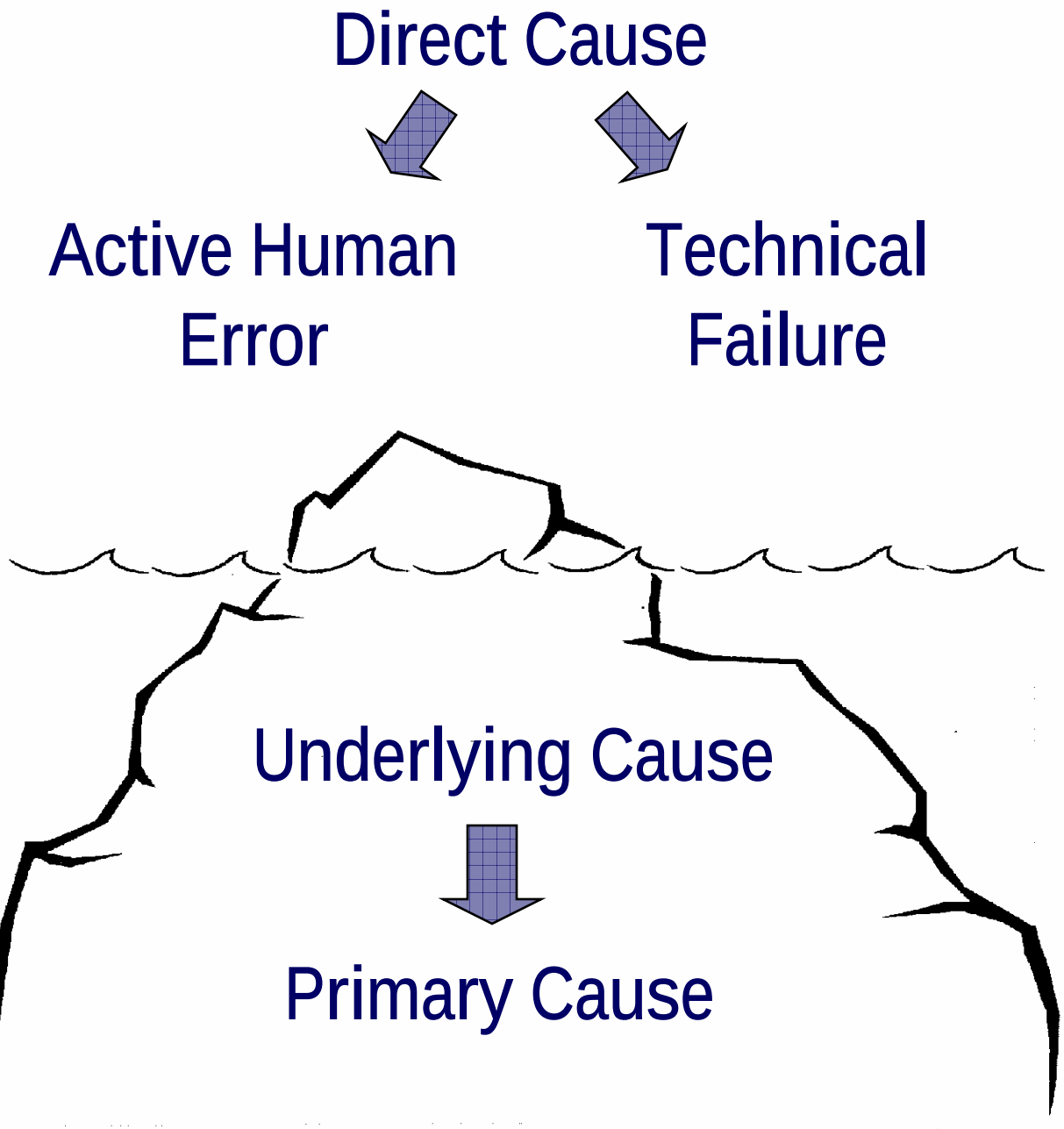


Technical Failures

- ✓ Pipe ruptured
- ✓ Seal failed
- ✓ Automatic valve failed to open or close

Human Factors Terms

Incident Investigation



Human Factors Terms

Underlying Causes

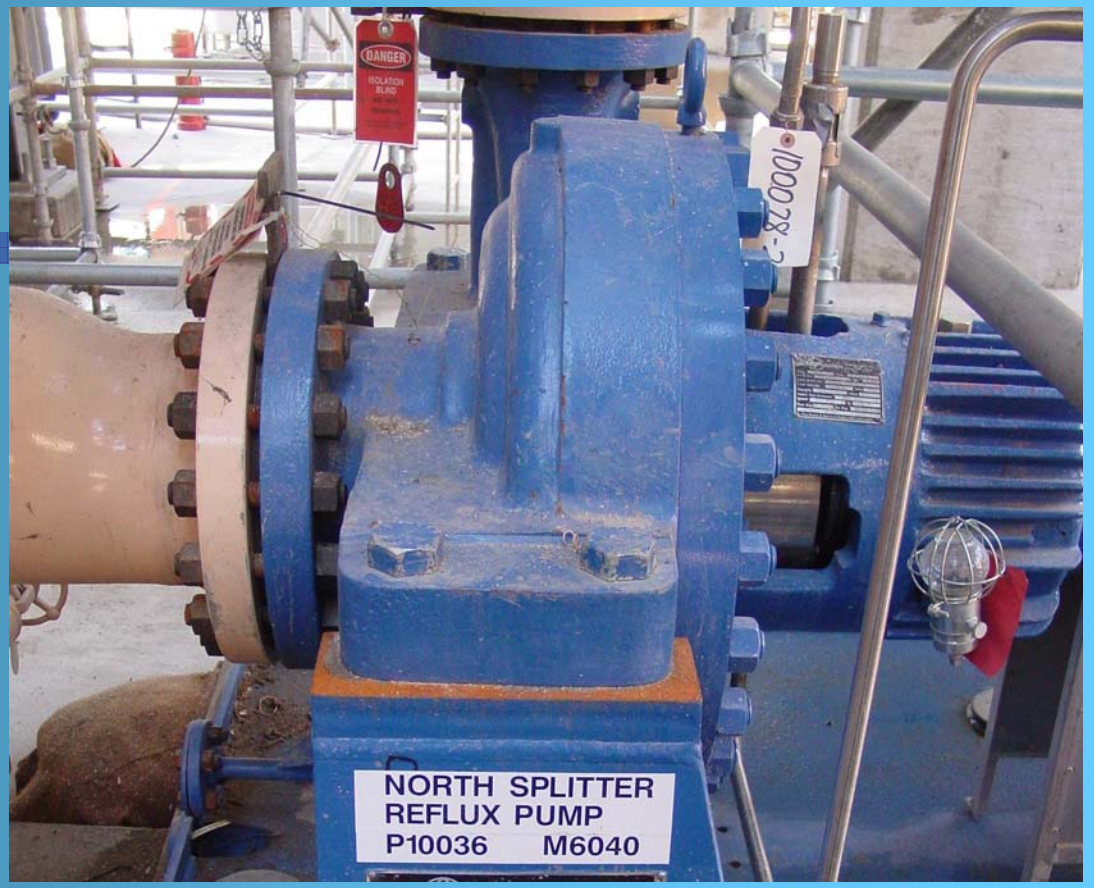
Poor Design
Unclear Labels
Control Layout
Equipment Access
Improper Placement
Lack of Maintenance
Inadequate Training
Fatigue
Inadequate Staffing

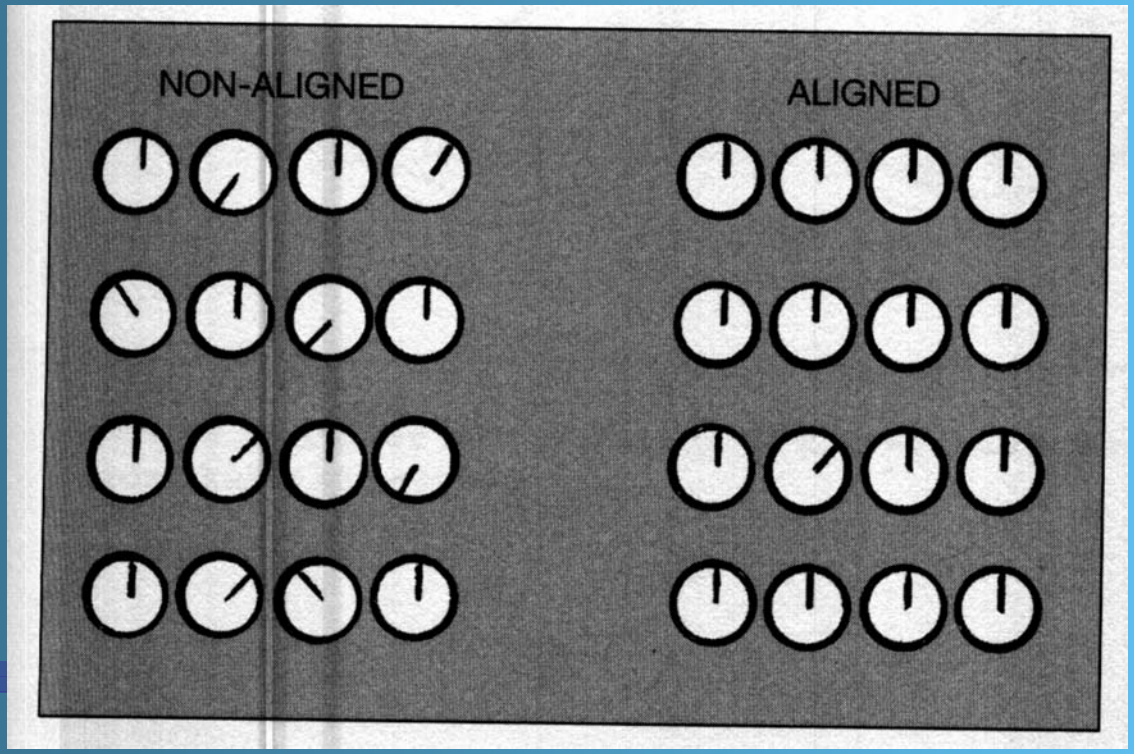
What would you do at this stoplight?

You are assigned to turn a valve on pipe A001.

How do you do it?

Labeling is important

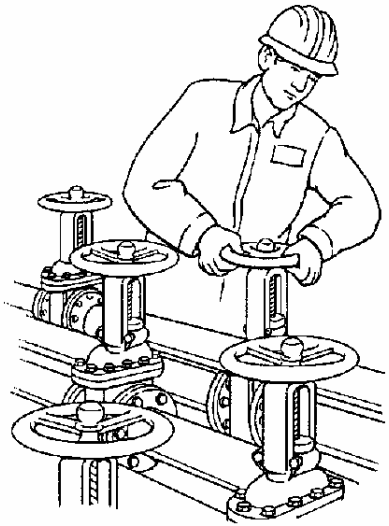




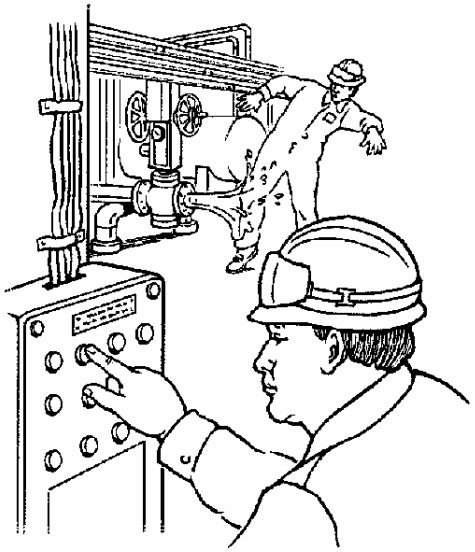
Human Factors in process controls.

- ✓Which set of controls is easier to read?
- ✓Which set will alert you to a problem in the unit?

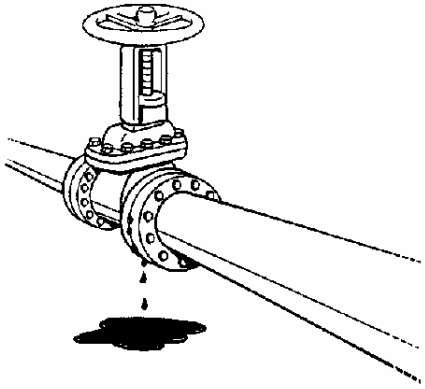
Looking For Causes



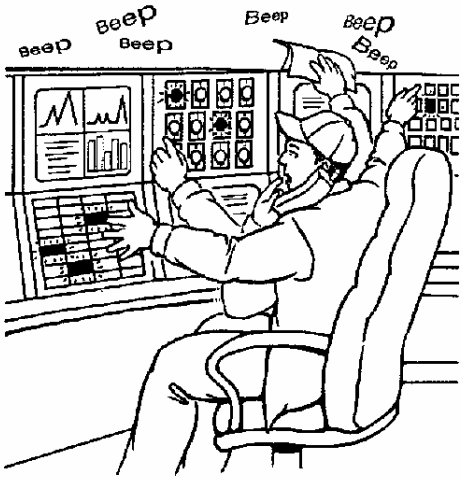
Someone opened the wrong valve



Someone pushed the wrong button



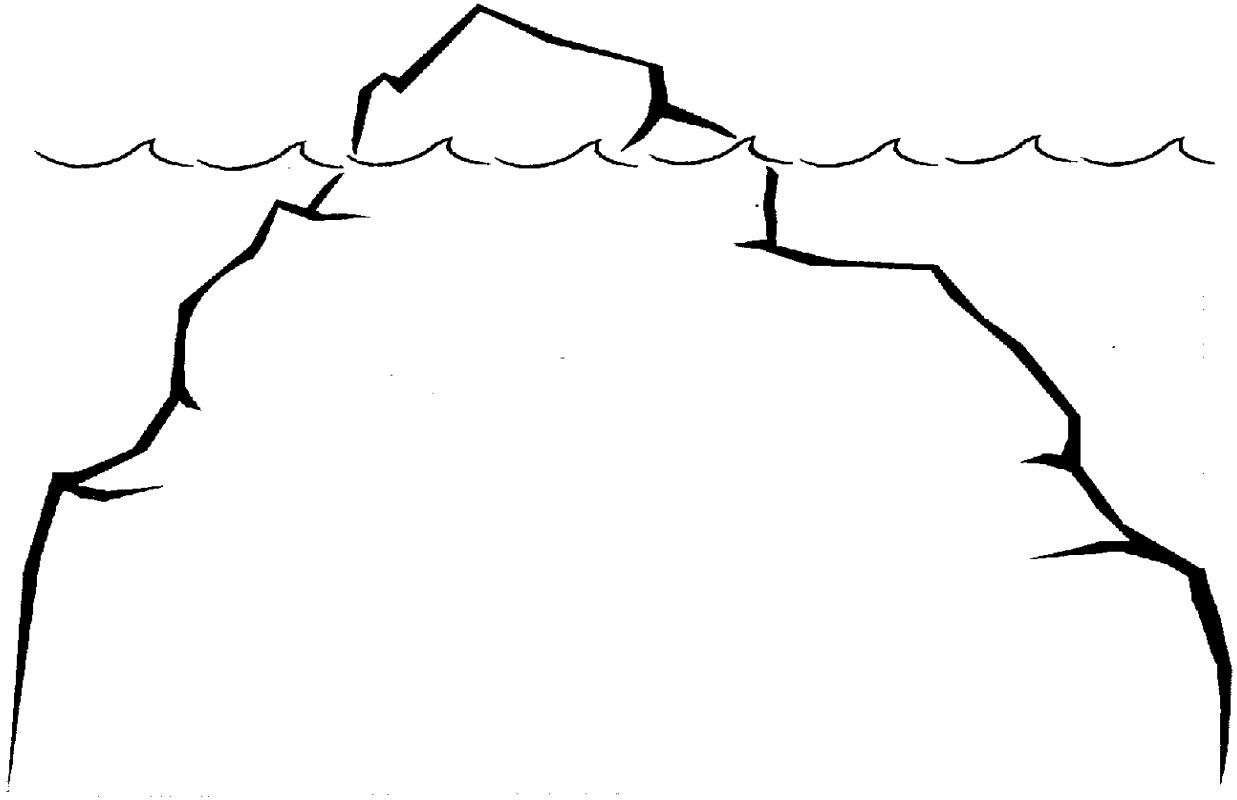
A pipe leaked



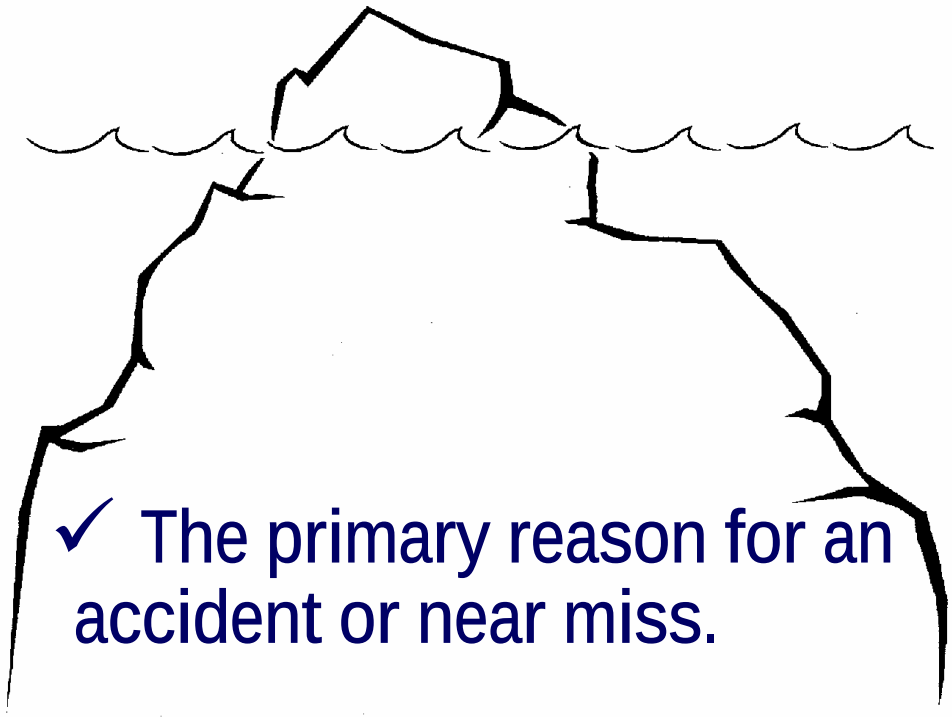
Someone didn't respond properly to an alarm

Active Human Errors

- ✓ Often cited as direct cause.
- ✓ Usually made by frontline operators or maintenance.
- ✓ Surface level causes - do not explain how or why.



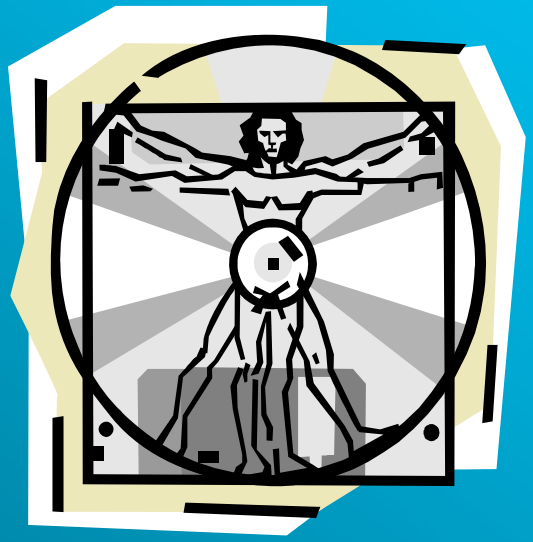
Underlying and Primary Causes



- ✓ The primary reason for an accident or near miss.
- ✓Hidden problem that plays a role repeatedly.
- ✓Condition that makes a job harder and errors more likely.

Human Factors Training - Lesson 2

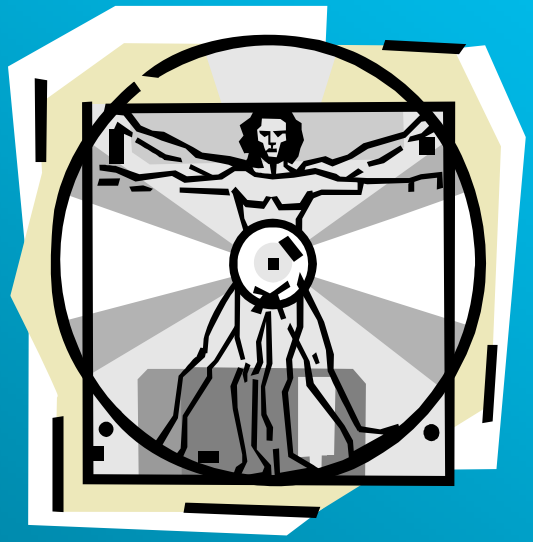
2. Finding Solutions



Human Factors Methods

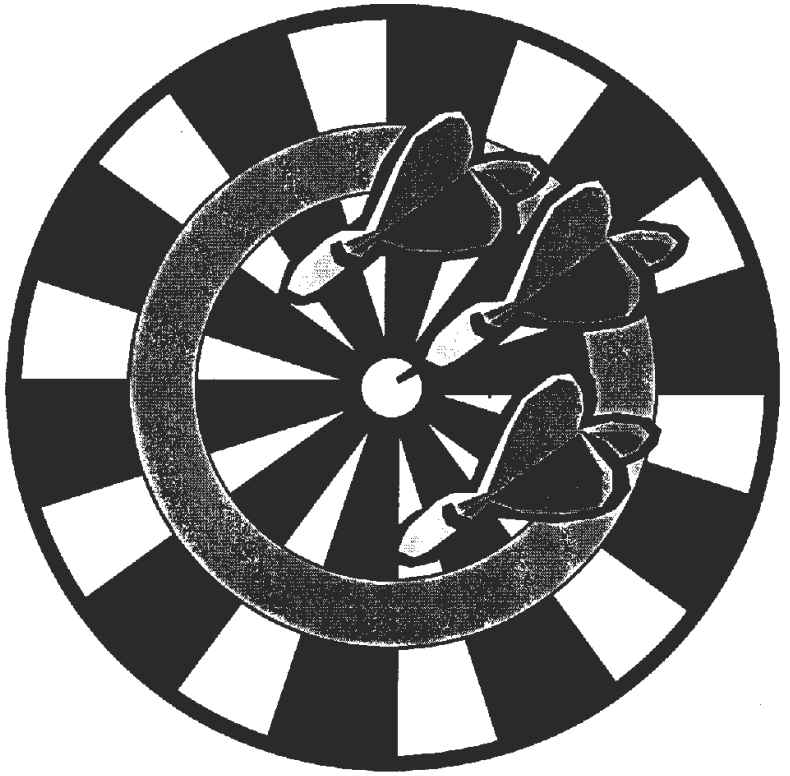
"Control the hazard, not the worker"

- ✓ Allow for differences among workers
- ✓ Remove opportunities for error
- ✓ Reduce impact of errors that occur
- ✓ Design "fail-safe" systems
- ✓ Match the job to the worker

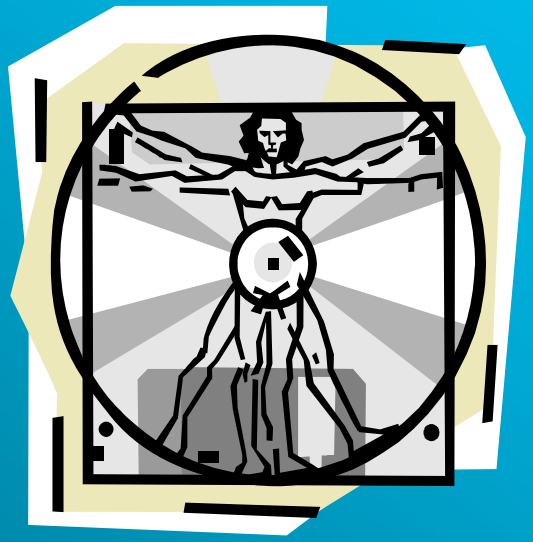


Human Factors Methods

“The Dart Game”



Allow for worker differences.

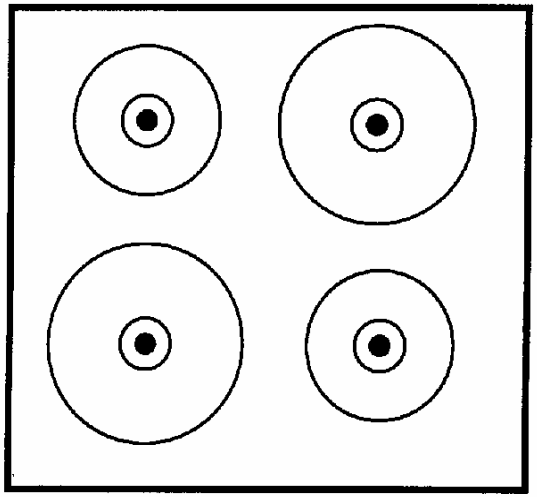


Human Factors Methods

One Solution

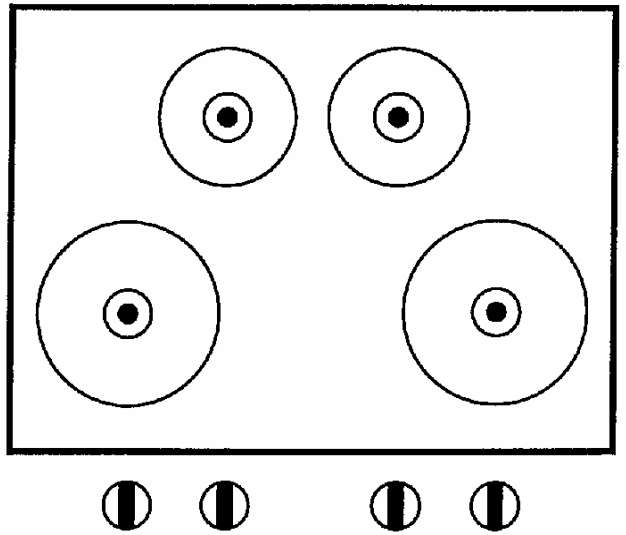
Reduce the opportunity for error.

Which stove has clearer controls?



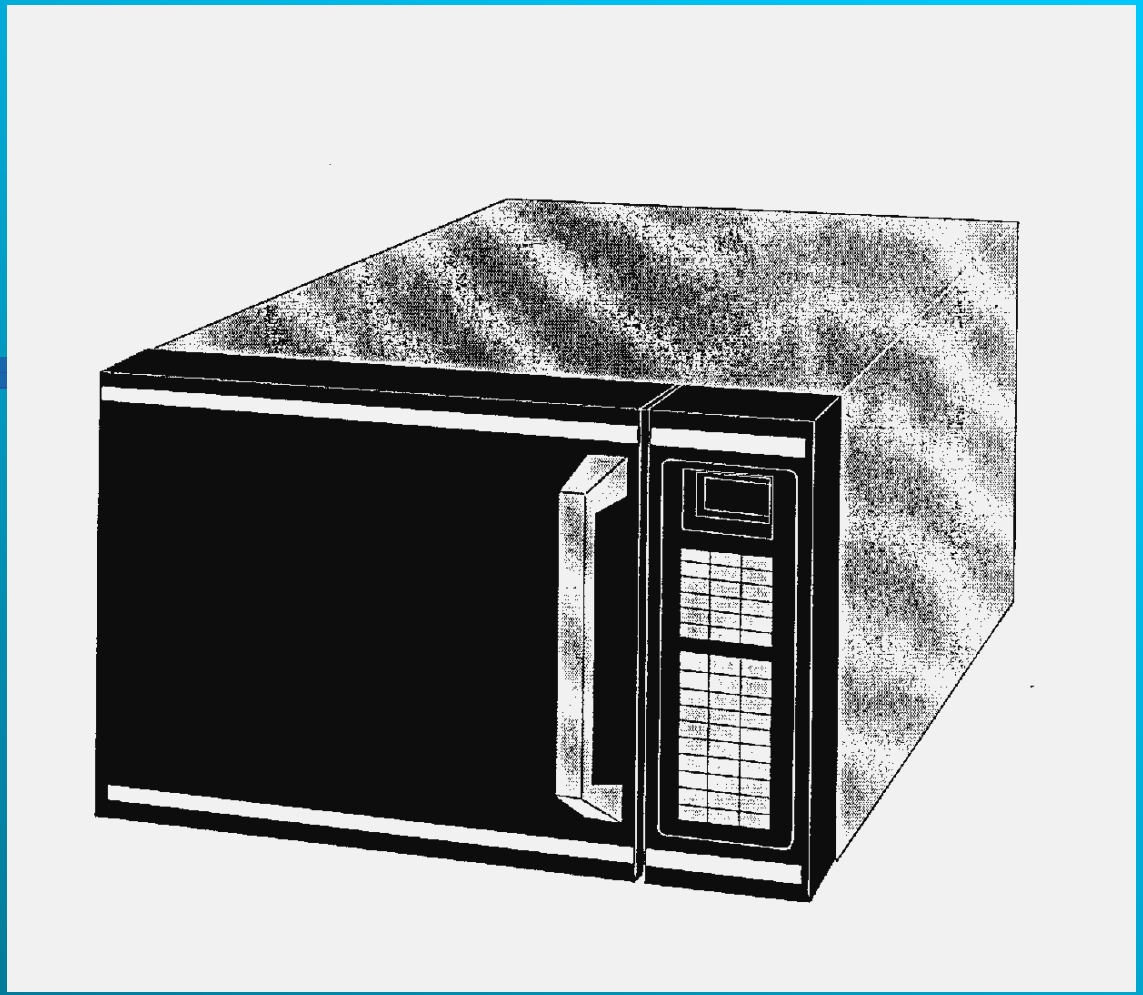
STOVE A

STOVE B



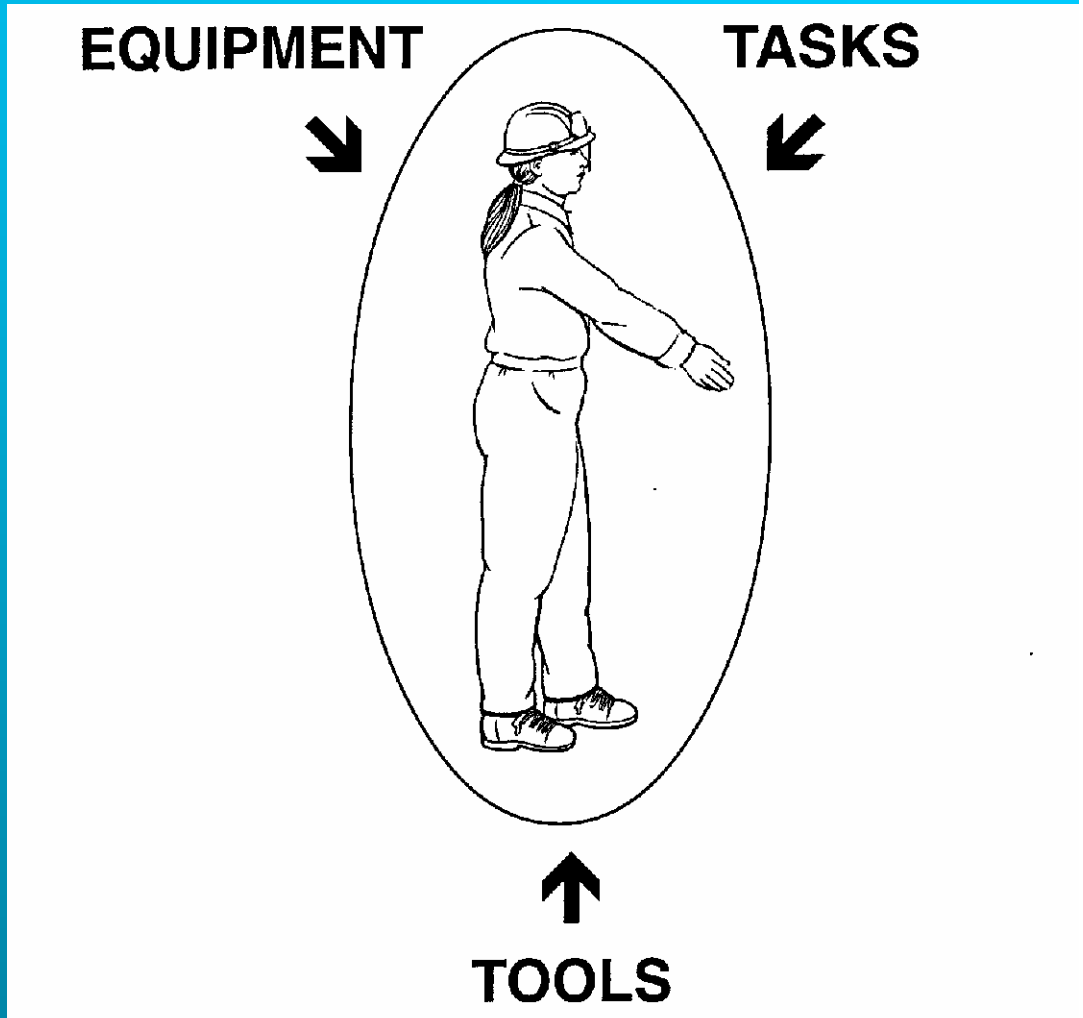
Reduce the impact of error.

Use fail-safe systems.



Put the worker at the center.

Match the job to the worker.



Human factors makes the plant “user friendly.”

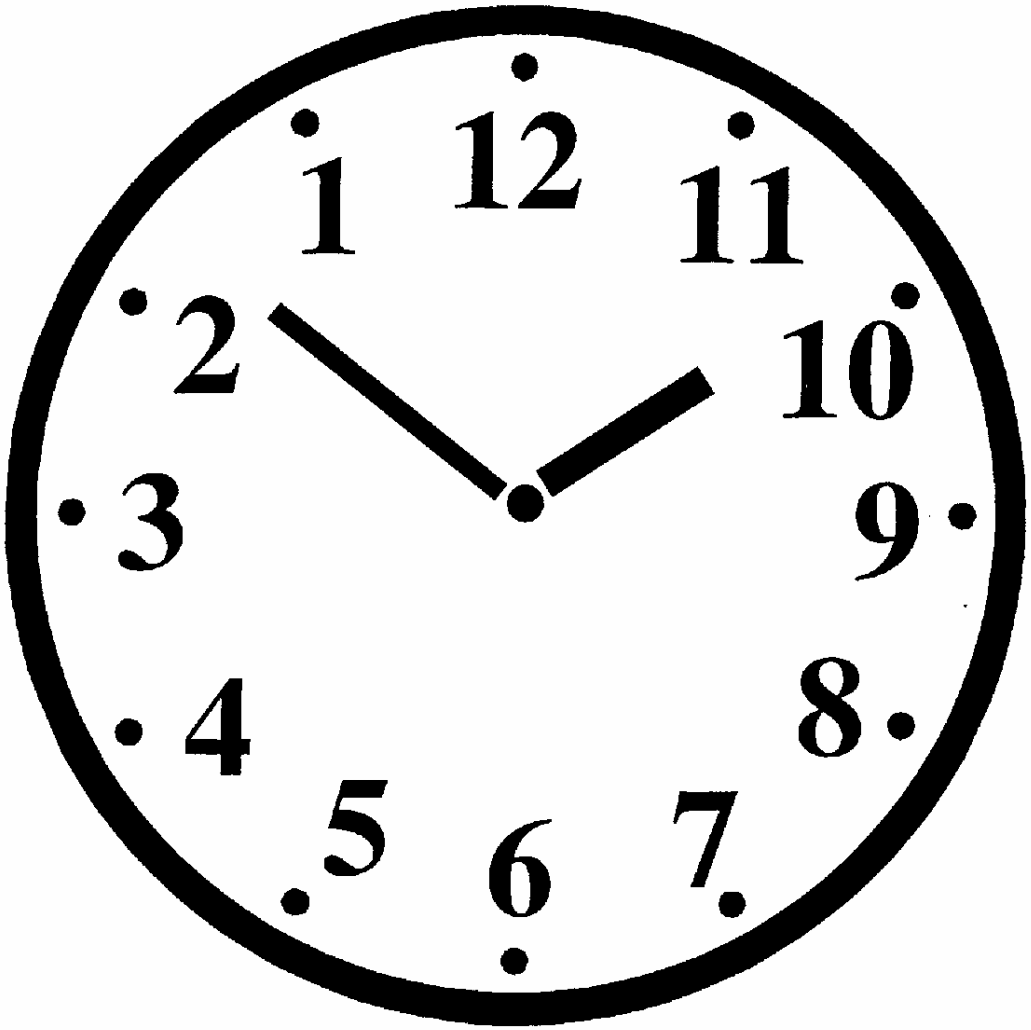
What problems do you see?

Match the job to the worker.

PHYSICAL

What time is it?

Match the job to the worker.



MENTAL

Stress and Fatigue

Match the job to the worker.

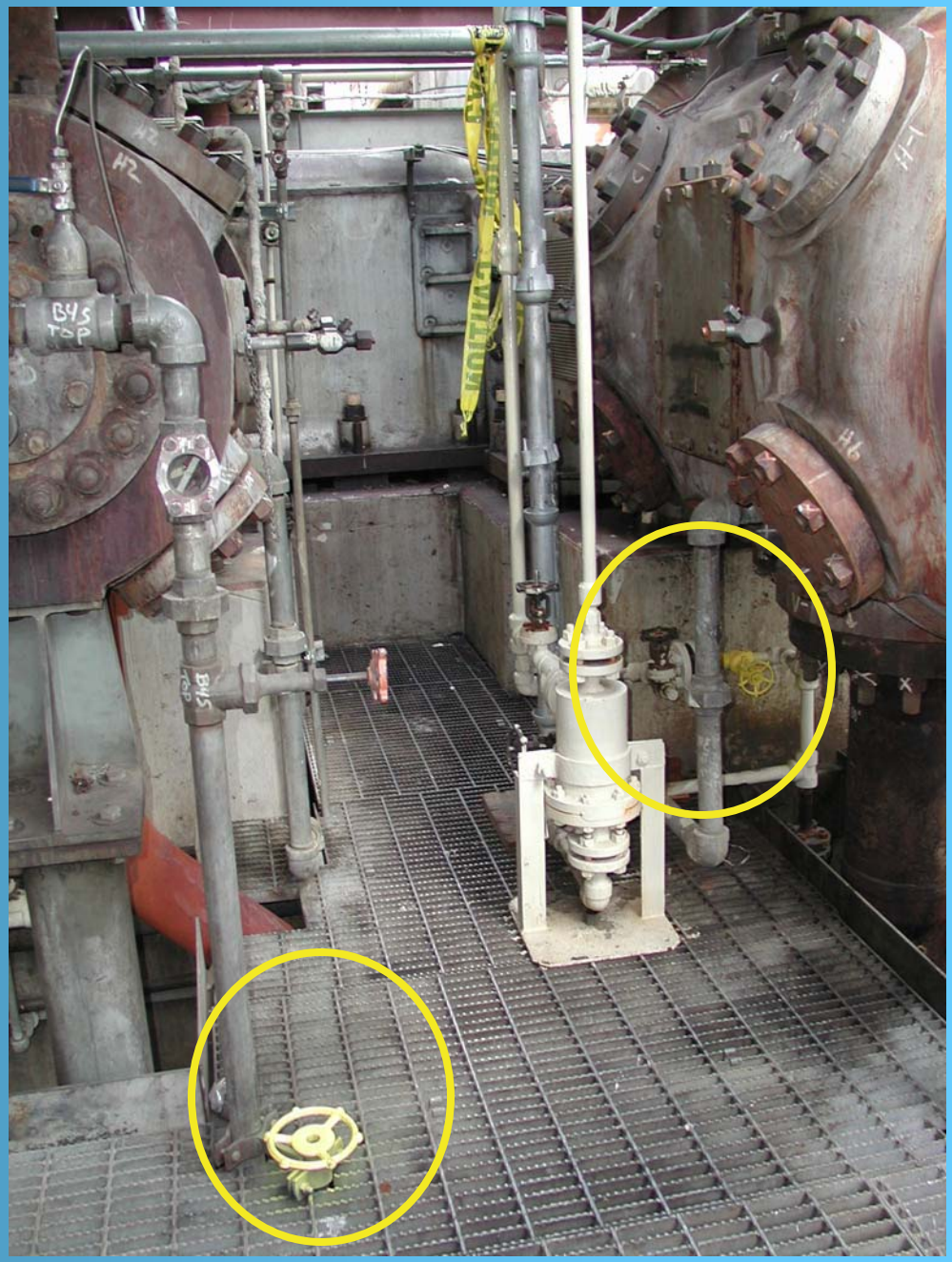
PHYSIOLOGICAL

Equipment Access

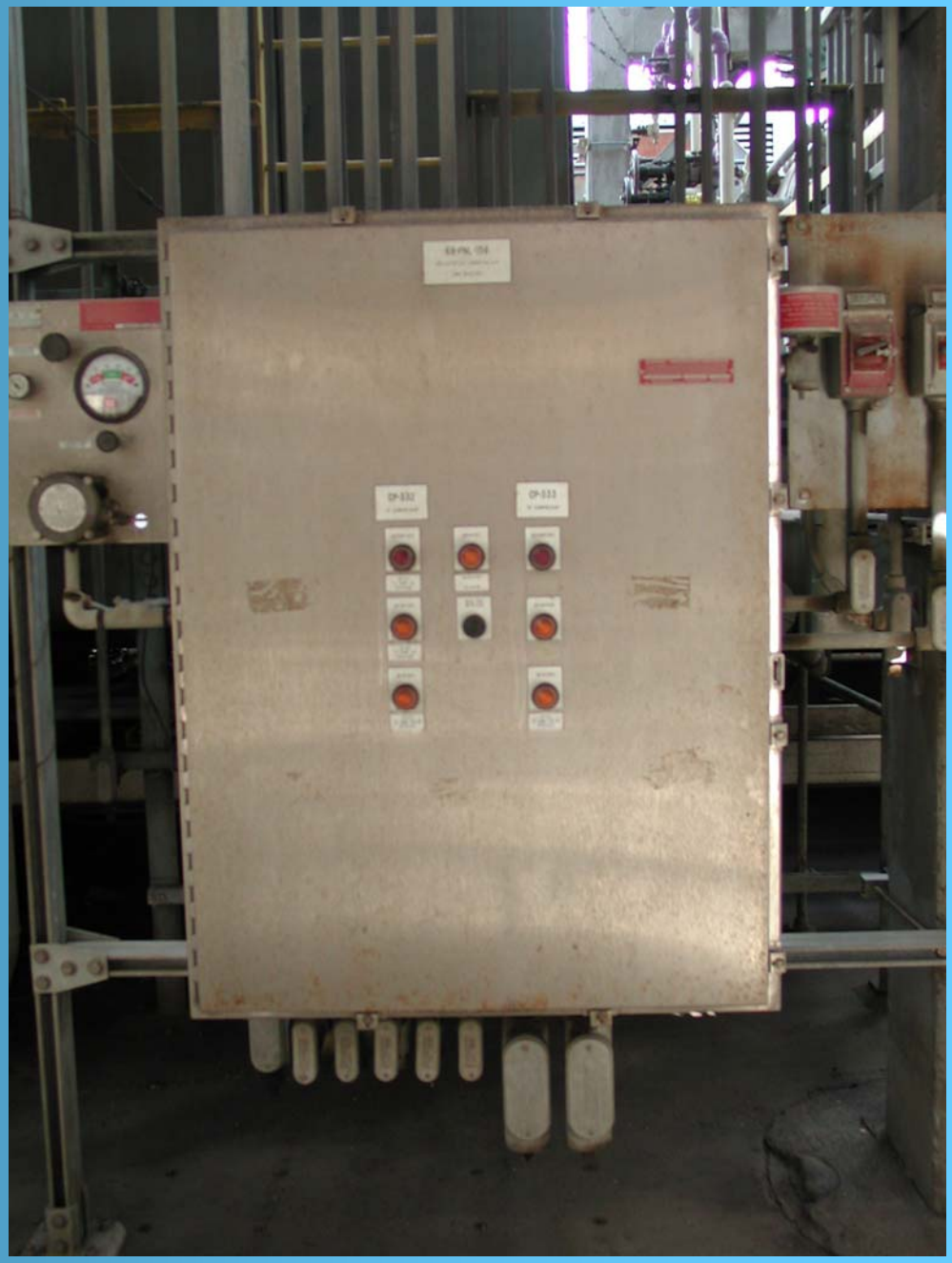
How would you turn those valves?

Equipment Access

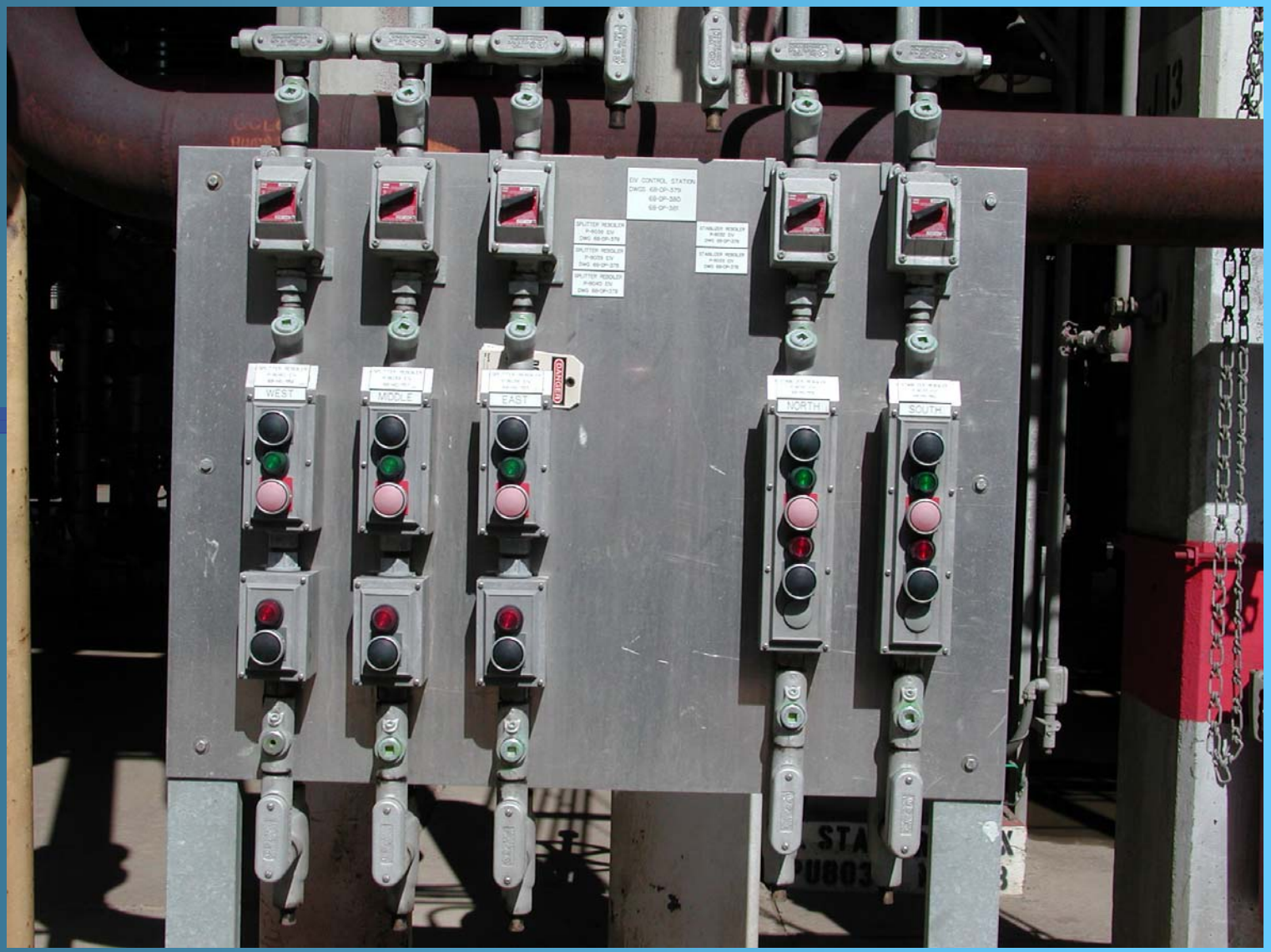
How would you turn those valves?

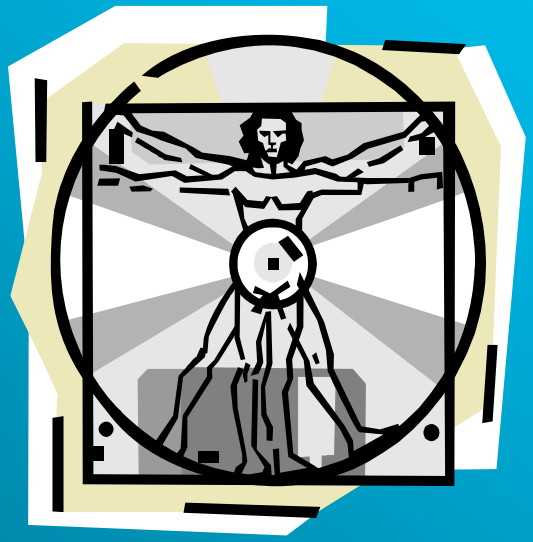


Control Panel Layout



Red/Green Populational Stereotype





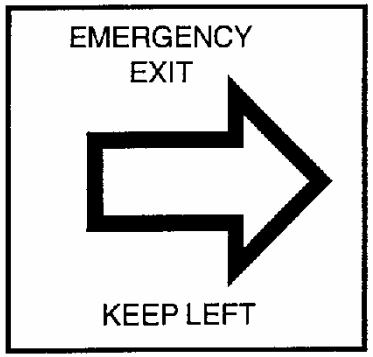
Human Factors Methods

Review

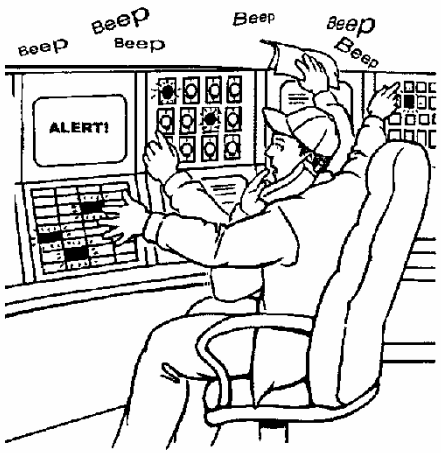
- ✓ Allow for differences among workers
- ✓ Remove opportunities for error
- ✓ Reduce impact of errors that occur
- ✓ Design “fail-safe” systems
- ✓ Match the job to the worker

Looking For Solutions

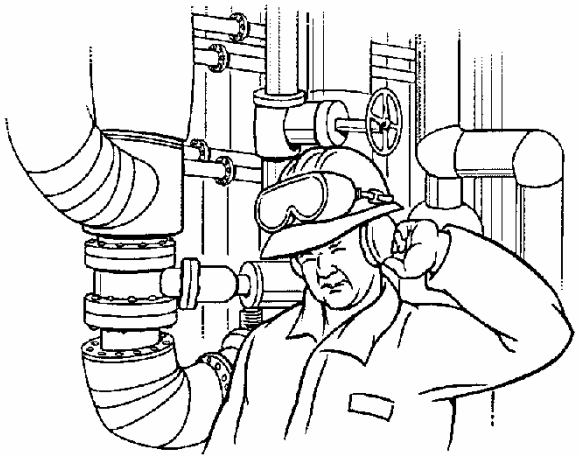
Group Exercise



The Exit Sign



The Emergency



The Racket

Human Factors Training - Lesson 3

3. Applying Human Factors

To Err Is Human...

" To say that accidents are due to human failing is not so much untrue as unhelpful. It does not lead to any constructive action. All we can do is tell someone to be more careful.

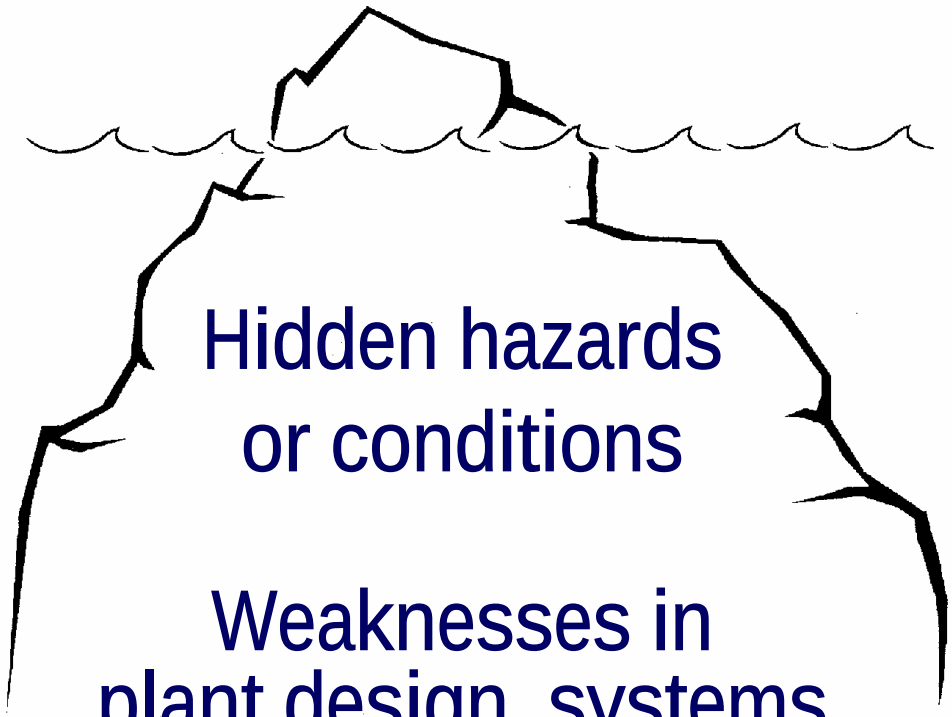
In contrast, if we say that an accident can be prevented by better design, training, instructions, auditing or inspection, then we can take action that may prevent a recurrence." - Trevor Kletz

An Engineer's View of Human Error

Human Factors Approach

Latent Conditions Checklist

Workplace Evaluation



Hidden hazards or conditions

Weaknesses in plant design, systems or management

Makes the job more difficult or mistakes more likely

Human Factors Approach

Latent Conditions

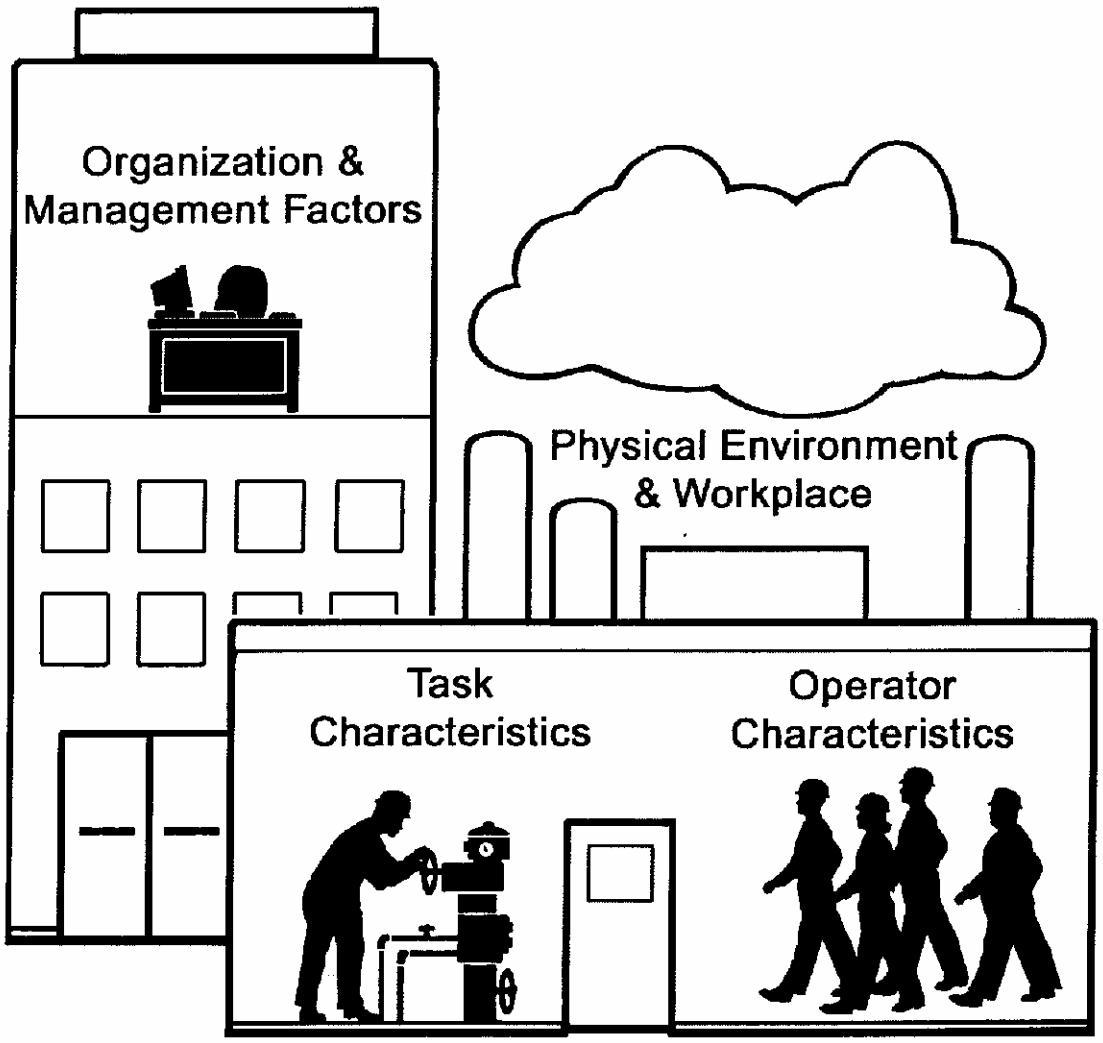
Poor Design
Unclear Labels
Control Layout
Poor Procedures
Equipment Access
Improper Placement
Lack of Maintenance
Inadequate Training
Fatigue
Inadequate Staffing

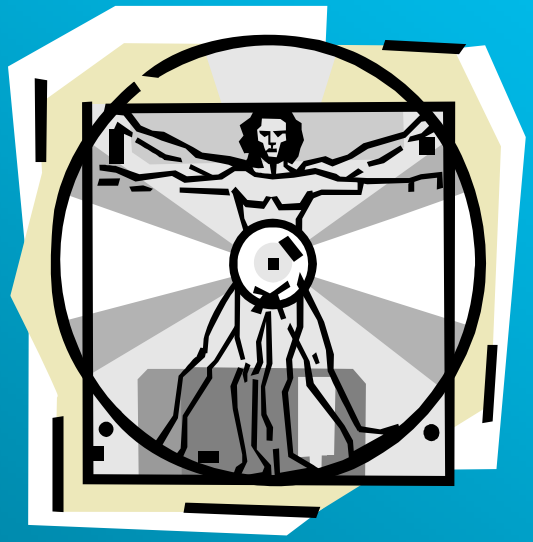
So, put simply.....

Latent Conditions are Root Causes that have not yet resulted in an incident!

Human Factors Approach

Four Point System





Latent Conditions Evaluation

- ✓ Latent Condition Checklists
- ✓ Organized By Function
- ✓ Refined To Fit Facility

PSM Element - Management Of Change

The Management of Organizational Change (MOOC) accounts for safety related job functions prior to making organizational changes.

Items found during MOOC

- ✓Training responsibilities (teaching)
- ✓Training required for new positions/new responsibilities
- ✓Unit preparation to conduct maintenance responsibilities
- ✓Communication responsibilities

PSM Element - Incident Investigation

Root Cause Analysis methods account for Human Factors

Root Cause analysis focuses on finding system failures, not blaming people.

PSM Element - Incident Investigation

The most common Human Factors contributions to incidents:

- –Unclear procedures
- –No procedure for a particular task
- –Communication barriers
- –Lack of labeling

PSM Element - Operating Procedures

Human Factors guidelines have been established for use in writing and reviewing operating procedures.

PSM Element - Operating Procedures

A checklist is used to review procedures.

Common Human Factor issues found during reviews:

- –No procedure for certain tasks.
- –Caution/Warning Statements should proceed the action to be taken.
- –Steps were out of sequence.
- –Procedure titles could be better.

Engineering Standards

Process Control Standard includes accounting for:

- Colorblindness
- Visual resolution
- Stress/workload
- Alarm prioritization
- Level of automation
- Control layout

PSM Element - Process Hazards Analysis

✓A comprehensive Human Factors Checklist is used during the HAZOP to evaluate lighting, equipment layout, labeling, noise, process controls, etc.

✓Human Factors findings are incorporated into PHA recommendations.

Process Hazard Analysis

Changes to a furnace from PHA

Questions???