A Systems Safety Approach

to

Equipment Procurement

Presentation at the

MSABC's "Make it Safe" Conference

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WorkSafeBC

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A Systems Safety Approach to Equipment Procurement

Intent: to illustrate how the Procurement Process can contribute to the health, safety and well-being of employees and the organization.

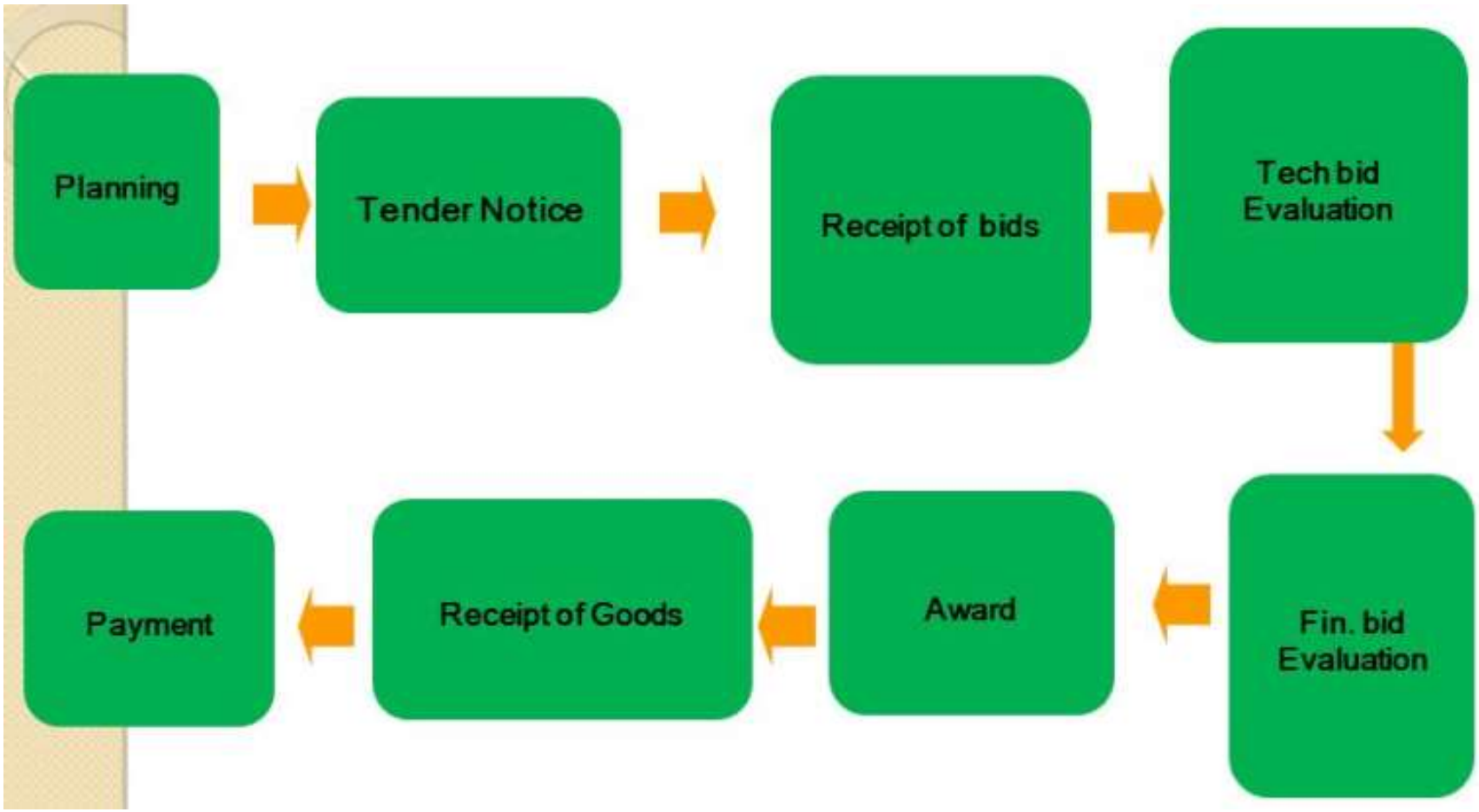
Outline:

1. Procurement
2. A systems perspective
3. Systems in Processes
4. Preventing Musculoskeletal Injuries
5. Requirement for Consultation
6. Questions

1 Procurement

Procurement is needed everywhere

A Typical Procurement Cycle



Question

A. In your organization what criteria are used when making decisions about a purchase?

B. In your organization what criteria are often not considered when making decisions about a purchase?

Answer

A. Procurement decisions are often made on:

- **Price**
- **Availability**
- **Production / productivity**
- **Robustness**

B. Rarely on ease of use, user functionality and prevention / safety

Procurement

"Procurement can influence overall safety through the purchasing decisions it makes, not only for materials suppliers and vendors, but also the contractors that perform services on behalf of the organization."

Jakob Nielsen

CSA Z1000-14 OHS Management (4.4.6.1 Procurement)

- The organization shall establish, implement, and maintain a procedure to evaluate and manage the procurement of products, supplies, equipment, raw materials, and other goods, including:

- Identifying hazards and assessing risk associated with the use of these goods;

- Eliminating hazards and controlling risk in accordance with Clause 4.3.4; *(**4.3.4 Hazard identification and risk assessment**)*

- Ensuring that purchased goods conform to the organization's OHS requirements.

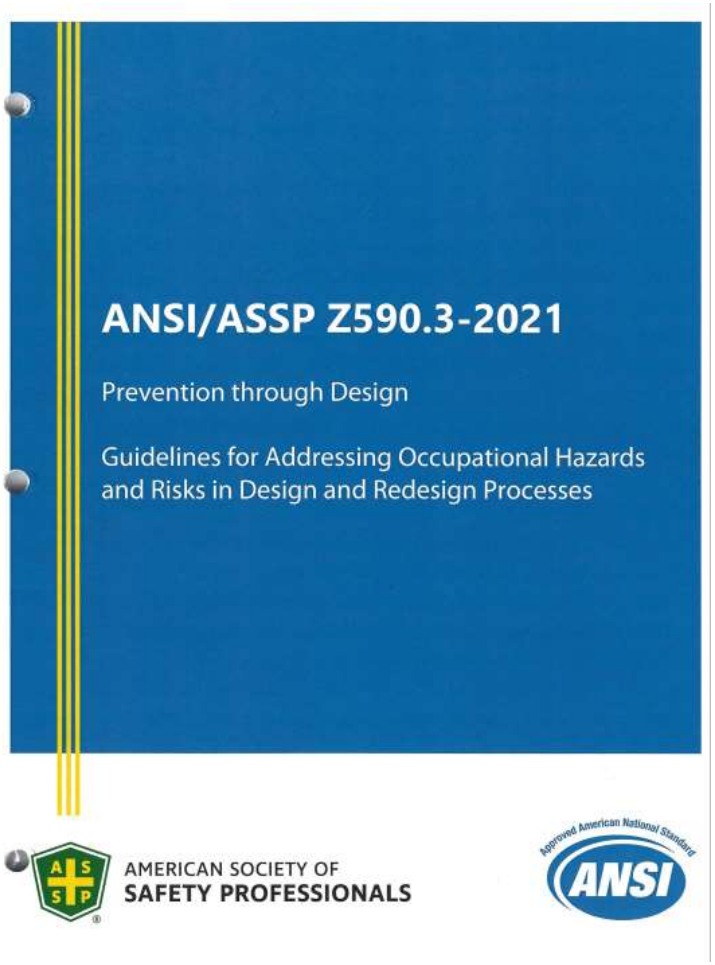
Procurement

The application of human factors information to the design of tools, machines, systems, tasks, jobs, and environments for safe, comfortable and effective human use.

- Chapanis, A. (1995, p. 11). Human Factors in Systems Engineering. Toronto: John Wiley.

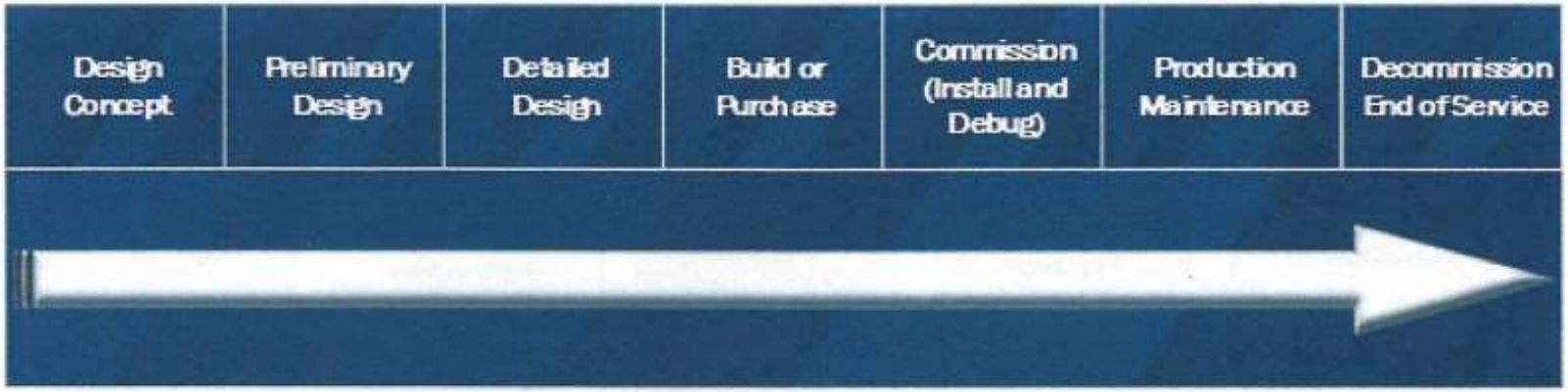
ANSI Z590.3-2021

Prevention through Design (PtD)



ANSI Z590.3-2021

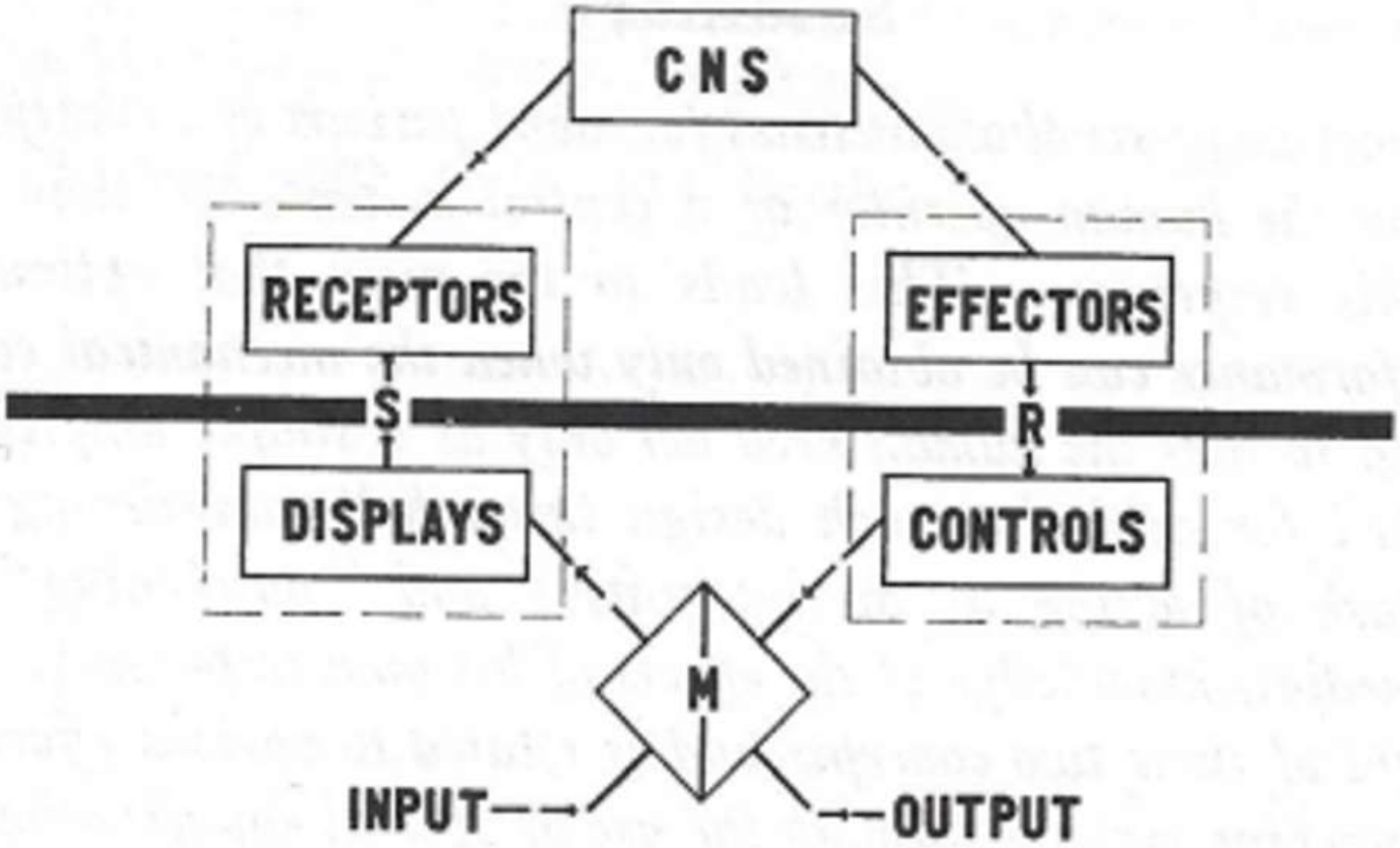
Example of the lifecycle phases of a PtD system



2 A Systems Perspective

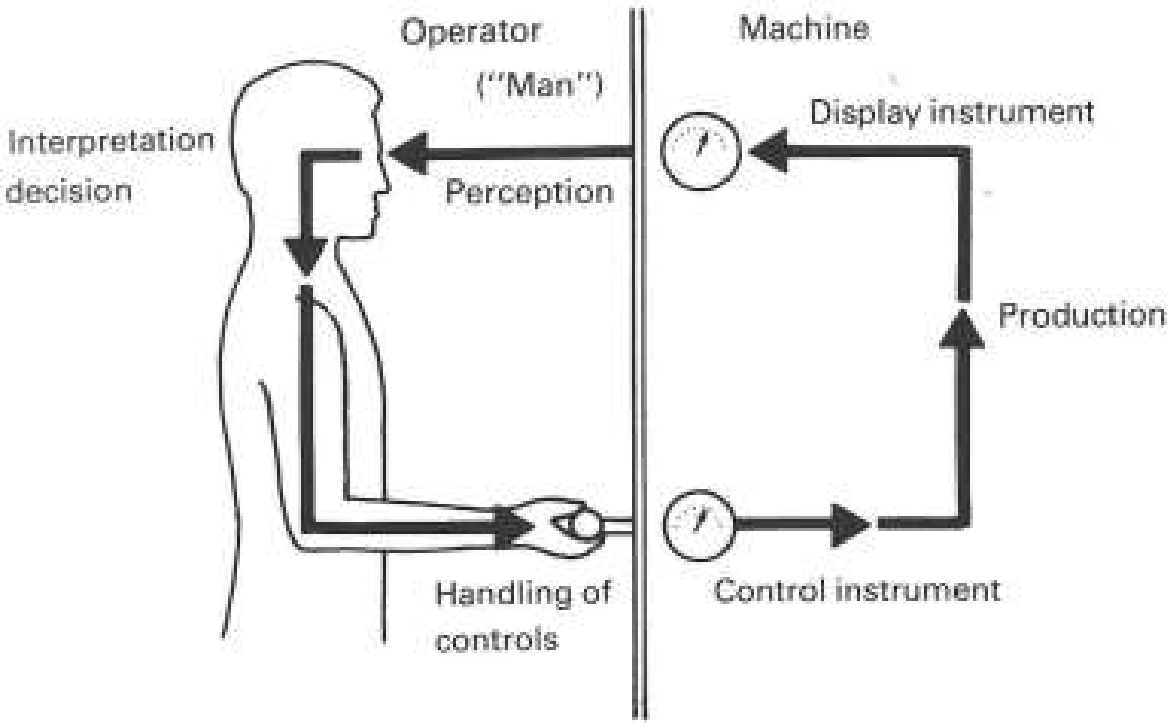
A basic person-machine system

"A Design Philosophy for Man-Machine Control Systems" by H. P. Birmingham and F. V. Taylor" in "Selected Papers on Human factors in the Design and Use of Control Systems Edited by H. W. Sinaiko, Dover Publications, Inc., New York 1961.



Person-machine interaction

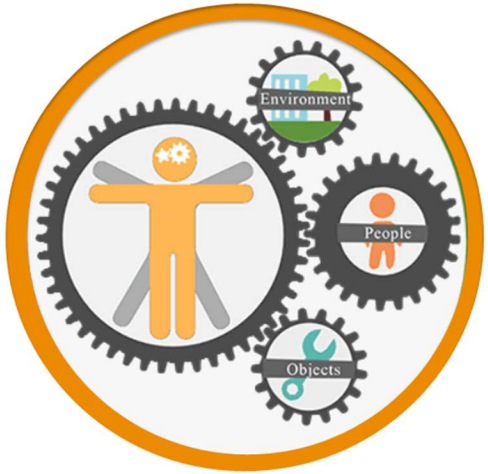
E. Grandjean "Fitting the Task to the Man" Taylor & Francis Ltd. London, 1980



Interactions occur among all the components in a work system

Ergonomics is:

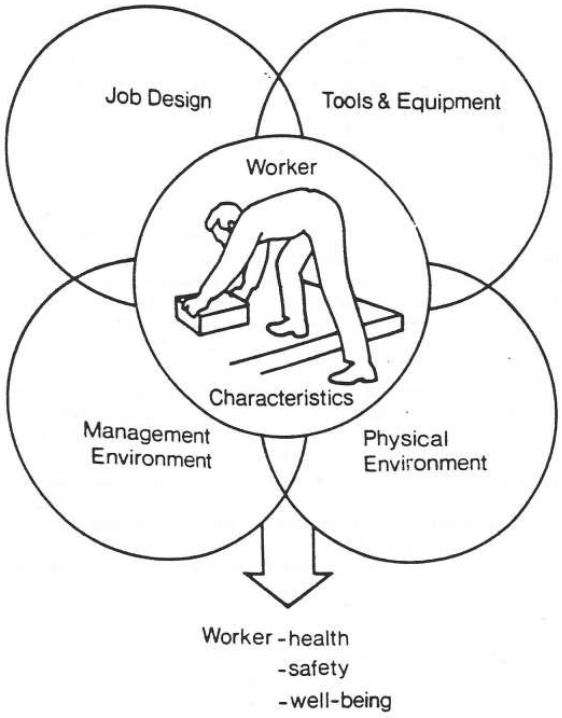
- **Concerned with the understanding of the interactions among workers and the other elements in the work system**



Interactions occur among all the components in a work system

Ergonomics is:

- **Applied to optimize human well-being and overall system performance.**



Interactions occur among all the components in a work system

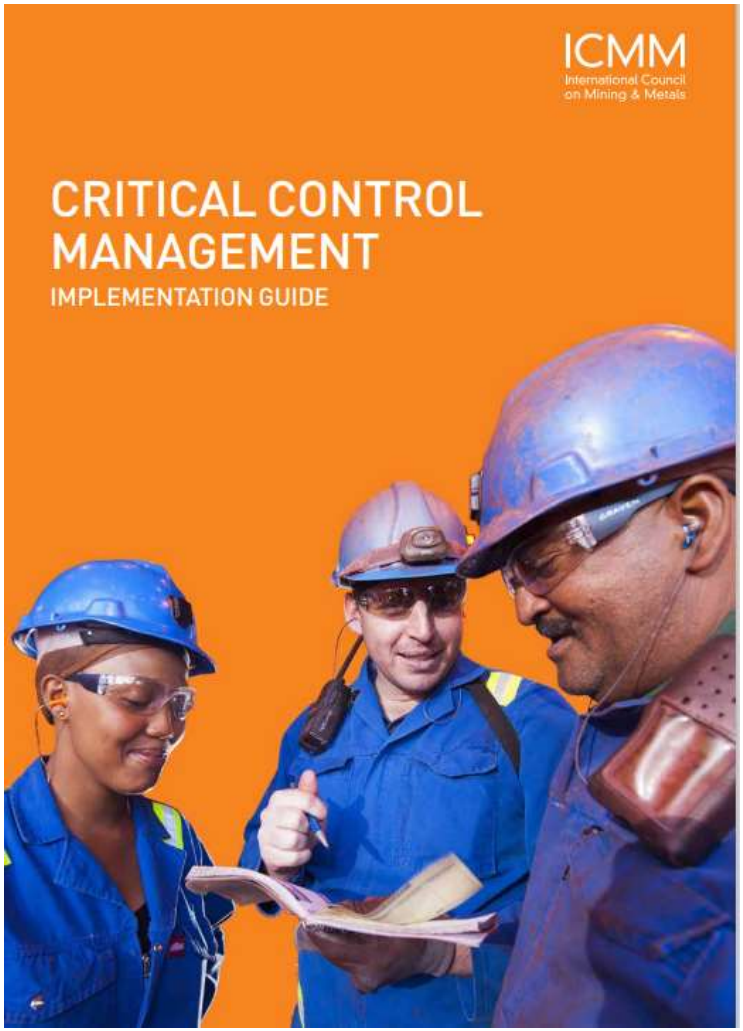
In Human-Centered Design:

- **The goal is to ensure jobs, tools, equipment and workplaces fit the worker**

Not the other way around

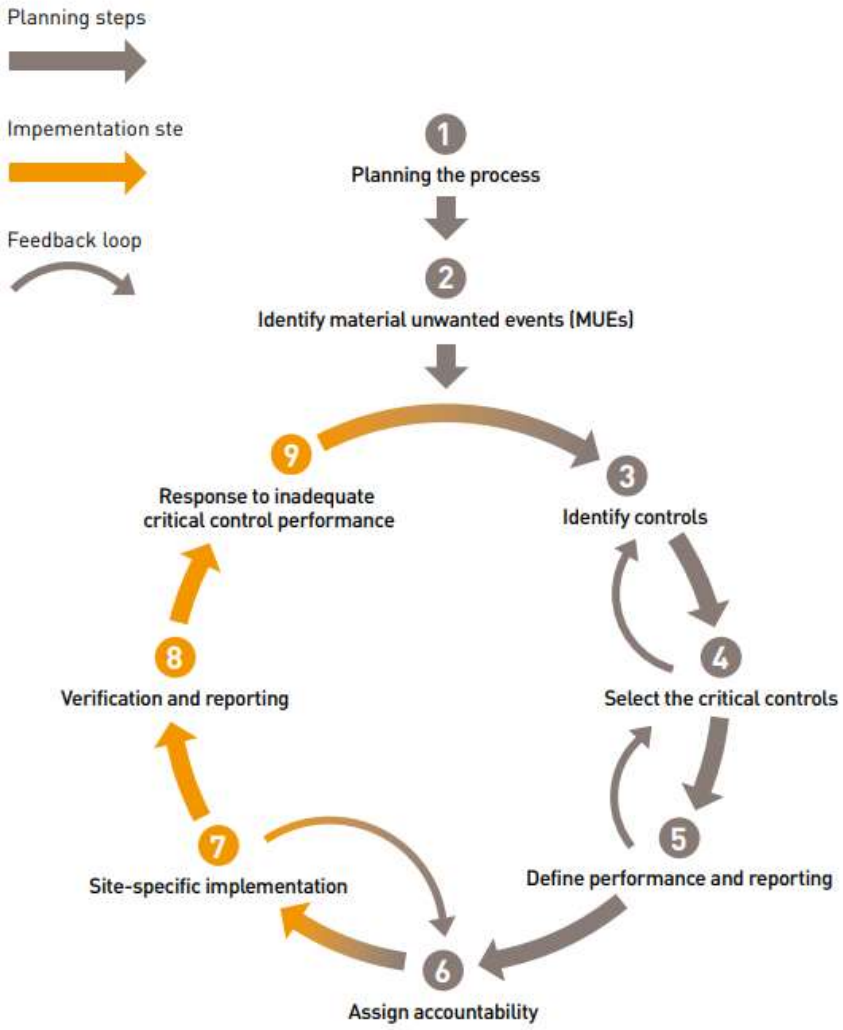
3 Systems in Processes

Systems in Process Safety



ICMM Process

A critical control management process



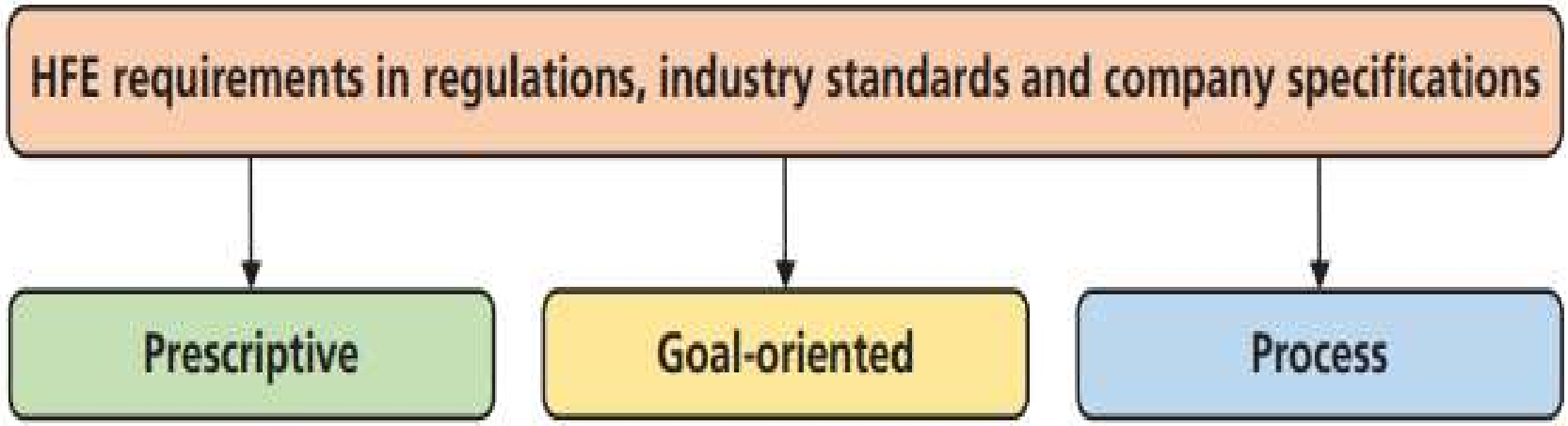
IOGP Report 454:
Human Factors Engineering in Projects

International Association of Oil & Gas Producers

energy institute

IOGP Report 454: HFE in Projects

3 Different types of HFE requirements



Examples:

- Workspace envelope
- Ladder dimensions
- Headroom clearance

Examples:

- Support human error ALARP demonstration
- Support situational awareness

Examples:

- Valve criticality analysis
- 3D model design review
- Task requirements analysis

IOGP HF/E for Process Safety

Ergonomics inputs:

Common HFE inputs and activities

- Ergonomics design review and validation
  - Iterative process throughout the design lifecycle
  - Work closely with designers and end-users
  - Identify potential issues / 'non-compliances' and advise on solutions / trade-offs
  - Typically involves desktop reviews of drawings and involvement in 3D model design reviews

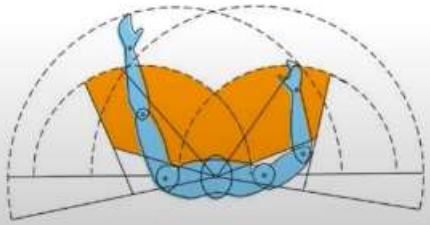
- Typical areas for HF input include:
  - Plant layout reviews
  - Equipment / Skid Package screening and reviews
  - Valve Criticality Analysis (VCA)
  - Control Room Studies
  - Human Machine Interface (HMI) & alarm system reviews

IOGP HF/E for Process Safety

Ergonomics inputs:

Summary

1. Consider HFE early in the design process – carry out screening to find out what is required
2. Make sure there is HF competent resource available and integrate within the design team
3. Ensure there is a HF strategy / Plan and programme for the activities to be performed, and that this is managed throughout the design process
4. Involve end-users (operators) to ensure a user-centred design process and 'buy in' to the final design



Question

Do ergonomics design features make it into the final design?

A. **Yes**

B. **Not common enough**

Answer

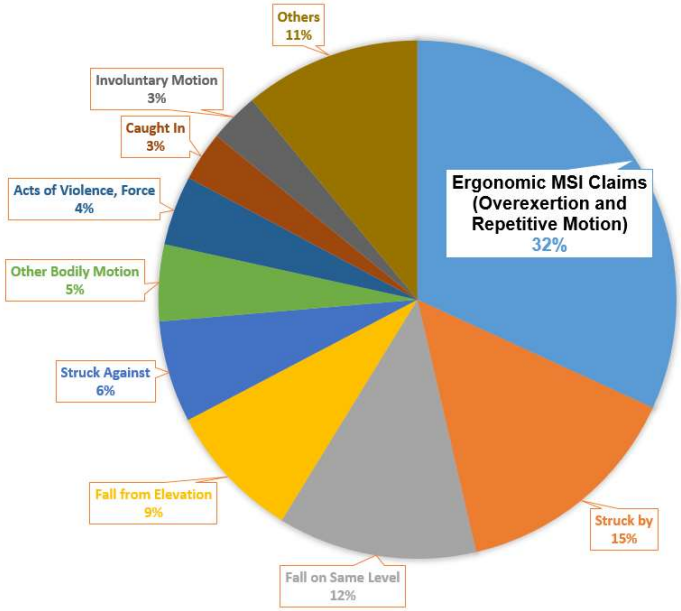
- ✓ **Ergonomics design features often make it into the final design**
- ✓ **but not in all organizations!**

4 Preventing Musculoskeletal Injuries

The Business Case for Preventing MSIs

Preventing MSIs is Important:

1. Largest single source of lost-time costs
2. Long recovery and disabling health effects
3. Health and productivity
4. Innovation
5. MSI requirements



Preventing MSIs is Important

Ergonomics (MSI) Requirements

Factors exposing workers to risk of musculoskeletal injury:

Physical Demands

❖ **Section 4.49 (a)**

- (i) force required,
- (ii) repetition,
- (iii) duration,
- (iv) work postures,
- (v) local contact stresses;

Contributing Risk Factors

❖ **Sections 4.49 (b) to (e)**

- (b) layout and condition of the workplace or workstation
- (c) characteristics of objects handled
- (d) environmental conditions
- (e) characteristics of the organization of work

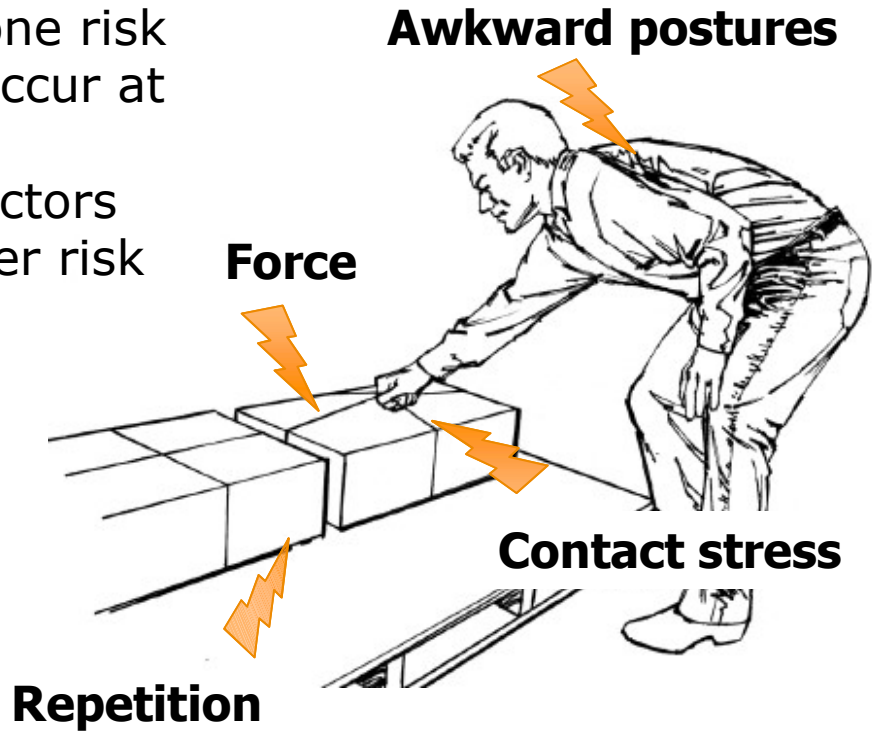
Factors exposing workers to risk of musculoskeletal injury:

The interactions that contribute to the risk of musculoskeletal injury are varied and complex. We need the perspective and insights from workers if we want to minimize the risk of injury.

Factors exposing workers to risk of musculoskeletal injury:

Combinations Create A Higher Risk

- More than one risk factor can occur at a time
- More risk factors mean greater risk of injury



Physical Demands exposing workers to risk of musculoskeletal injury:

Section 4.49 a

i) FORCE

ii) REPETITION

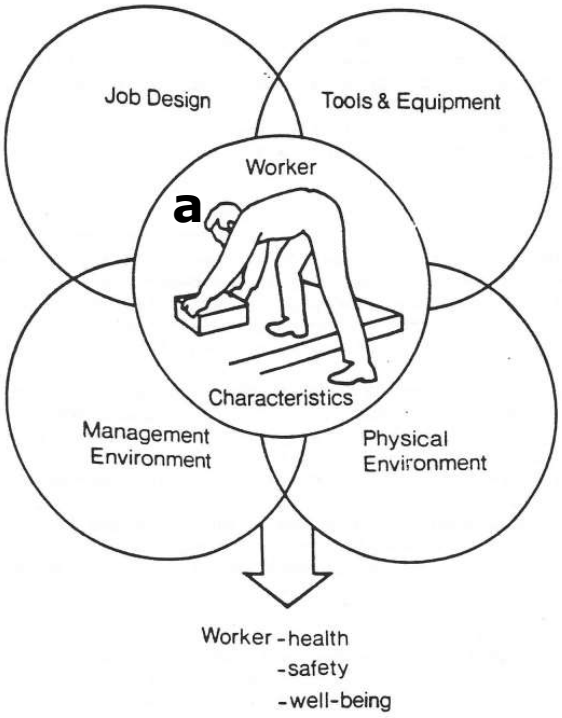
iii) DURATION

iv) POSTURE

v) CONTACT STRESS

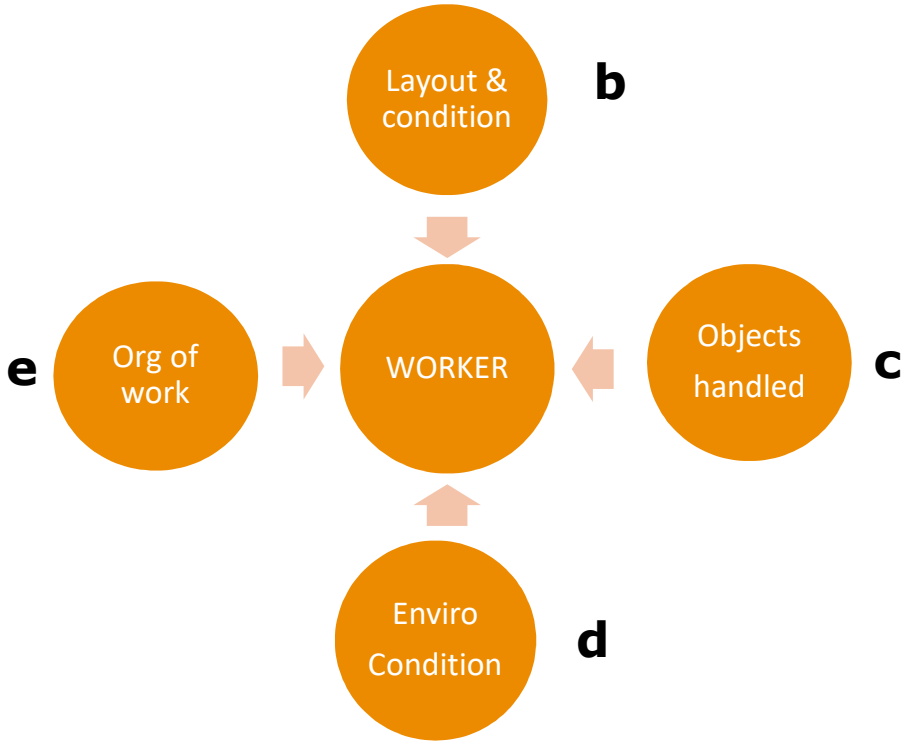
Contributing Risk Factors exposing workers to risk of musculoskeletal injury:

Section 4.49 a



Physical Factors:
a i, a ii, a iii, a iv, a v

Sections 4.49 b to e



Factors shown on schematic of the occupational work system

Is there a Risk of an MSI?

Example courtesy of Dr. Andrew Imada

Maria was a great worker. She never complained, and her productivity rates were incredible.

She maintained this work attitude throughout 22 months, while she was hired as a contract employee.

Based on her hard work and productivity, she got a permanent job in to the Company.

Why did this MSI injury occur?

Example courtesy of Dr. Andrew Imada

Human

- Female, with 22 months of industry experience before being hired by company
- Population of women in the region average in height

Activity

- Cutting flowers (most commonly roses) for 8 hours – 6:00am – 2:00pm
- Production rate: 250-400 flowers per hour

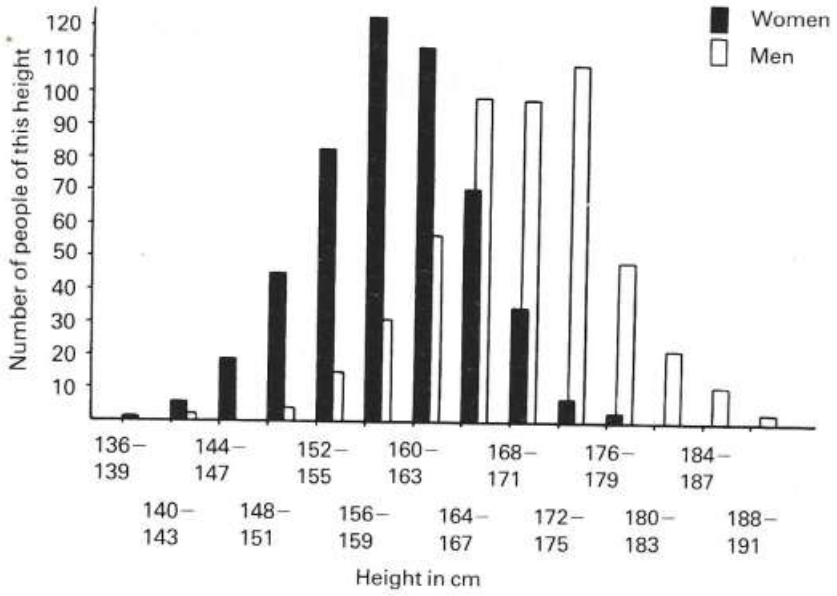
Context

- For 11 months the woman was the fastest flower cutter and selected by the agency

Is there a Risk of an MSI?

Example courtesy of Dr. Andrew Imada

There is a wide range in the variation of height in a given population



Is there a Risk of an MSI?

Example courtesy of Dr. Andrew Imada

Two months later she claimed disability due to repetitive strain injury.

Question

In your organization is "Try before you Buy" just common sense?

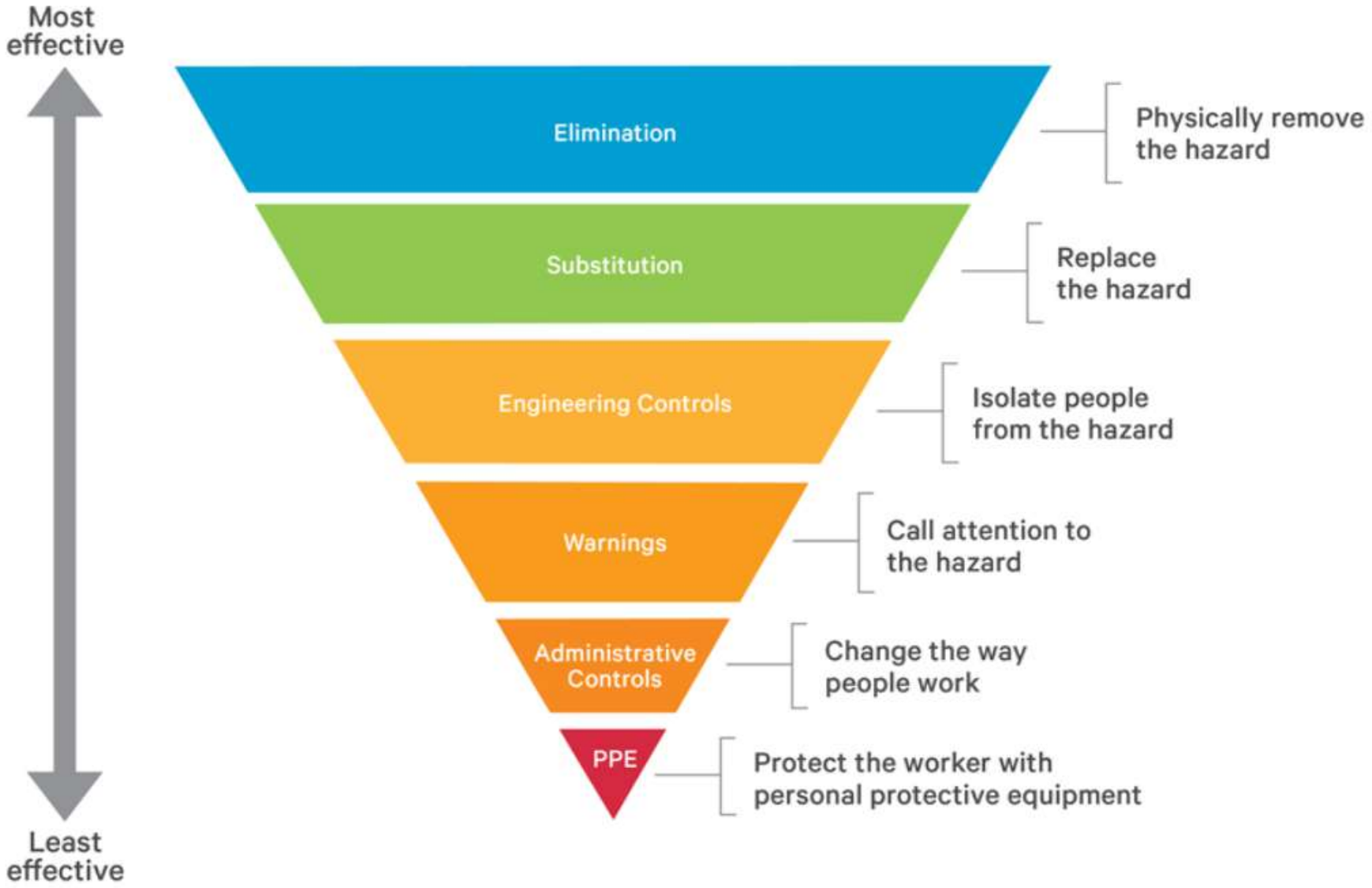
A. **Yes**

B. **Not common enough**

Answer

- ✓ **"Try before you Buy" is common sense**
- ✓ **but it is not common enough!**

Procurement within the Hierarchy of Controls



5. Requirement for Consultation

Ergonomics (MSI) Requirements

4.53 Consultation

(1)The employer **must consult** with the joint committee or the worker health and safety representative, as applicable, with respect to:

(a) risk identification, assessment and control;

(b) the content and provision of worker education and training;

(c) the evaluation of the compliance measures taken.

(2) The employer must, when performing a risk assessment, **consult with**: (a) **workers** with signs or symptoms of MSI, and

(b) **a representative sample of the workers** who are required to carry out the work being assessed.

Question

In your organization are workers considered and treated as an asset?

A. **Yes**

B. **Not common enough**

Consultation with workers is an important component in the procurement process

- ✓ **Workers should be considered and treated as an asset.**
- ✓ **Their opinions and insights should be valued.**
- ✓ **but it is not common enough!**

Consultation with workers is an important component in the procurement process

Workers are a key source of information about the demands of the job, the potential MSI hazards, and have suggestions for fixing it.

- Are workers actively involved in your organization's procurement process?

- Is there an appropriate and effective system for workers - and their supervisors - to raise health and safety concerns?

Question about the Future

In your organization, who would be in a position to describe the process that reduced injuries and improved employee health safety and wellness?

A. **Occupational Health and Safety Specialist**

B. **Others**

Ideally this type of interview will be given by Procurement

Answer about the Future

In your organization, who would be in a position to describe the process that reduced injuries and improved employee health safety and wellness?

- ✓ **Occupational Health and Safety Specialist**
- ✓ **Procurement Specialist**

Your Employees hope that this will be the future in your organization!

Include the end-users in your Procurement Process

6 Questions

Contact:
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Thank you !

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