The role of trade unions in promoting safer machinery

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European Trade Union Institute (ETUI)

6th Atlantic Alliance Conference: Global Initiatives on Safety and Health

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Outline

- **The context**
- The problem
- Possible solutions
- The ETUI questions

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The context - 1

The Single Market

Product Directives

Social Directives

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The context - 2

- Work equipment **design** is covered by directive 98/37, with obligations on **manufacturers**;

- Work equipment **use** is covered by directive 89/655 (minimum standard) which defines **employers'** obligation

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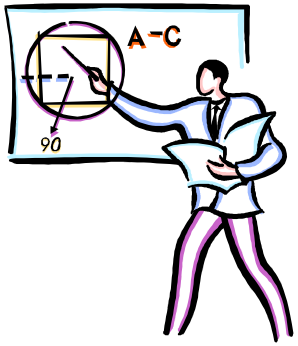
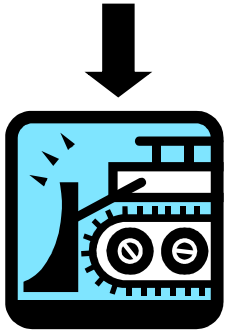
Risk assessment



Manufacturer

Design

Risk assessment



Employer

Use

Machinery Regulation management

Notified Bodies

BUSINESSEUROPE

CEN CENELEC

ORGALIME

NORM APME

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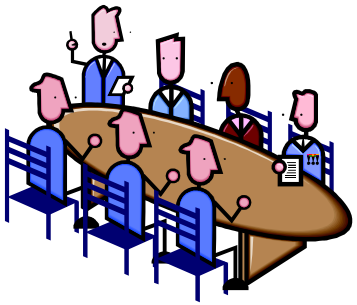
ANEC

Commission



Member States

Working Group
“Machinery”

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Machinery Standardisation management

Notified Bodies

BUSINESSEUROPE

ORGALIME

NORM APME

ANEC

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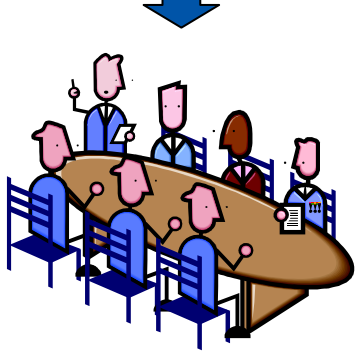

Technical Committee
TC 114 Safety of Machinery

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Outline

- The context
- **The problem:**
  - **The large number of severe accidents that are occurring**
- Possible solutions
- The ETUI questions

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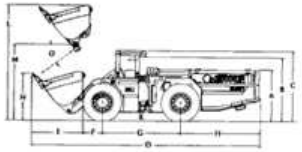
http://www.cdc.gov/niosh/mining/topics/topicpage21.htm

NIOSH Office of Mine Safety and Health Research Topic

Equipment Design



Machines pervade the mining industry, greatly reducing manual labor and providing efficient production. Machines are also the direct or indirect cause of a significant number of injuries and fatalities. Miners interact with a wide assortment of machinery and tools in the course of their work. The interaction issue for consideration is the proper design of the human machine systems such as control layouts, proper visual and auditory presentation of information to the worker, and design of equipment for ease of maintenance. Recent years have seen a rapid growth in the development of new mining technologies, such as remote control, continuous haulage, automated equipment, etc. These new technologies introduce the potential for new health and safety risks.

The work in this topic area is supported by the NIOSH Mining Ergonomics and Machine Safety programs. See the NIOSH Mining Products page for software, guides, training materials or other items related to this topic.

Related Topics

Ergonomics
Illumination
Manual materials handling
Musculoskeletal diseases and disorders
Proximity detection
Workstation design

Sub Topics

Maintainability
Programmable electronic systems

Equipment Design Spotlights

Operating Speed Assessments of Underground Mining Equipment (PDF, 573 KB, 2010-03)
This publication details the results of NIOSH studies to examine operating speeds based on usage and seam height. The data obtained in these studies revealed a complex interaction of factors that affect the risk of struck-by accidents when miners operate mining machines in an underground mining environment.

Visual Performance for Trip Hazard Detection When Using Incandescent and LED Miner Cap Lamps (PDF, 193 KB, 2010-04)
This NIOSH study determined if new LED-based cap lamp technology has an impact on visual performance in the context of detecting trip hazards for the visual environment of an underground coal mine.

Overviews

Mine Power Systems (PDF, 28024 KB, 1990)
This U.S. Bureau of Mines publication presents a comprehensive review of mine electrical power-system theory and practice. It discusses fundamental theory and the vital aspects to be considered in planning and designing mine electrical power systems.

Data & statistics

What Causes Equipment Accidents? (HTM, 1997)
This article presents statistics on mining equipment accidents and summarizes accident causes and design recommendations.

Measurement & analysis

Acceleration and GPS Data Monitor Truck-Haulage Jolts (PDF, 794 KB, 2000)
This paper discusses the application of global positioning system (GPS) data, accelerometers, and pressure transducers to provide feedback about equipment operations and identify the

http://www.wvminesafety.org/safety.htm

West Virginia Office of Miners' Health Safety and Training

Safety Topics and Information

Abstracts of recent fatal mining accidents

Injury Statistics

Miner Certification Information

Mountaineer Guardian Safety Awards

Mine Rescue Contests and Team Training

Operation of Man Trips at Surface Mines
(Power Point Presentation)

Pure Water for Well Plugging

River Loadout Safety

Developing a Comprehensive Emergency Plan for Underground Mines

Davitt McAteer Report on Mine Health Safety and Training

WV Joint Accident Prevention Team

MHS&T Homepage	WV Homepage	Statistical Information
publications	videos	MHS&T Offices

Metal and Nonmetal Mine Fatalities

2010 Preliminary Accident Reports, Fatalgrams and Investigation Reports	2009 Fatalgrams and Investigation Reports
2008 Fatalgrams and Investigation Reports	2007 Fatalgrams and Investigation Reports
2006 Fatalgrams and Investigation Reports	2005 Fatalgrams and Investigation Reports
2004 Fatalgrams and Investigation Reports	2003 Fatalgrams and Investigation Reports
2002 Fatalgrams and Investigation Reports	2001 Fatalgrams and Investigation Reports
2000 Fatalgrams and Investigation Reports	1999 Fatalgrams and Investigation Reports
1998 Fatalgrams and Investigation Reports	1997 Fatal Alert Bulletins and Investigation Reports
1996 Fatal Alert Bulletins and Investigation Reports	1995 Fatal Alert Bulletins and Investigation Reports

Equipment Safety and Health Concerns

Equipment Related Accidents

The following pages contain equipment related accident data from 1995 - 2009. Searches can be done for a particular year or by listed equipment type, which then are linked to fatalgrams and accident reports. Our goal is to educate equipment operators and the mining community about the hazards associated with operating a specific type of equipment.

Use this option if you want to view information for a particular equipment type for a particular year.

Select Equipment Type: Conveyor | Year of Accident: 1995 | Get Information

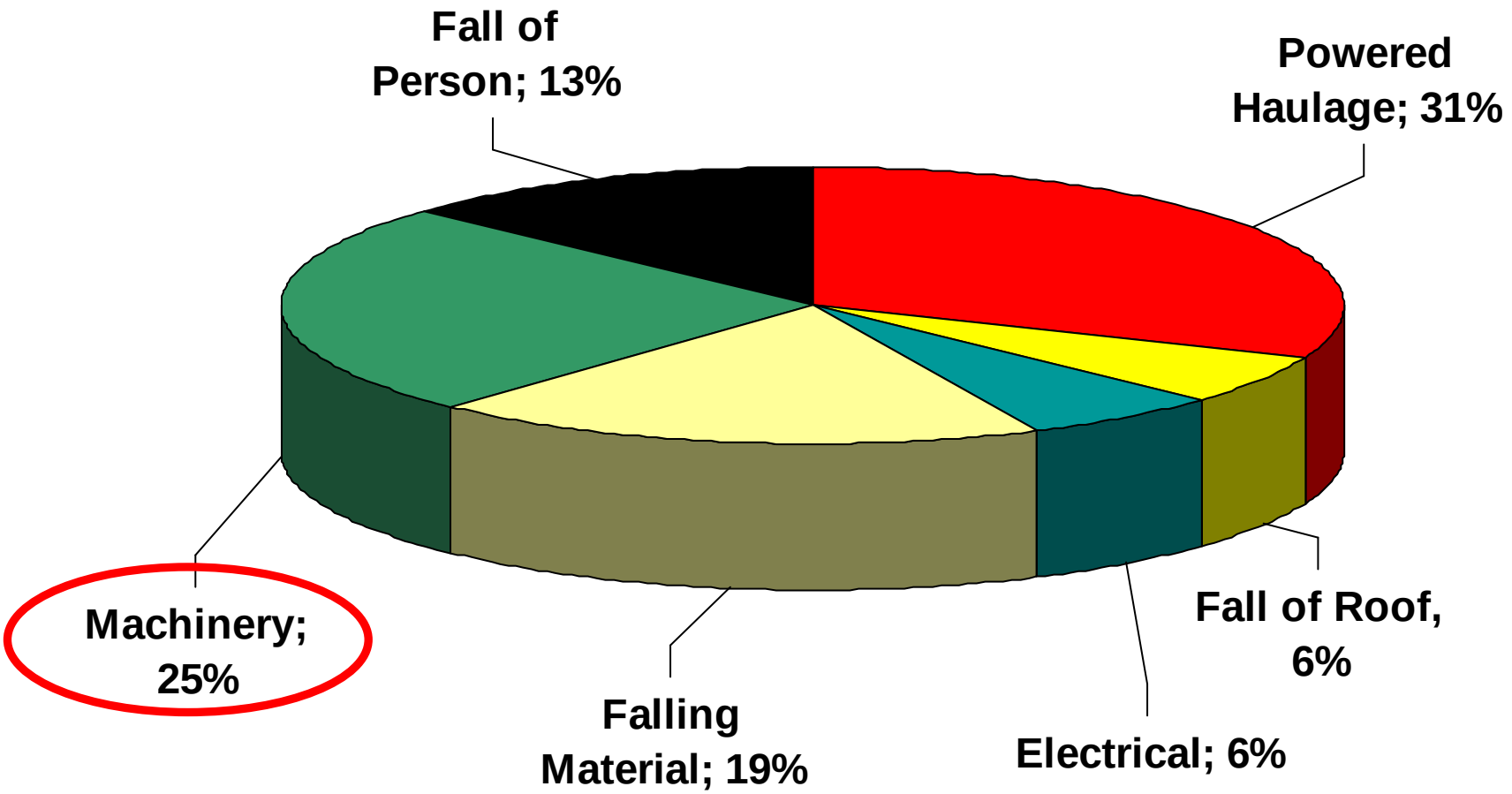
Use this option if you want to view information for "All Years" for a particular equipment type.

Select Equipment Type: Conveyor | Get Information

Use this option if you want to view information for "All Equipment" for a particular year.

Year of Accident: 1995 | Get Information

Fatalities by Classification



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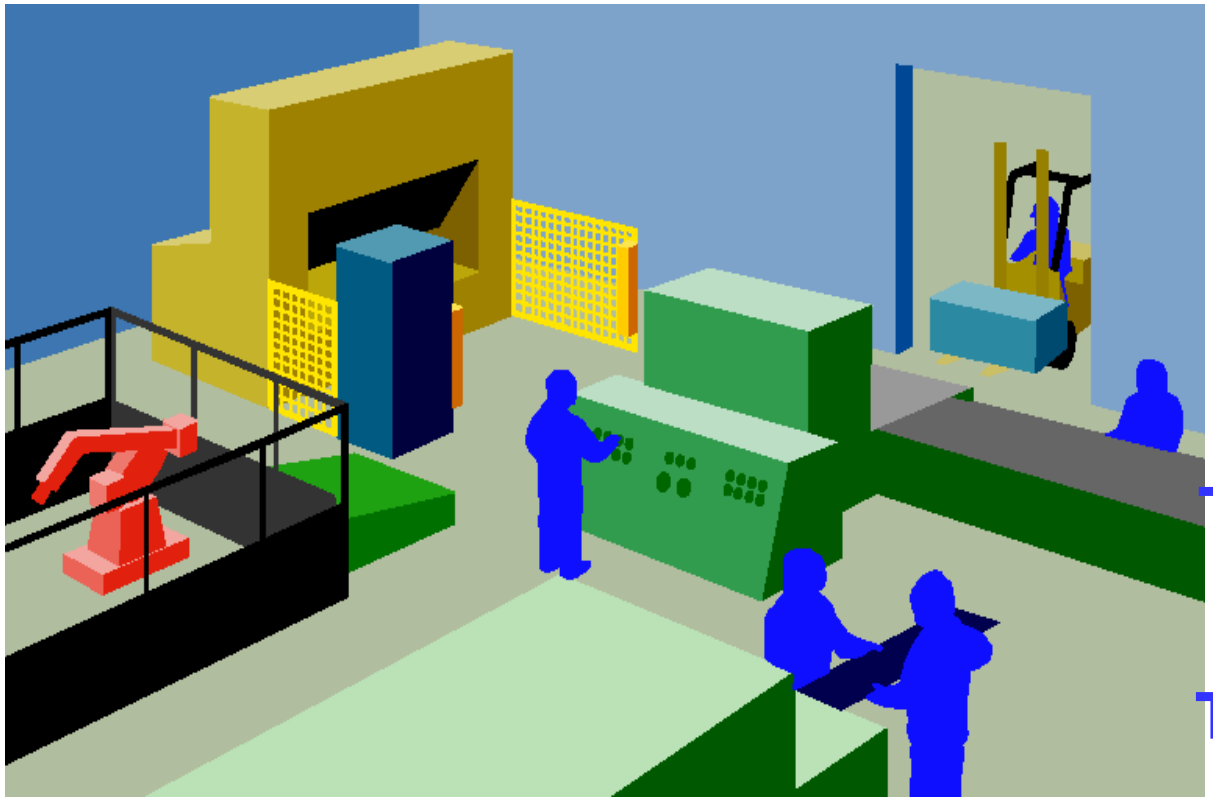
The complexity of the work system



The space

The equipment

The organization

The environment

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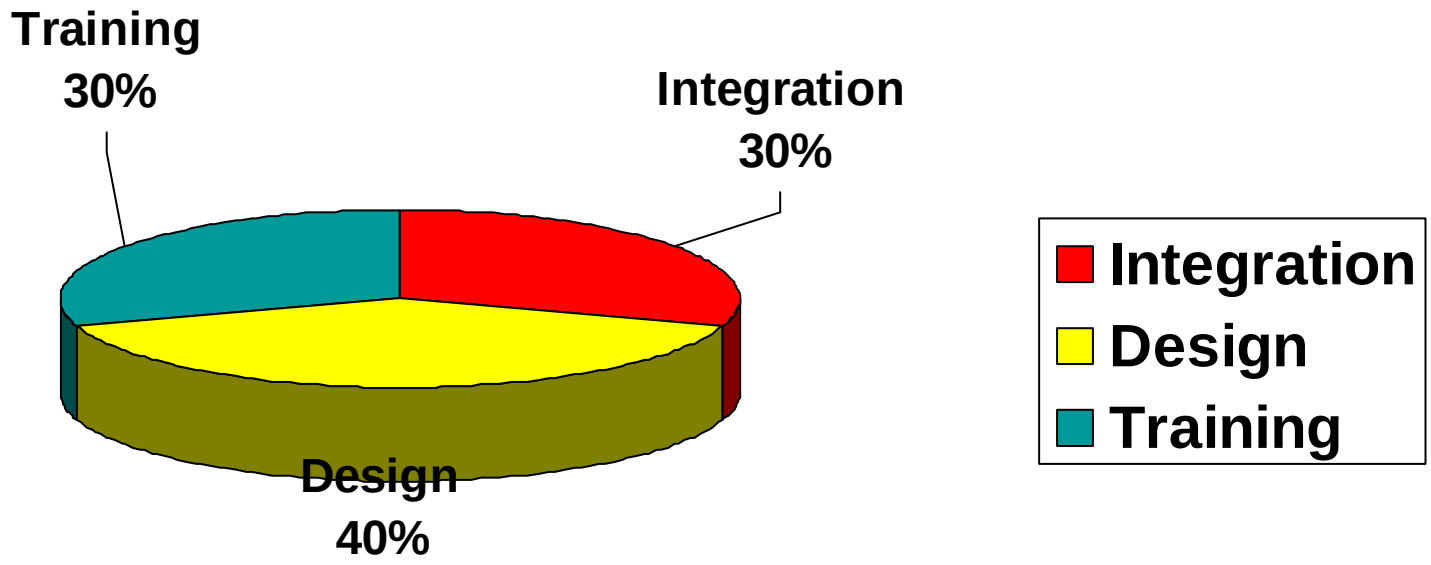
Leading causes classification



Root causes

- Poor original design or redesign
- Control-display layout
- Inadequate ingress/egress design
- Exposed sharp surfaces or pinch points
- Unguarded moving parts
- Restricted visibility

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Outline

- The context
- The problem
- **Possible solutions**
- The ETUI questions

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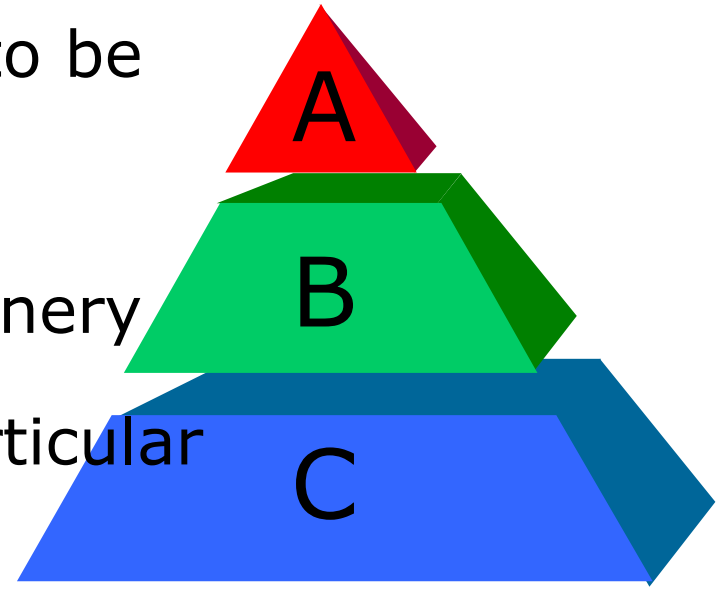
Possible solutions

Basic design concepts & principles to be applied to all machinery

Design guidance on safety aspects applicable to a wide range of machinery

Design guidance applicable to a particular machine or group of machines



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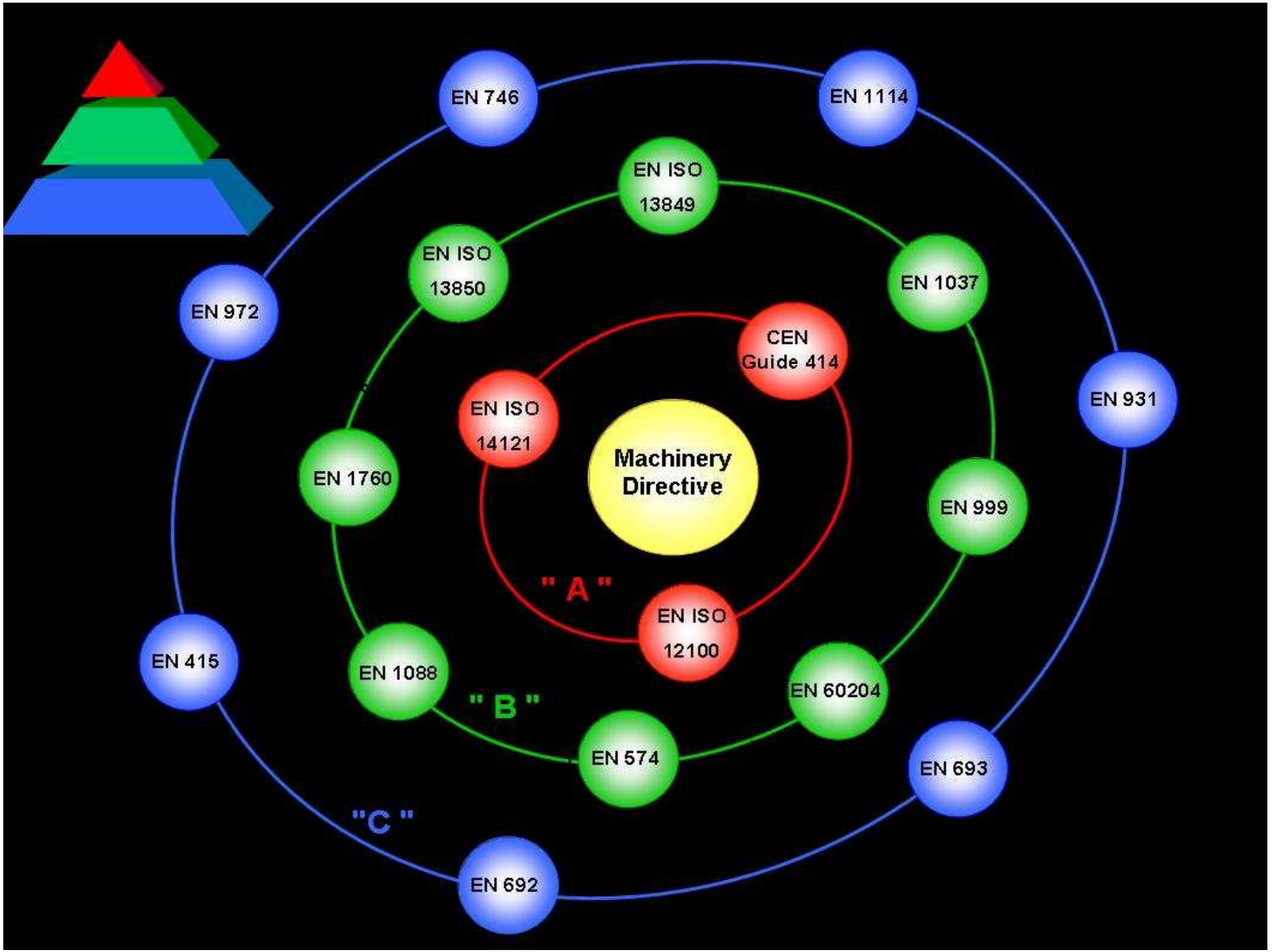
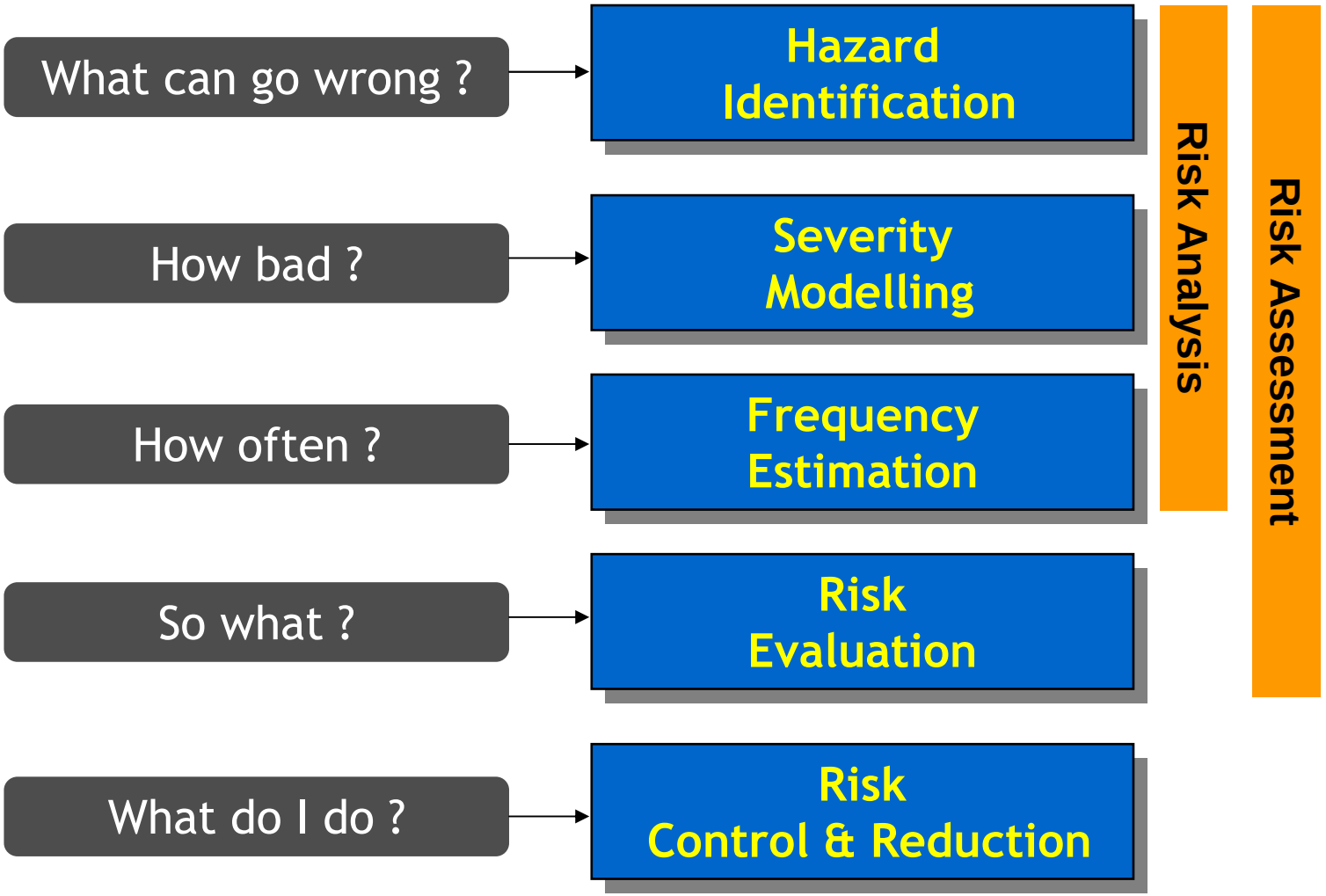

EN 746
EN 1114
EN ISO 13849
EN ISO 13850
EN 1037
EN 972
CEN Guide 414
EN 931
EN ISO 14121
Machinery Directive
EN 1760
EN 999
" A "
EN ISO 12100
EN 415
EN 1088
EN 60204
" B "
EN 574
EN 693
"C "
EN 692

The message of EN ISO 12100



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The message of EN ISO 12100

Hazard Identification

The designer shall identify hazards taking into account the following:

a) **human interaction** during the whole life cycle of the machine;
b) possible states of the machine (…)
c) unintended behaviour of the operator or reasonably foreseeable misuse of the machine, for example:
    1. loss of control of the machine by the operator (especially for hand-held or mobile machines) ;
    2. reflex behaviour of a person in case of malfunction, incident or failure during the use of the machine ;
    3. behaviour resulting from lack of concentration or carelessness;
    4. behaviour resulting from taking the "line of least resistance" in carrying out a task;
    5. behaviour resulting from pressures to keep the machine running in all circumstances;

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The message of EN ISO 12100

Severity Modelling

Frequency Estimation

Human factors

Human factors can affect risk and shall be taken into account in the risk estimation. This includes, for example:

1. interaction of person(s) with the machinery including correction of malfunction;
2. interaction between persons;
3. stress related aspects;
4. ergonomic aspects;
5. capacity of persons to be aware of risks in a given situation depending on their training, experience and ability;
6. fatigue aspects;
7. aspects of limited abilities (for example due to disability, age).

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The message of EN ISO 12100

Risk
Control & Reduction

Inherently safe design measures - Observing ergonomic principles

1. Ergonomic principles shall be taken into account in designing machinery to **reduce mental or physical stress and strain of the operator**. These principles shall be considered when allocating functions to operator and machine (degree of automation) in the basic design. It also improves the performance and reliability of the operation and hence it reduces the **probability of errors** at all stages of machine use.
2. Account shall be taken of body sizes likely to be found in the intended user population, strengths and postures, movement amplitudes, frequency of cyclic actions.
3. **All elements of the "operator-machine" interface** such as controls, signalling or data display elements, shall be designed to be easily understood so that clear and unambiguous interaction between the operator and the machine is possible.

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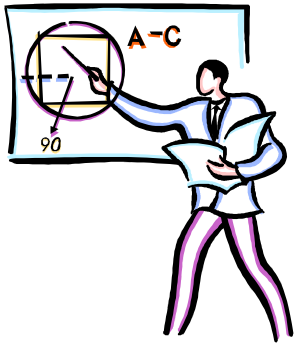
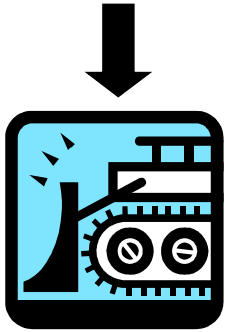
Risk assessment



Manufacturer

Design

Risk assessment



Employer

Use

Feedback in action

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Workgroups management sheet

Work phase:_____

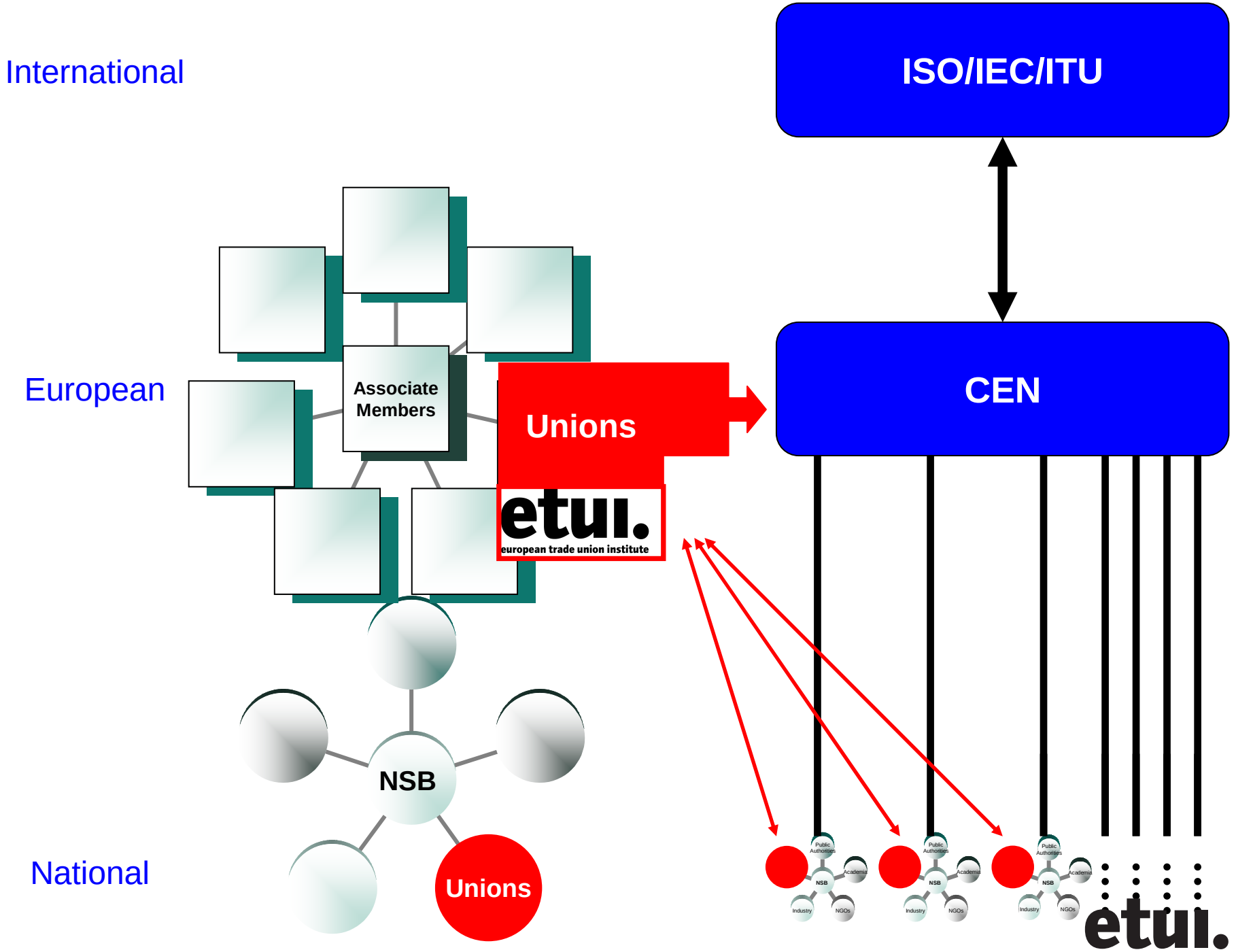
Order of tasks	**Operating Procedure** Description of the procedure for carrying out the tasks listed with information on the **equipment** used, **safety devices** and **personal protective equipment (PPE).**	**Competence** Information about the competence required for optimum execution of task (use of **equipment, materials**, **procedure** etc. and information about the instruction handbook).	**Hazards/Risks** Factors that represent a hazard as regards the machinery itself, equipment, safety devices, surrounding conditions (e.g. microclimate, dust, lighting or layout), fatigue and organisational factors (frequency, shifts etc.)**.**	**Suggestions for prevention** Notes on how to prevent the hazards identified and information on **training, the instruction handbook, safety devices, procedure, PPE**, etc.

Since ten years, ETUI uses an ergonomic method to collect the machinery operators knowledge and experience.

This knowledge is then elaborated and communicated to Employers, Designers, Authorities

The input into DESIGN is made via Standardization

This method is called Feedback


International
ISO/IEC/ITU
European
Associate Members
Unions
CEN
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european trade union institute
NSB
Unions
National
Public Authorities
Academia
Industry
NGOs
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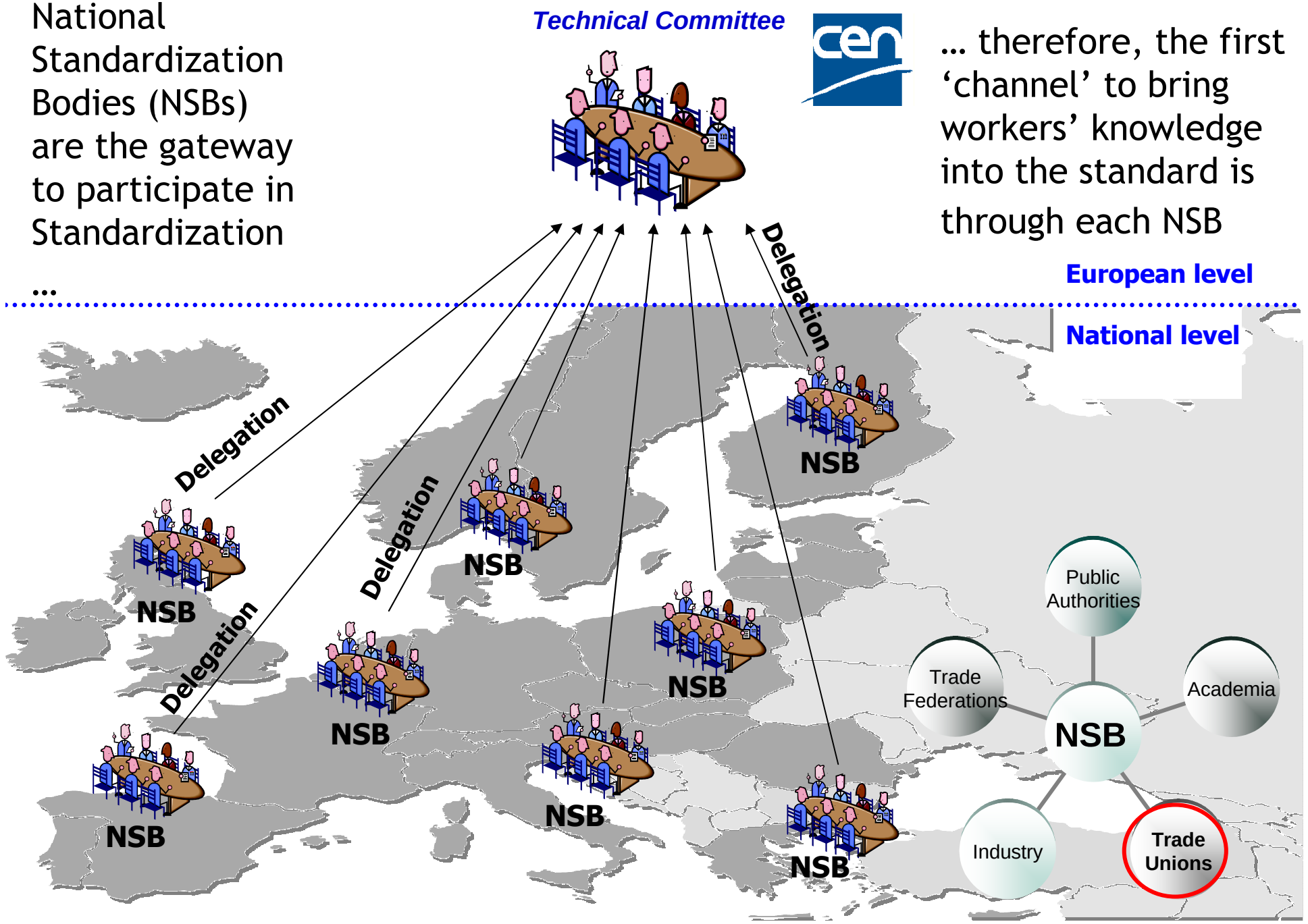
National Standardization Bodies (NSBs) are the gateway to participate in Standardization

…



The way forward

- Neglecting human-machine compatibility requires the greatest investment in operator training, and operator training is the less reliable line of defense against unwanted events. A “new deal” must be set up to bring ergonomics closer to machinery manufacturers

- How to design a system where the field experience (either coming from OHS bodies, final users, inspectors, market surveillance authorities) is centralized and elaborated in order to be shared with INDUSTRY?

- One possible model: collecting data from the field with adequate tools like FEEDBACK©, elaborating this data, and making it available to Designers

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Questions to the Panel

- What would be the most useful ways to have **risk assessment** intergrating users' knowledge with machinery ?
- How to avoid that cheaper machinery are sold incomplete, with essential safety devices offered as an **optional** extra ?
- How to make sure that the R.A. done by Manufacturers and Employers **converge** and complement each other ?

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About ETUI

http://hesa.etui-rehs.org/uk/dossiers/dossier.asp?dos_pk=19

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