

Risk Assessment Evaluation and Control

Lecture Title: Maintenance, Safe Systems

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**Undergraduate Diploma in
Occupational Health and Safety**

Lecture Aim

- To explain how Safe Systems of Work are developed and applied to control workplace risks effectively.



What Are Safe Systems of Work?

- Structured methods ensuring work is carried out safely
- Aim to minimise risks involved in tasks
- Necessary when hazards can't be eliminated by engineering controls



Why Safe Systems Are Needed

- Cannot rely solely on safe equipment
- Human interaction introduces risk
- High-risk tasks require formal systems

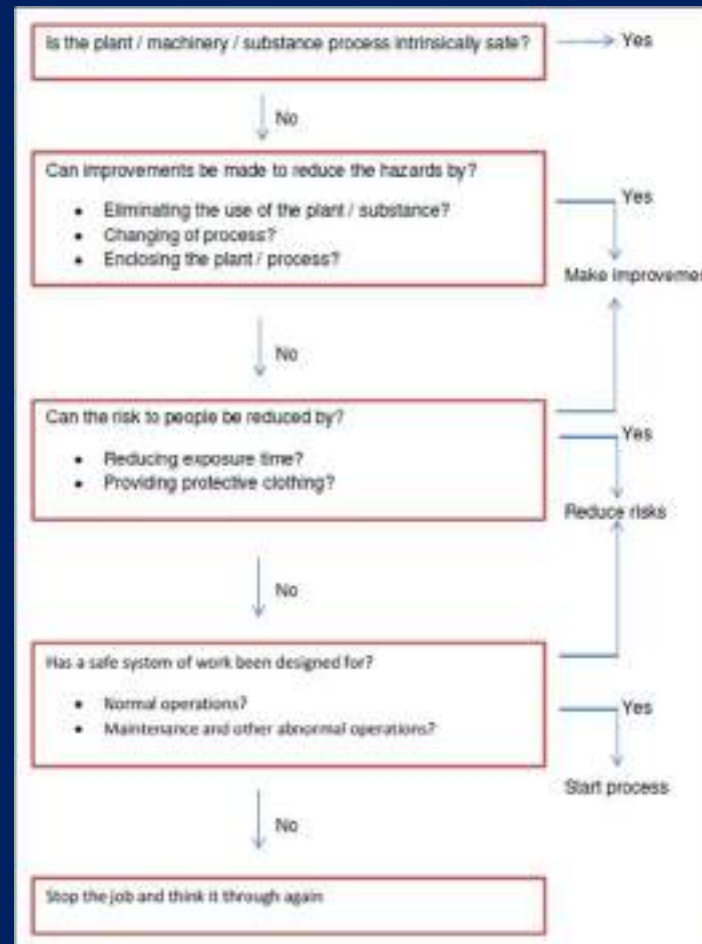


Characteristics of a Safe System

- Forethought (*careful consideration of what will be necessary or may happen in the future*).
- Planning
- Clear procedures
- Effective supervision



Safe System of Work



When Systems Must Be Written

- Complex/hazardous tasks
- Specialised machinery
- Maintenance operations
- Emergency procedures
- High-risk non-routine tasks

Can you think of a work activity in your experience that would require a safe system of work?



When Systems Must Be Written

- Complex/hazardous tasks
- Specialised machinery
- Maintenance operations
- Emergency procedures
- High-risk non-routine tasks

Examples:

- Changing machine blades
- Entering a confined space
- Working on live electrics
- Hot work in a flammable environment

Can you think of a work activity in your experience that would require a safe system of work?



Preparing a Safe System of Work

- Identify hazards
- Remove or reduce risks
- Improve design or safeguards
- Modify working practices
- Document method
- Train workers



Common Workplace Hazards

- Moving machinery
- Fire/explosion
- Hazardous substances
- Electricity
- Work at height
- Confined spaces
- Noise/heat/pressure
- Vehicles & contractors



Job Safety Analysis (JSA)

- Break job into steps
- Identify hazards
- Determine risk level
- Decide controls
- Develop safe method
- Train personnel



JSA Basic Procedure

- 1. Identify job
- 2. Break down tasks
- 3. Observe hazards
- 4. Assess risk significance
- 5. Establish controls
- 6. Write instructions
- 7. Train workers
- 8. Review regularly



Safe Systems Checklist

- What is the job?
- Who will do it?
- What risks are created?
- Special tools/PPE?
- Impact on others?
- Emergency needs?
- Permits required?
- Need revision?



Safe Systems Checklist

Sometimes a simple checklist is useful when devising a safe system of work for a particular defined operation. It can be used to highlight the critical points to be considered for a safe system of work which is to be as safe as is reasonably practicable.

The following questions need to be asked:

- What is the work/job to be done?
- What risks will be created by the job?
- Is the work/job essential?
- Can a safe method be found?
- Do any existing safe systems of work apply and if so are they satisfactory or outdated?
- Who will carry out the work?
 - Normal operators?
 - Maintenance personnel?
 - Contractors?
 - A combination of the above?
- Have the roles of the various people been set out clearly and communicated to those doing the work?
- Will they require special training?
- Who will be responsible for the work?
- Are any special tools, equipment or personal protective equipment required?
- Who will be responsible for supplying the necessary equipment?
- Can the machine be stopped or the material being processed be removed?
- Must the plant be shut down?
- Is it necessary to remove existing safeguards thus exposing persons to dangerous machinery or hazardous chemicals? If so, and special purpose or temporary safeguards cannot be used, what other precautions should be taken?
- Are special permits to work required? If so, who will authorise their issue?
- Are special isolation precautions required, for example:
 1. Lock off?
 2. Make a chemical inert?
 3. Insert blanks in pipes or remove a section of pipe?
- Will personal protection be required, example:
 1. Ear defenders?
 2. Respiratory protection?
 3. Special clothing?
- Will the work interfere with other machines or pieces of plant?



Example Safe System (Portable Sander)

- Unplug equipment
- Secure sander
- Open clamps correctly
- Insert abrasive paper
- Align properly
- Prepare for safe use



Training Requirements

- Personnel needing training:
 - Managers
 - Supervisors
 - Operators
 - Contractors
 - Covers hazards, legal roles, procedures, permits





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Compliance Checks

- Is the system adequate?
- Is it being followed?
- Checks: risks, controls, PPE, duties, tools, communication



Permit-to-Work: Purpose

- Used when routine procedures can't control hazards
- Ensures safe work, isolation, protection, compliance



When Permits Are Required

- Confined spaces
- Hot work
- HV electrical work
- Excavation
- Asbestos
- Hazardous pipelines



Confined Space Entry Summary

- Determine if entry required
- Isolate plant
- Test atmosphere
- Ventilate
- Specify PPE
- Issue permit
- Monitor continuously



Permit Layout Essentials

- Plant details
- Work description
- Isolation steps
- Remaining hazards
- Precautions
- Time limits
- Signatures



Permit-to-Work – Form Example

Plant details (location, identifying number etc.)	Acceptance of certificate I have read and understood this certificate and will undertake to work in accordance with the conditions in it.
Work to be done	Signed: _____ Date: _____ Time: _____
Withdrawal from service The above plant has been removed from service and persons under my supervision have been informed.	Completion of work The work has been completed and all persons under my supervision, materials and equipment withdrawn.
Signed: _____ Date: _____ Time: _____	Signed: _____ Date: _____ Time: _____
Isolation The above plant has been isolated from all sources of ingress of dangerous forces etc.	Request for extension The work has not been completed and permission to continue is requested.
Signed: _____	Signed: _____ Date: _____ Time: _____
The above plant has been isolated from all sources of electrical and mechanical power.	Extension I have re-examined the plant isolated above and confirm that the certificate may be extended to expire at: _____
Signed: _____	Further precautions:
The above plant has been isolated from all sources of heat.	Signed: _____ Date: _____ Time: _____
Signed: _____ Date: _____ Time: _____	
Cleaning and purging The above plant has been freed of dangerous materials.	The permit-to-work is now cancelled. A new permit will be required if work is to continue.
Materials:	Signed: _____ Date: _____ Time: _____
Method(s):	
Signed: _____ Date: _____ Time: _____	
Testing (Containments tested):	Return to service I accept the above back into service.
Results:	Signed: _____ Date: _____ Time: _____
Signed: _____ Date: _____ Time: _____	
I certify that I have personally examined the plant detailed above and satisfied myself that the above precautions are correct.	Notes
(1) The plant is safe for entry without breathing apparatus.	
(2) Breathing apparatus must be worn.	
Other precautions necessary:	
Time of expiry of certificate (Delete (1) or (2))	
Signed: _____ Date: _____ Time: _____	(Reverse A)

Roles & Responsibilities

- Senior authorised person
- Authorised person
- Competent person
- Specialists
- Supervisors



Training Topics

- Legal framework
- Permit types
- Authority levels
- Safety equipment
- Communication & documentation
- Air sampling procedures



Safe Maintenance



The graphic is a promotional leaflet for 'Safe Maintenance'. It features a black background with blue and white text. On the left, there are three numbered sections: '5 Basic Rules', '2 Maintenance Tasks', and '3 Key Hazards', each with a list of sub-points. On the right, a large statistic states '1 in 3 workplace deaths are caused by maintenance failures'. A diagonal banner at the top right says 'Dangers lurk in every workplace'. At the bottom, there is a call to action to visit the HSENI website or call a helpline, and a description of the leaflet as a five-step guide to safe maintenance. The HSENI logo and a partnership statement with the District Councils are also present.

! Safe Maintenance
Saves Time >> Saves Money >> Saves Lives

5 Basic Rules

- Planning
- Making the work area safe
- Using the appropriate equipment
- Working as planned
- Final Check

2 Maintenance Tasks

- Corrective
- Preventive

3 Key Hazards

- Asbestos
- Work at Height
- Isolation

1 in 3
workplace
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! Safe Maintenance
Saves Time >> Saves Money >> Saves Lives

Want to Know More? Additional information is available from the HSENI website www.hseni.gov.uk or via the helpline number 0800 0320 121

Your five-step guide to safe corrective and preventive maintenance in the workplace

hseni
Hazardous Substances and Environmental Noise Investigation
In partnership with the District Councils

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NHS

Safe Maintenance

What is maintenance?

Maintenance is carried out on buildings, plant, equipment and vehicles to enable it to perform the function required of it. Corrective repair and ongoing preventive maintenance tasks are carried out in all sectors and all workplaces.

Typical maintenance activities include:

- inspection • testing • measurement • replacement
- adjustment • repair • upkeep • fault detection
- replacement of parts • servicing • lubrication
- cleaning • clearing blockages • thorough examination

Saves	Facts
 Saves time	Time is saved by good preventive maintenance that keeps the working environment, buildings and machinery both safe and reliable. Lack of or inadequate maintenance leads to time consuming faults and the need for repairs.
 Saves money	Maintenance is critical to ensure continuous productivity, to deliver products of high quality and to keep a company competitive.
 Saves lives	Statistics prove maintenance is a high-risk activity, with maintenance workers more likely than other employees to be exposed to a range of hazards. In 2009/2010, one third of NI's workplace fatalities were related to maintenance activities.

The 5 basic rules to get it right

These five basic rules for safe maintenance provide common principles applicable to all industry sectors and tasks:

1. Planning
2. Making the work area safe
3. Using the appropriate equipment
4. Working as planned
5. Final Check

1 Planning

Maintenance should start with proper planning. Consulting workers and keeping them informed is vital throughout the planning stage including involvement in preparing risk assessments. Their participation increases not only maintenance safety, but also its quality, because of the workers familiarity with their work, its hazards and short cuts that may be taken.

Define the task

- What needs to be done? By whom?
- How will it affect other workers and activities in the workplace?
- Will it affect anyone outside the workplace?
- What problems or emergency situations may arise?



Do you need a licensed asbestos contractor?

Safe Maintenance



Many entrapment accidents result when loose clothing becomes entangled with moving machinery.

3

Using appropriate equipment

- Employers must provide the right tools and equipment for the job (with appropriate instructions in using it), in appropriate condition and suitable for the work environment (e.g. no sparking tools in flammable atmospheres).
- Maintenance equipment may be different from what is normally used e.g. hired equipment.
- **Personal Protective Equipment** must be appropriate for the task, without itself leading to any increased risk.

4

Working as planned

The work should be **monitored** by the person in charge so that the agreed safe systems of work and site rules are observed. Maintenance is often carried out under pressure – for example when a fault has brought the production process to a standstill. Safe procedures must be followed, **even when there is time pressure**. Shortcuts are costly – they lead to accidents, injuries, or damage to equipment.



Is a Mobile Elevated Working Platform (e.g. cherry picker) more appropriate than a ladder or makeshift scaffold?



Unstable ground caused a telehandler to overturn, injuring two painters. Their injuries have had long term life-changing consequences.

5

Making final checks

The maintenance process ends with checks:

- Has the task been completed?
- Has the item under maintenance been left in a safe condition?
- Has all waste material been cleaned away?
- When all is checked and declared safe, then the maintenance task is complete and normal operations can restart.



A rotating drive shaft ripped clothes off a young worker during the repair of machinery in a printing line.

Depending on the industry, hold a **review meeting** with the workers involved in the process to discuss the maintenance activity and suggest improvements. A **written report** may be produced to summarise the work, any difficulties encountered, and to make recommendations for improvement.

CDS 00270 June 2011



Safe Maintenance



Can machine guards be designed to allow minor maintenance without removing the safeguards?

Risk assessment

Pay particular attention to Asbestos, Work at Heights and Isolation from energy sources, dangerous or unstable machinery and locations. Potential hazards have to be identified and measures need to be developed to eliminate or minimise the risks. Hazards may be physical, chemical, biological, or psychosocial.

Safe systems of work

Define how the area will be made safe. Decide whether formal management systems are required to control the risks such as Signs and Physical Barriers; Safe Stop; Lock-Out Tag-Out; Control of Contractors; Permission to Proceed; Permits to Work. Procedures need to be in place for emergency situations.



Are hot areas cool enough for entry?

The time and resources

Before starting work, identify and provide the right equipment, sufficient competent staff and adequate time.

Communication

- Employers should decide who is in charge i.e. the 'chain of command' both for normal maintenance tasks and if unforeseen problems arise.
- Communicate appropriately with all parties. This is especially important if the maintenance is carried out by subcontractors who may not be familiar with your workplace or the consequences of their maintenance actions on others.



Maintenance is the most subcontracted function in industry.



Several men were exposed to asbestos when it was mishandled during a shop refurbishment project and the asbestos was spread across the site. Project costs soared and time was wasted due to the clean up operation.

Competence and adequate training

Employers must ensure that workers have the skills that they need to carry out the necessary tasks. Workers must be informed about safe work procedures, and receive on-site training if required. They must be clear about the chain of command and know what to do when a situation exceeds their competence or should a problem arise. It is very important to remember that exceeding the scope of your own skills and competence may result in accidents – especially if unfamiliar with hired equipment.



Can isolation be achieved by simply unplugging?

2

Making the work area safe

- Secure the work area to prevent unauthorised access, for example, by using barriers and signs.
- Keep the area clean and safe, with power locked-off, moving parts of machinery secured, temporary ventilation installed, and safe routes established for workers to enter and exit the work area.



Has your working platform adequate edge protection to prevent a fall?



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