

HEALTH AND SAFETY MANAGEMENT

**RISK ASSESSMENT
&
RISK MANAGEMENT**

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RISK ASSESSMENT

Process of analyzing a potential loss from a given hazard using a combination of known information about the situation, knowledge about the underlying process, and judgement about the information that is not known or well understood.



RISK ASSESSMENT

4 general steps:

1. Hazard identification
2. Evaluating exposure to a risk and adverse effects
3. Exposure assessment – evaluation of conditions that lead to exposure to a risk
4. Risk characterization – adverse effects, likelihood, and strength of evidence (e.g. use of probability and statistics)



HOW CAN WE ESTIMATE RISK?

- Historical data
- By modeling
- Breaking down the system (event trees or fault trees)
- Analogy with similar situations
- Combination of methods



RISK ASSESSMENT

		Severity/Consequence		
		Slightly harmful (1)	Harmful (2)	Extremely harmful (3)
Likelihood	Highly unlikely (1)	Trivial risk (Score 1)	Tolerable risk (Score 2)	Moderate risk (Score 3)
	Unlikely (2)	Tolerable risk (Score 2)	Moderate risk (Score 4)	Substantial risk (Score 6)
	Likely (3)	Moderate risk (Score 3)	Substantial risk (Score 6)	Intolerable risk (Score 9)



TECHNIQUES FOR RISK ASSESSMENT

- What-if analysis
- Check-list of known threats and hazards
- Hazard and operability study (HAZOP)
- Failure mode and effect analysis (FMEA)
- Fault tree analysis (FTA)



TECHNIQUES FOR RISK ASSESSMENT

What-if analysis

What could go wrong and could happen if it does go wrong

Brainstorming activity

Developed by people with Experience in the area, processes or exposed to hazardous events or conditions

Check-list

To ensure that all what-if questions are discussed

Creative approach to risk assessment

Both will help to identify threats and hazards



TECHNIQUES FOR RISK ASSESSMENT

Hazard and operability study (HAZOP)

Thorough analysis, time and cost consuming

Adequate for repetitive complex processes (e.g. industrial)

Identification of nodes and development of process flow diagrams

For each node, use of standardised guide-words and process parameters to identify potential deviations

For each deviation, feasible causes and likely consequences are identified

Decisions whether the existing safeguards are sufficient or needs additional action to reduce risk



TECHNIQUES FOR RISK ASSESSMENT

Guide Word	Meaning
NO OR NOT	Complete negation of the design intent
MORE	Quantitative increase
LESS	Quantitative decrease
AS WELL AS	Qualitative modification/increase
PART OF	Qualitative modification/decrease
REVERSE	Logical opposite of the design intent
OTHER THAN / INSTEAD	Complete substitution
EARLY	Relative to the clock time
LATE	Relative to the clock time
BEFORE	Relating to order or sequence
AFTER	Relating to order or sequence



RISK ASSESSMENT & RISK MANAGEMENT

Parameter / Guide Word	More	Less	None	Reverse	As well as	Part of	Other than
Flow	high flow	low flow	no flow	reverse flow	deviating concentration	contamination	deviating material
Pressure	high pressure	low pressure	vacuum		delta-p		explosion
Temperature	high temperature	low temperature					
Level	high level	low level	no level		different level		
Time	too long / too late	too short / too soon	sequence step skipped	backwards	missing actions	extra actions	wrong time
Agitation	fast mixing	slow mixing	no mixing				
Reaction	fast reaction / runaway	slow reaction	no reaction				unwanted reaction



TECHNIQUES FOR RISK ASSESSMENT

Failure mode and effect analysis (FMEA)

Identify potential failures and effect failures would have

Inductive reasoning

Select one system for analysis and then look at each element within the system

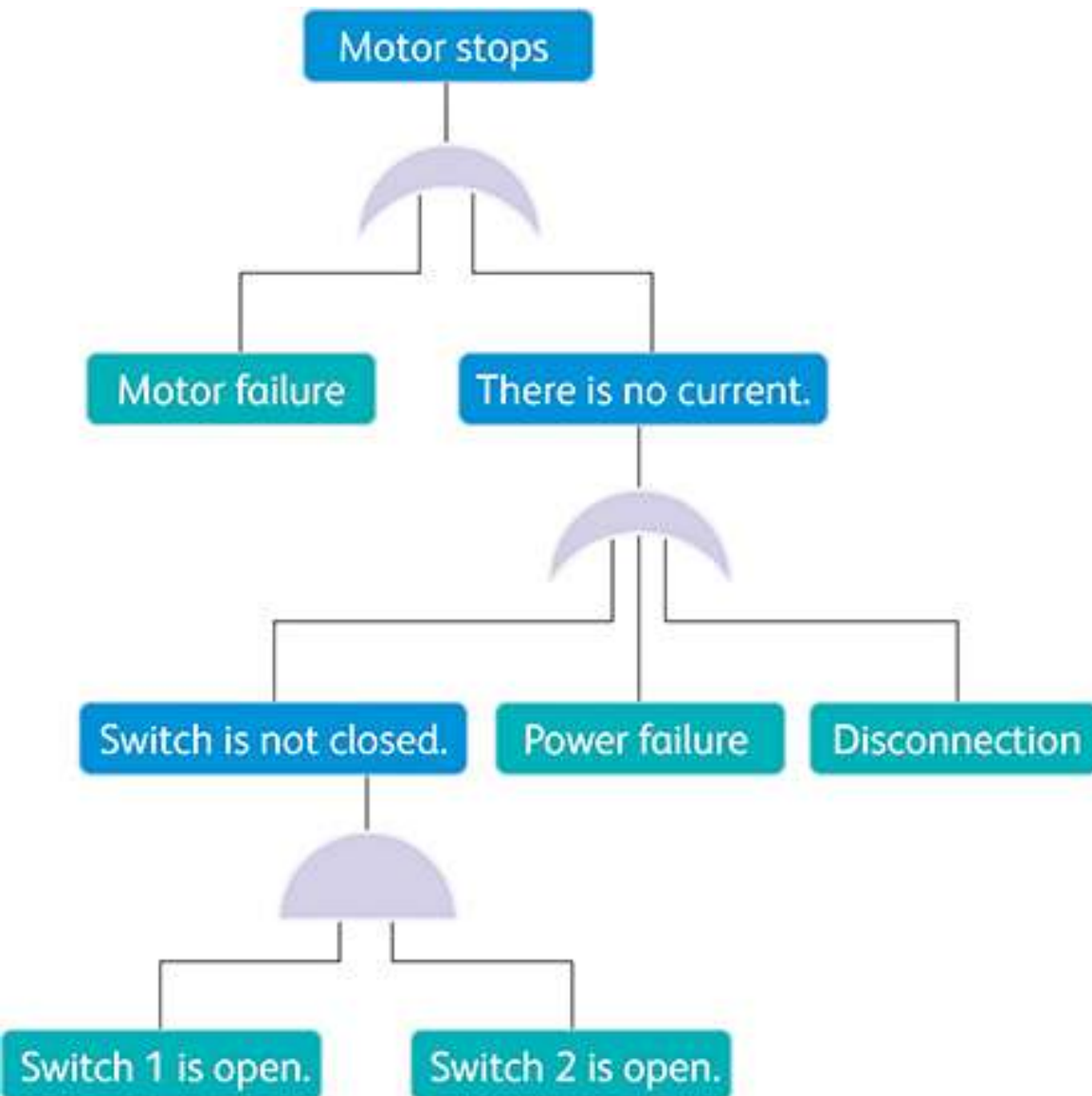
Try to predict what would happen to the system as a whole when one element fails

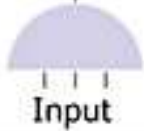
Applicable for Engineering. Often used for hardware failures

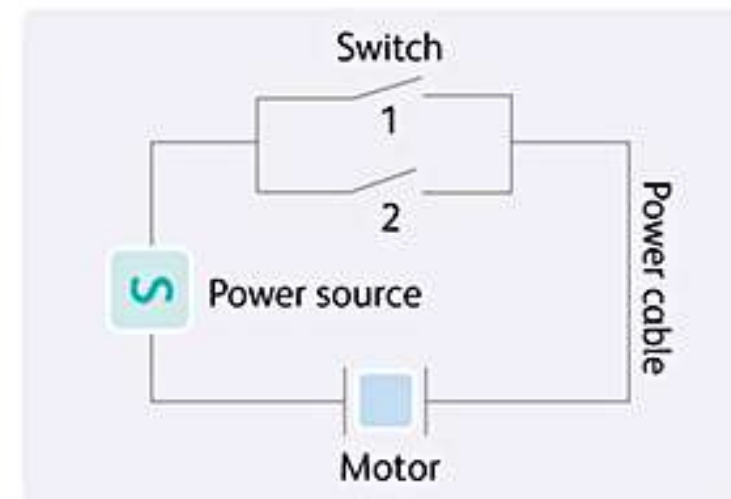


RISK ASSESSMENT

Fault tree analysis



Symbols	Names
	AND Logical multiplication
	OR Logical sum
	Phenomenon





RISK MANAGEMENT

Process of combining a risk assessment with decisions on how to address that risk, and doing so in ways that consider the technical and social aspects of the risk assessment.

Risk assessments provide information and insight to those who make decisions about how to manage risk.

Judgement and values in risk assessment

- To decide what techniques should be used to **describe and evaluate risk**

Judgement and values in risk management

- To decide the most effective and socially acceptable **solution to reduce risk**



RISK MANAGEMENT

1. Formulate the problem

(Identify risks, who is involved, in what context)

2. Perform the risk analysis

(likelihood and hazard)

3. Define the options

(What can be done to reduce risk)

4. Make sound decisions

(Best solutions and how to implement)

5. Implement decisions

6. Evaluate actions taken

**RISK
ASSESSMENT**

**RISK
MANAGEMENT**



RISK MANAGEMENT

UNCERTAINTY

Not always risk can be under control

There are unforeseen situations that happen

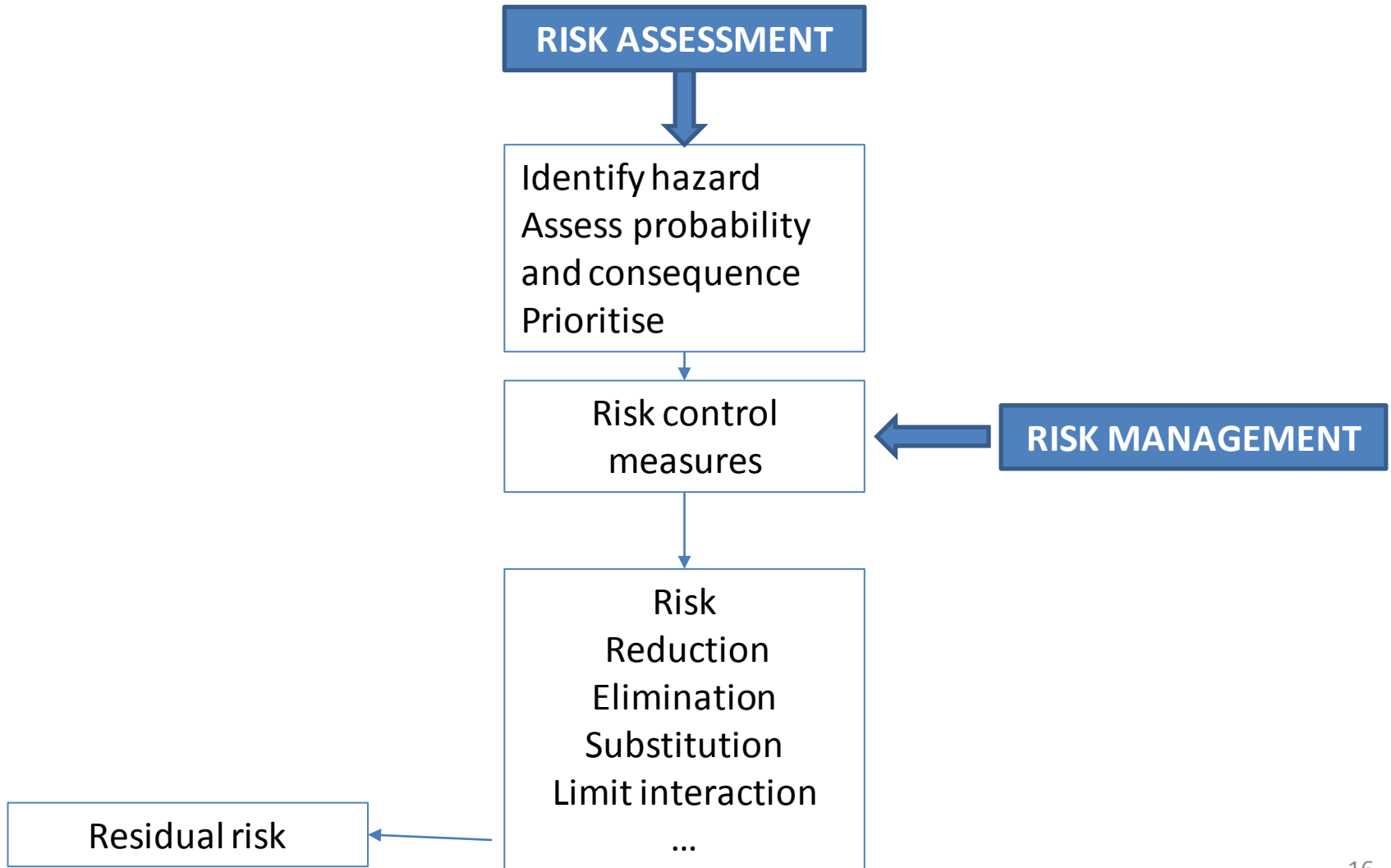
This is residual risk or uncertainty

The objective of risk management is to reduce uncertainty as much as possible



THE PROJECT RISK

Risk Management Process





RISK MANAGEMENT TEMPLATES

Item	Description	Risk			Without controls			Controls	Residual risk	Action
		H	M	L	Cost impact	Time impact	Other			

EXAMPLES

<http://www.hse.gov.uk/risk/>



IN SUMMARY...

BASIC STEPS TO MAKE YOUR RISK ASSESSMENT

1. Identify the hazards

- Walk around and think possible hazards
- Ask your employees/users
- Check manufacturers' instructions
- Look back at your accident and ill-health records
- Take account of non-routine operations
- Remember to think about long-term hazards to health
- Visit the HSE website (www.hse.gov.uk)



BASIC STEPS TO MAKE YOUR RISK ASSESSMENT

2. Identify who is at risk

- Identify groups of people
- Think how employees/users might be harmed
- Some workers may need particular requirements
- Identify people who might not be in all the time
- Look back at your accident and ill-health records
- Aware of shared spaces/multiple activities



BASIC STEPS TO MAKE YOUR RISK ASSESSMENT

3. Evaluate the risks

- Level of risk. Likelihood and harm caused
- Main risks to reduce or eliminate
- Look at what control measures you already have in place
- Solutions must be reasonably practicable
- Balance in terms of money, time or trouble
- No action to take if it would be grossly disproportionate to the level of risk
- You are not expected to anticipate unforeseeable risks



BASIC STEPS TO MAKE YOUR RISK ASSESSMENT

3. Evaluate the risks

- Some practical steps:
 - Trying a less risky option
 - Preventing access to the hazards
 - Organising your work to reduce exposure to the hazard
 - Issuing protective equipment
 - Providing welfare facilities (first aid, washing facilities, etc.)
 - Involving and consulting with workers



BASIC STEPS TO MAKE YOUR RISK ASSESSMENT

4. Record your significant findings

- Any paperwork you produce should help to communicate and manage the risks
- Use a template
- Keep it simple when writing
- It should show:
 - A proper check was made
 - You identified you might be affected
 - You dealt with the main hazards and people involved
 - Precautions taken are reasonable
 - The remaining risk is reasonable
 - Employees/users were involved



BASIC STEPS TO MAKE YOUR RISK ASSESSMENT

5. Regularly review your risk assessment

- From time to time, ask yourself:
 - Have there been significant changes?
 - Are there improvements you still need to make?
 - Have employees/users spotted a problem?
 - Have you learnt anything from accidents or near misses?
- Keep the risk assessment updated