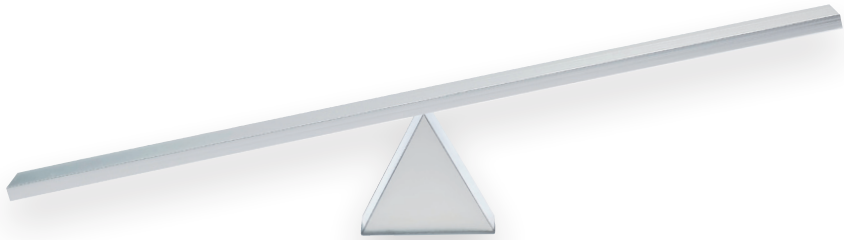
ENGINEERING COUNCIL



GUIDANCE ON RISK

for the Engineering Profession

www.engc.org.uk/risk

Engineering Council

This guidance describes the role of professional engineers and technicians in dealing with risk, and their responsibilities to society. It lists six principles to guide and motivate professional engineers and technicians in identifying, assessing, managing and communicating about risk.

1. **Apply professional and responsible judgement and take a leadership role**
2. **Adopt a systematic and holistic approach to risk identification, assessment and management**
3. **Comply with legislation and codes, but be prepared to seek further improvements**
4. **Ensure good communication with the others involved**
5. **Ensure that lasting systems for oversight and scrutiny are in place**
6. **Contribute to public awareness of risk**

Risk is referred to both explicitly and implicitly in several Engineering Council documents including the UK Standard for Professional Engineering Competence (UK-SPEC) and other associated documents. The Engineering Council will review this guidance periodically and welcomes comments on it. Professional Engineering Institutions may wish to use it to assist them in developing guidance for their members.

Risk

There are several definitions of risk. At its simplest, risk is the possibility of an adverse outcome. Risk is often expressed in terms of a combination of the consequences of a series of events and the associated likelihood of occurrence.

The probability, frequency of occurrence and impact of an event are factors which should be considered in any analysis of risk.

The role of engineering professionals

The engineering profession recognises that risk is inherent in the activities undertaken by its members. Professional engineers and engineering technicians[1] have a significant role to play in limiting or eliminating risk and there is a personal obligation on them to maintain and enhance their competence in their area of practice.

Risk is present in all engineering projects as a result of uncertainty as well as inherent hazards. Some elements of risk may be quantified, for example the databases that document component failures. Nevertheless, novel engineering projects will often involve a degree of uncertainty where previous experience offers an incomplete guide. In all cases, there is a need for engineers to exercise informed judgement and leadership in order to manage the risk, since excessive risk aversion will lead to technological stagnation and deny society potential benefits.

Society's perception of risk may differ from the engineer's, and therefore engineers should strive for clarity when communicating about risk, and communicate in terms understandable by non-specialists.

Through the effective management of risk, engineers should be able to:
- improve the reliability and effectiveness of their product, process or service
- minimise the impact of potential problems or adverse effects
- provide early warning of potential threats
- help ensure at least demonstrable compliance with regulation
- improve the resilience of their organisations
- maximise potential opportunities
- protect project revenue and enhance value for money
- articulate and manage the uncertainty surrounding the decisions being made

Risk management is also practised by other professions with whom engineers work in multi-disciplinary teams. Effective risk management is likely to produce more positive outcomes than avoiding risk altogether.

[1]Referred to in this document as 'engineers'

Principles to guide engineers

These six principles will guide an engineer when identifying, assessing, managing and communicating about risk, and help to ensure that risk issues are recognised as important considerations in all engineering activity. They may be included as part of an organisation's risk management policy, with risk management plans describing how the principles will be applied in that organisation.

A range of quantitative and systematic methods exist for the management of risk. However, the behaviour of people is central to any engineering enterprise, and this includes high-level management, the work force and the general public who can be expected to benefit, directly or indirectly. The control of risk will depend upon the support of those inside the organisation and the agreement of those outside. Hence the engineer will need to pay attention to human and cultural perspectives as well as purely technical aspects.

1

Apply professional and responsible judgement and take a leadership role

Engineers should demonstrate by example a commitment to safety, reliability and ethical conduct through the professional management of risk, from the inception of any project. Engineers at all levels should clearly demonstrate the standards by which they expect risks to be managed, thus setting an example to others. In doing so, engineers should:

- be prepared to challenge assumptions and proposals
- ensure that safety receives appropriate consideration
- assess the balance of risk and reward
- strive for all those involved to be able to identify potential problems and opportunities
- ensure that any engineer reporting to them has the opportunity to maintain competence in the area of risk
- lead others in improving practice

2 Adopt a systematic and holistic approach to risk identification, assessment and management

The factors that give rise to risk are interdependent and cannot be examined in isolation. It is vital in managing risk to be aware of this interdependency, and rather than dealing with risks one-by-one as they arise, use approaches that deal with whole systems. This requires engineers to:

- look beyond purely technical considerations, to address non-technical factors and include human, organisational and cultural perspectives
- make risk assessment and management an integral part of all engineering activity and decision making
- adopt a conservative decision making approach that is proportionate to the risk especially where a novel process is employed
- aim to quantify the risks with as much precision as is relevant, sufficient and can be supported by the evidence
- be responsive to changes in the operating environment
- look for connections, patterns and relationships between risks and opportunities
- consider the role that ergonomics can play in mitigating the risk of human error
- bear in mind that risk assessment should be used as an aid to professional judgement and not as a substitute for it
- be aware that developing over-elaborate procedures can lead to poor compliance and undermine the wider safety culture

Further information

A handy wallet card listing the six principles is available from the Engineering Council. Professional Engineering Institutions and other organisations produce materials related to identifying, assessing, managing and communicating about risk, some of which were referred to in the preparation of this guidance.

For further information visit: **www.engc.org.uk/risk**

3 Comply with legislation and codes, but be prepared to seek further improvements

Regulations and codes are generic. They can only deal with anticipated events, and cannot predict every possible situation. Engineers should take a measured, yet challenging approach to potential risks, whether or not regulations apply. Engineers should:

- act in accordance with codes of conduct
- know about and comply with the law in countries where they are operating or where their products will be used
- recognise and understand the intent behind standards and codes, and understand when their limits are being approached
- comply with current relevant legal requirements governing engineering risk issues
- seek advice where necessary
- where it is reasonably practicable, seek further improvements, thus embedding a culture of seeking continuous improvement
- be open-minded and avoid hiding behind regulations

4 Ensure good communication with the others involved

Shortcomings in communication are present in nearly all failures in the management of risk. Communicating effectively with customers, clients, suppliers, subcontractors and colleagues is important to ensure that risks and their implications are understood properly. Within an organisation, risk management should be communicated as a core value. Engineers should:

- establish strong, honest and effective two-way communication within and beyond their organisation
- establish a consultation and feedback process about risks with all stakeholders, including the public and local community
- express clearly the balance of risk and benefit
- encourage an 'open reporting' approach, and a spirit of questioning and learning from others
- avoid a 'good news only' or closed culture

5 Ensure that lasting systems for oversight and scrutiny are in place

Effective oversight and scrutiny processes are important safeguards in controlling risks. They should be challenging, and carried out with independence from those creating the risk or attempting to control it. Engineers should:

- ensure that effective oversight and scrutiny procedures are in place
- ensure that roles and responsibilities are understood, especially where functions are outsourced
- include scrutiny of culture and response to the management system, and ensure that audits are not limited to paper systems

6 Contribute to public awareness of risk

The perception of risk amongst the public is influenced by a range of factors, including emotional ones. Engineers have an important role in raising awareness and understanding about the real levels of risk and benefit, and helping to prevent mis-conceptions. Engineers should:

- be prepared to engage in public debate on the perceived risks and benefits
- ensure that discussion with the public includes risk and its management, and the interdependence of risk factors under consideration
- ensure that the concepts of 'risk and reward' are communicated
- recognise the social, political and economic implications in the risk assessment and acknowledge them publicly
- explain the quantitative aspects of risk with clarity and supporting evidence
- be honest and clear about uncertainties, and be prepared to challenge mis-representations

Engineering Council
recognising professional excellence

246 High Holborn
London WC1V 7EX

T +44 (0)20 3206 0500
F +44 (0)20 3206 0501
info@engc.org.uk
www.engc.org.uk

Registered Charity: 286142
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