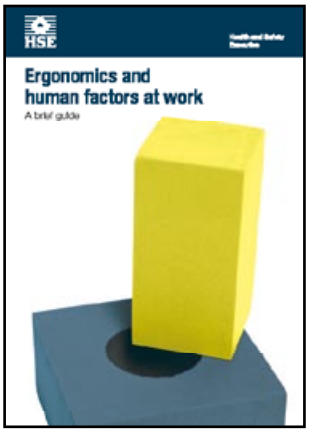
Ergonomics and human factors at work

A brief guide



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Introduction

This leaflet is aimed at employers, managers and others and will help you understand ergonomics and human factors in the workplace. It gives some examples of ergonomics problems and simple, effective advice about how to solve them.

You may have heard the term 'ergonomics'. In some industries, such as major hazards, defence and transport, ergonomics is also called 'human factors'. This leaflet helps to explain how applying ergonomics can improve health and safety in your workplace.

Ergonomics is a science concerned with the 'fit' between people and their work. It puts people first, taking account of their capabilities and limitations. Ergonomics aims to make sure that tasks, equipment, information and the environment fit each worker.

To assess the fit between a person and their work, you have to consider a range of factors, including:

The job/task being done:

- The demands on the worker (activities, workload, work pacing, shiftwork and fatigue).
- The equipment used (its design in terms of size, shape, controls, displays, and how appropriate it is for the task).
- The information used (how it is presented, accessed, and changed).
- The physical environment (temperature, humidity, lighting, noise, vibration).

The individual's physical and psychological characteristics:

- Body size and shape.
- Fitness and strength.
- Posture.
- The senses, especially vision, hearing and touch.
- Mental abilities.
- Personality.
- Knowledge.
- Training.
- Experience.

The organisation and social environment:

- Teamwork and team structure.
- Supervision and leadership.

- Supportive management.
- Communications.
- Resources.

You will find a range of physical and psychological abilities in your workforce which you may need to take into account in designing the plant and equipment they use, and the tasks they perform.

By assessing people's abilities and limitations, their jobs, equipment and working environment and the interaction between them, it is possible to design safe, effective and productive work systems.

How can ergonomics and human factors improve health and safety?

Applying ergonomics to the workplace can:

- reduce the potential for accidents;
- reduce the potential for injury and ill health;
- improve performance and productivity.

Taking account of ergonomics and human factors can reduce the likelihood of an accident. For example, in the design of control panels, consider:

- the location of switches and buttons – switches that could be accidentally knocked on or off might start the wrong sequence of events that could lead to an accident;
- expectations of signals and controls – most people interpret green to indicate a safe condition. If a green light is used to indicate a 'warning or dangerous state' it may be ignored or overlooked;
- information overload – if a worker is given too much information they may become confused, make mistakes, or panic. In hazardous industries, incorrect decisions or mistaken actions have had catastrophic results.

Ergonomics can also reduce the potential for ill health at work, such as aches, pains and damage to the wrists, shoulders and back, noise-induced hearing loss and work-related asthma. Consider the layout of controls and equipment – they should be positioned in relation to how they are used. Place those used most often where they are easy to reach without the need to stoop, stretch or hunch. Making sure protective measures such as extraction hoods or respirators are easy and comfortable to use means they are more likely to be effective at reducing exposure to hazardous substances.

If you don't follow ergonomics principles, there may be serious consequences for people and whole organisations. Many well-known accidents might have been prevented if ergonomics and human factors had been considered in designing people's jobs and the systems they worked in.

What kind of workplace problems can ergonomics and human factors solve?

Ergonomics is typically known for solving physical problems. For example, ensuring that emergency stop buttons are positioned so that people can reach them readily when they need to. But ergonomics also deals with psychological and social aspects of the person and their work. For example, a workload that is too high or

too low, unclear tasks, time pressures, inadequate training, and poor support from managers can all have negative effects on people and the work they do.

The following examples highlight some 'typical' ergonomic problems found in the workplace:

Design of tasks

- Work demands are too high or too low.
- The employee has little say in how they organise their work.
- Badly designed machinery guards (awkward to use or requiring additional effort) slow down the work.
- Conflicting demands, eg high productivity and quality.

- These problems can lead to employees failing to follow procedures or removing guards, causing accidents, injury and ill health. For more information see www.hse.gov.uk/humanfactors/index.htm.

Manual handling

- The load is too heavy and/or bulky, placing unreasonable demands on the person.
- The load has to be lifted from the floor and/or above the shoulders.
- The job involves frequent repetitive lifting.
- The job requires awkward postures, such as bending or twisting.
- The load can't be gripped properly.
- The job is performed on uneven, wet, or sloping floor surfaces.
- The job is performed under time pressures and doesn't include enough rest breaks.

These problems may lead to physical injuries, such as low back pain or injury to the arms, hands, or fingers. They may also contribute to the risk of slips, trips, and falls. For more information on manual handling, see www.hse.gov.uk/msd/index.htm.

Workstation layout

- Items that are used frequently are out of convenient reach.
- Inadequate space under work surface for legs.
- Work surface height inappropriate for the tasks causing awkward and uncomfortable postures.
- Lighting inadequate causing eyestrain when inspecting detail on work items.
- Chair not properly adjusted to fit the person and workstation.

Managing the working day

- Not enough recovery time between shifts.
- Poor scheduling of shifts.
- Juggling shifts with domestic responsibilities.
- Employees working excessive overtime.

These problems may lead to tiredness or exhaustion, which can increase the likelihood of accidents and ill health. For more information see www.hse.gov.uk/humanfactors/index.htm.

How can I check if there are ergonomics problems?

Checking for human factors problems is part of your normal risk assessment process. The first step in a risk assessment is to identify the hazards. This can be done by talking to employees and seeking their views, walking around your workplace to see if you can spot any hazards, and reviewing any accidents or reports of ill health you have had in the past. You may find useful information about common ergonomics problems in your industry on HSE's website.

Talking to employees

Workplaces where employees are involved in taking decisions about health and safety are safer and healthier. Collaboration with your employees helps you to manage health and safety in a practical way by:

- helping you spot workplace risks;
- making sure health and safety controls are practical;
- increasing the level of commitment to working in a safe and healthy way.

You are legally required to consult all your employees, in good time, on health and safety matters. In workplaces where a trade union is recognised, this will be through union health and safety representatives. In non-unionised workplaces, you can consult either directly or through other elected representatives.

Consultation involves employers not only giving information to employees but also listening to them and taking account of what they say before making health and safety decisions. Employees have important knowledge of the work they do, problems they have, and their impact on health, safety, and performance. While talking to them, you could also ask them some specific questions about their work such as:

- are their working postures comfortable (or not)?
- do they experience discomfort, aches, pain, fatigue, or feel unable to keep up with the flow of work?
- is the equipment appropriate, easy to use and well maintained?
- is the person satisfied with their working arrangements?
- do they make the same errors and mistakes repeatedly?
- are they following procedures, and if not, why not?

Hazard spotting

While you walk around your workplace, look for signs of poor or inadequate equipment design such as:

- improvised tools;
- handwritten reminders, or handwritten labels on machinery controls;
- plasters on workers' fingers or 'home-made' protective pads made of tissue or foam.

Review

Review information you may already have about accidents and ill health which may result from human factors problems:

- Look at the circumstances that lead to frequent errors or incidents. Try to identify the root causes of people's mistakes. Use accident reports to identify details of incidents and their possible causes.

- Record and look at sickness absence and staff turnover levels. High numbers may be because of the problems listed earlier and/or dissatisfaction at work.

What can I do if I think I have identified an ergonomics problem?

- Talk to employees and get them to suggest ideas and discuss possible solutions. Involve employees from the start of the process – this will help them to adopt changes.
- Look for likely causes and consider possible solutions. A minor alteration may be all that is needed to make a task easier and safer to perform. For example:
  - arrange items stored on shelving so those used most frequently and those that are the heaviest are between waist and shoulder height;
  - raise platforms to help operators reach badly located controls (or alternatively relocate the controls);
  - remove obstacles from under desks so there is enough leg room;
  - provide height-adjustable chairs, so individual operators can work at their preferred work height;
  - change shift work patterns;
  - introduce job rotation between different tasks to reduce physical and mental fatigue.
- Always make sure any alterations are properly evaluated by the people doing the job. Be careful that a change introduced to solve one problem doesn't create difficulties somewhere else.
- You should be able to identify straightforward, inexpensive changes yourself. But you may need to ask a qualified ergonomist if you can't find a straightforward solution or if a problem is complex.
- Adopting an ergonomics and human factors approach can save money in the long term by avoiding costly accidents, reducing injuries, reducing sickness absence, and improving quality and productivity.
- There is a list of relevant HSE guidance at the end of this leaflet, including practical evaluation checklists and advice.

Case study 1

Eddie works on an engine assembly line. He uses a handheld impact wrench to fit a component to an engine. The assembly line makes up to 2400 engines a day and it takes approximately 3 seconds to tighten each component.

As well as the risk from using a vibrating tool, Eddie often had to adopt poor postures to reach some parts of the engine. He had to repeatedly stretch out his arm and constrain his posture while tightening the adapter. After a few weeks Eddie found that he was leaving work with shoulder and neck pain. One tea break, Eddie's line manager saw him rubbing his neck and shoulder and recognised that the pain could be due to the type of work Eddie was doing. The line manager spoke with Eddie and then told the company health and safety officer about what she had seen.

The company assessed the work by considering ergonomics principles and, after getting ideas from the workforce, came up with the following modifications:

- They replaced the impact wrench with one with minimal reaction force so that little shock was transmitted to the hand. They also suspended the wrench so Eddie didn't have to support its weight.
- They modified the workplace layout so workers had better access to all sides of the engine, avoiding the need to adopt poor working postures.
- They implemented a job rotation scheme so the five workers on the line were moved around a number of different tasks.

Some of these tasks still required the use of vibrating tools, but the overall personal exposure was halved. As a result of the modifications there was:

- a reduction in vibration exposure;
- no need to adopt poor and constrained postures;
- reduced boredom and fatigue for Eddie's team;
- improved productivity.

Case study 2

Julie is a receptionist at a bank. Much of her work involves using a telephone to take messages and redirect calls to other departments. Julie regularly uses a computer to make appointments, record messages and respond to emails.

After working at reception for eight months, Julie found she was leaving work with an aching shoulder and neck, and with sore eyes and a headache. Julie talked about the problems with her manager, who decided to review how computers were used in reception.

Her manager carried out a DSE assessment, and also looked at the work Julie was doing at reception.

- The DSE assessment identified that Julie's computer screen was difficult to read because of glare and reflections from light through the window. This meant that she would repeatedly adjust her posture to view the screen.
- In addition, her manager also identified that Julie would often hold the telephone between her shoulder and ear while talking on the phone and typing a message on the computer. She regularly adopted this awkward posture during her working day.

The assessment led to the introduction of simple, cost-effective measures to reduce the risks:

- With the help of her manager, Julie rearranged her workstation so that the screen no longer faced the window, to remove the glare.
- An eye test to establish if Julie had any problems with her vision.
- A hands-free telephone headset was provided, which helped eliminate Julie's neck and shoulder problems.

As a result, Julie's health problems diminished, and her productivity increased.

Case study 3

An operative's hand was amputated after he became trapped in packaging machinery while trying to clear a blockage. The machine was part of a production line. Workers were protected by a fence that enclosed several production lines. Access to the machines was through a door in the fence which was arranged so that all production lines were switched off when it opened. Managers regularly visited the shop floor to talk about production targets.

The workers had obtained an override key, so they could open the door and enter the enclosure without stopping production. But this meant the machinery was not isolated.

Following the accident, these measures were identified to help prevent a recurrence:

- consulting workers about how and why the maintenance procedures were difficult to follow;
- installing local guards so workers could isolate individual machines without stopping the other production lines;
- holding toolbox talks with the workforce to better communicate management's commitment to safe working.

As a result of these changes, employees were less likely to take short cuts when clearing blockages. There was also less down time on the production lines which improved productivity.

Where can I get more information?

HSE publishes more detailed guidance on ergonomics and human factors in *Reducing error and influencing behaviour* HSG48 (Second edition) HSE Books 1999 ISBN 978 0 7176 2452 2 www.hse.gov.uk/pubns/books/hsg48.htm

There is more information on specific topics on the HSE website: www.hse.gov.uk/humanfactors/index.htm.

For names of ergonomics practitioners:

Institute of Ergonomics & Human Factors, Elms Court, Elms Grove, Loughborough, LE11 1RG Tel: 01509 234904 Website: www.ergonomics.org.uk
E-mail: iehf@ergonomics.org.uk

Relevant HSE publications

Consulting employees on health and safety: A brief guide to the law Leaflet INDG232(rev1) HSE Books 2008 www.hse.gov.uk/pubns/indg232.htm

See the worker involvement website for more information on consulting with your employees (www.hse.gov.uk/involvement).

Lighting at work HSG38 (Second edition) HSE Books 1998 ISBN 978 0 7176 1232 1 www.hse.gov.uk/pubns/books/hsg38.htm

Aching arms (or RSI) in small businesses: Is ill health due to upper limb disorders a problem in your workplace? Leaflet INDG171(rev1) HSE Books 2003 www.hse.gov.uk/pubns/indg171.htm

Managing the causes of work-related stress: A step-by-step approach using the Management Standards HSG218 (Second edition) HSE Books 2007 ISBN 978 0 7176 6273 9 www.hse.gov.uk/pubns/books/hsg218.htm

Manual handling at work: A brief guide Leaflet INDG143(rev3) HSE Books 2012 www.hse.gov.uk/pubns/indg143.htm

Manual handling: Solutions you can handle HSG115 HSE Books 1994 ISBN 978 0 7176 0693 1 www.hse.gov.uk/pubns/books/hsg115.htm

Reducing error and influencing behaviour HSG48 (Second edition) HSE Books 1999 ISBN 978 0 7176 2452 2 www.hse.gov.uk/pubns/books/hsg48.htm

Seating at work HSG57 (Third edition) HSE Books 1998 ISBN 978 0 7176 1231 4 www.hse.gov.uk/pubns/books/hsg57.htm

Upper limb disorders in the workplace HSG60 (Second edition) HSE Books 2002 ISBN 978 0 7176 1978 8 www.hse.gov.uk/pubns/books/hsg60.htm

Working with VDUs Leaflet INDG36(rev3) HSE Books 2006 www.hse.gov.uk/pubns/indg36.htm

Workplace health, safety and welfare: A short guide for managers Leaflet INDG244(rev2) HSE Books 2007 www.hse.gov.uk/pubns/indg44.htm

See the risk assessment website for more information about risk assessment (www.hse.gov.uk/risk/index.htm).

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This leaflet is available in priced packs from HSE Books, ISBN 978 0 7176 6473 3. A web version can be found at www.hse.gov.uk/pubns/indg90.htm.

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