

## Construction Industry Council CDM Guidance for Designers

### Designing to reduce the potential for musculo-skeletal injury while constructing the works

## Health Guidance Series

# H 20.001

### INTRODUCTION

1. Designers can play a major part in minimising workers' exposure to operations, which may cause or contribute to musculo-skeletal injury [MSI].
2. All construction projects involve the bringing together, transporting and placing of materials. These activities are all site related and as such are frequently ignored by designers of works when assessing risks of ill health to those constructing the works. Generally, the processes used by the contractor will be the most cost effective ones (to him).
3. The majority of ill-health experienced by site workers is caused by the following:
  - a) Lifting heavy or awkward materials or equipment;
  - b) Carrying out repetitive strenuous activities;
  - c) Using damaging equipment; or
  - d) Working in awkward positions.
4. It is not acceptable for the designer to simply carry out his design and then expect the contractor to control all the risks resulting from the design, on site.

### HAZARDS ASSOCIATED WITH LIFTING, ETC

5. When workers have to operate under any of the conditions listed in 3, the body is put under strain. If the condition is too strenuous, the worker is exposed to the risk of MSI, which could manifest as strains and sprains, causing short-term discomfort or, in more serious cases, long-term injury. Constant exposure to overstraining could be cumulative, meaning that a worker never recovers fully, leading to permanent disability.

### WHAT DESIGNERS SHOULD DO

6. Designers, through their early involvement in projects, are ideally placed to reduce the incidence of MSI, by eliminating or minimising the hazardous conditions listed in 3.
7. This may be achieved in two ways:
  - a) Controlling the hazard by design; or
  - b) Providing adequate information to allow the hazard to be effectively managed by a contractor.
8. It may also be possible to control hazards indirectly by influencing the project specification, selection of contractors and so on.

### Controlling the hazard by design

9. At the design stage, designers should assess the risks to health introduced by their requirements and change the details if necessary. In certain circumstances it may be possible to discuss, with a contractor, the construction methods likely to be employed. If not, designers will need to consider how the work is likely to be constructed.

10. Generally, overall design concepts should, as far as possible, reduce the need for long duration repetitive or strenuous activity.

11. Some of the common construction operations, in which operatives are exposed to MSI are given in 17. Generally, designers should consider details, which avoid these operations. For example, designers should consider:

- a) Eliminating the need for manhandling heavy components, eg, high density blocks – see Technical Series **T 20.015 Concrete blocks**.
- b) Designing to allow use of plant for materials handling and processing rather than manual methods, ie:
  - i) by using layouts, which provide sufficient space for mechanical plant, and
  - ii) by detailing, components so that their sizes are compatible with machines currently available;
- c) Not specifying operations, which require
  - i) hand-held tools, which vibrate, eg, needle guns, power saws, etc, or
  - ii) tools, which are heavy or awkward to use, eg, concrete drills, pneumatic breakers; because they are likely to contribute to MSI;
- d) Not specifying operations, which will require people to work in awkward or cramped conditions. Information on anthropomorphic (human body) measurements is widely available;
- e) Detail the works to allow for maximum off-site prefabrication, eg:
  - i) using reinforcing mesh instead of individual bars wherever possible,
  - ii) detailing reinforcement to allow fabrication in a more accessible situation;
- f) Dimension the works to allow the use of non-hand held tools for cutting, excavation and compaction. For example:
  - i) Trench widths should be sized to allow remotely controlled compaction,
  - ii) Trench widths should not be narrower than minimum excavator bucket sizes,
  - iii) Detail reinforcing mesh so that it arrives on site at the correct size, rather than to be cut on site;

12. Layouts, dimensions of buildings and structures and clearances should allow good access for building and maintenance tasks, for example:

- a) Heights of work should fit with module sizes of temporary works equipment [TWE] – see Technical Series **T 20.006 Temporary Works Equipment**.
- b) Corridor widths should allow use of mobile TWE;
- c) Service runs could be designed to be at heights, which fit in with TWE module sizes;
- d) Service runs should be detailed with enough space around them, so that they can be grasped properly;

### Controlling hazards by information

13. When it is not possible to eliminate the hazards, it is essential that this is communicated to the contractor and others involved in the project. Designers must supply

relevant information on residual hazards. This can be communicated through meetings, noted on drawings and must be included in the Health and Safety Plan.

14. Some examples of how the designer might be able to help are given in Table 1. Note that this table is not exhaustive and is for guidance only. It is for the designer to identify the risks and to set out appropriate control methods.

**TABLE 1 Examples of risk control measures**

Activity	Health Risk	Possible Control Measure
Laying block pavements	WRULD	Design for machine laying: space, component size, etc
Brick laying	WRULD	Design to reduce long duration repetition
Tying reinforcement	WRULD Back injury	Use welded mesh; detail to allow prefabrication and lifting in.
Block laying	Back injury	Use lighter blocks
Materials Handling	Back injury	Adequate space for available machines; Specify low weight packages
Working in small or awkward spaces	Back injury & Other MSIs	Dimension: height, width, to fit modules of TWE; Size rc components to minimise pushing /pulling while fixing re-bar.
Use of hand tools, eg, a) in rc work, b) compaction	HAVS	Design for: a) use of crack-inducers; or non-scabbled joints; b) Remote compaction
Pile cropping	HAVS	Design spacing and pile re-bar for machine cropping
Cutting, eg, a) chases, b) joints in rc, c) blocks, etc	HAVS	a) Provide ducts, detail box-outs, b) Use crack inducers, c) minimise number of cuts

Note: WRULD work-related upper limb disorder  
HAVs hand arm vibration syndrome

**BACKGROUND INFORMATION ON MUSCULO-SKELETAL INJURY [MSI]**

15. MSI is a cumulative disorder, caused by continuous exposure to the conditions, which cause it – see 3. In its advanced stages it can be extremely painful and debilitating, sometimes rendering sufferers disabled.

16. Generally, any activity, which requires a person to work under strain or in an unergonomic position, is likely either to cause or contribute to MSI.

17. Construction operations in which workers are particularly exposed to MSI include:
- a) Bricklaying – high density blocks;
  - b) Glazing – installing heavy windows;
  - c) Manoeuvring heavy components while laying paving and kerbstones;
  - d) Working while bent over, eg:
    - i) Concrete work requiring – hand spreading, vibrating, hand floating large areas of concrete and cutting joints;
    - ii) Steelfixing, especially in ground slabs;
  - e) Working while stretching, eg:
    - i) Fixing services in ceiling spaces;
    - ii) Steelfixing in retaining walls;
  - f) Using tools, which vibrate, eg:
    - i) breaking out concrete,
    - ii) scabbling concrete,
    - iii) pressure washing;
    - iv) compacting equipment;
  - g) Using hand held diggers and breakers;

18. Common types of MSI and the activities, which can cause them, may be summarised as follows:
- a) *Back injury*: caused by lifting and carrying of plant and materials or working in awkward conditions;
  - b) *Work-related upper limb disorder [WRULD]*: caused by carrying out repetitive tasks over long periods;
  - c) *Hand arm vibration syndrome [HAVs]*: caused by exposure to vibrations from plant and machinery.

19. The situation is exacerbated by:
- a) Workers who often do not recognise that carrying out tasks in a particular way may result in long-term ill-health. Their working methods are frequently based on ‘how it has always been done’; and
  - b) Contractors work methods, which are usually driven by site, planning, time or financial constraints;
  - c) Sometimes thoughtless design creates the problem.

20. Further information on manual handling is given in General Information Series I 001 **Manual handling**.

**USEFUL REFERENCES**

- HSG 224 Managing health and safety in construction 0 7176 2139 1
- HSG 149 Backs for the future 0 7176 1122 1
- L23 Manual handling (Regulations and AcoP) 0 7176 2415 3
- INDG 171 Upper limb disorders – assessing the risks 0 7176 1063 2
- HSG 88 Hand arm vibration 0 7176 0743 7

There are other HSE information sheets available which give guidance on dealing with musculo skeletal injury. These are available from HSE Books.