

National Occupational Health and Safety Commission

**GUIDANCE NOTE FOR
THE PREVENTION OF
OCCUPATIONAL
OVERUSE SYNDROME IN
KEYBOARD EMPLOYMENT
[NOHSC:3005(1996)]**

November 1996

**Australian Government Publishing Service
Canberra**

Commonwealth of Australia 1997
ISBN 0 644 45167 X

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FOREWORD

The National Occupational Health and Safety Commission is a tripartite body established by the Commonwealth Government to develop, facilitate and implement a unified national approach to occupational health and safety in Australia.

Through its major focus on national occupational health and safety (OHS) standards, the National Commission aims to:

- achieve best practice in OHS regulation through national coordination of development, implementation and evaluation of national OHS standards;
- provide an effective national tripartite forum to address OHS issues of national importance;
- provide the basis for targeting OHS activities by producing statistical reports using existing information systems and identifying and developing additional cost effective data sources;
- achieve OHS research outcomes supporting the development of national standards; and
- contribute to industry performance through independent assessment of industrial, agricultural and veterinary chemicals for their occupational health, public health and environmental effects.

The National Commission comprises representatives of the Commonwealth, State and Territory governments as well as the peak employee and employer bodies—the Australian Council of Trade Unions and the Australian Chamber of Commerce and Industry.

Consistent with the National Commission's philosophy of consultation, tripartite standing committees have been established to deal with issues relating to standards development and research. Expert groups and reference groups may be established to provide advice to the standing committees on those issues with which the National Commission is concerned.

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PREFACE

Following the release of *The Prevention and Management of Occupational Overuse Syndrome: General Code of Practice*, the National Occupational Health and Safety Commission established a working party to develop an industry-specific document for the prevention and management of occupational overuse syndrome in keyboard employment.

The working party produced this *Guidance Note for the Prevention of Occupational Overuse Syndrome in Keyboard Employment* which has been endorsed by the National Commission. It provides general guidelines for all those involved in the prevention of occupational overuse syndrome and on how to minimise risk in keyboard employment.

A guidance note is an advisory technical document issued by the National Commission. In contrast to national standards and codes of practice, guidance notes have no legal standing as documents declared under Part VI of the *National Occupational Health and Safety Commission Act 1985* (Cwlth), and may not be suitable for reference in Commonwealth, State or Territory legislation. In any case it should be noted that the application of any National Commission document in any particular State or Territory is the prerogative of that State or Territory.

The expectation of the National Commission is that guidance notes will provide detailed information for use by unions, employers, management, health and safety committee representatives, safety officers, medical practitioners and others requiring guidance.

This guidance note should be read in conjunction with *The Prevention and Management of Occupational Overuse Syndrome: General Code of Practice* (Australian Government Publishing Service, 1987), which is included at Appendix D. In order to avoid duplication of material, users will be referred to the General Code of Practice where appropriate. Additional information is available from Worksafe Australia or the department co-ordinating occupational health and safety in your State or Territory.

The guidelines outlined in this guidance note are based on the assessment of current technical data and recommend means of prevention and control of occupational overuse syndrome in keyboard employment.

Worksafe Australia would welcome suggestions for increasing the usefulness of this document, and details of alternative solutions and new developments in the prevention of occupational overuse syndrome. Periodic revisions of the guidance note will be undertaken in the light of this feedback and the accumulating knowledge of the factors associated with occupational overuse syndrome.

Comments should be sent to the following address:

The Chairman
National Occupational Health and Safety Commission
GPO Box 58
SYDNEY NSW 2001
Attention: Preventive Strategies Branch

1. INTRODUCTION

These guidelines apply to a range of work practices identified as areas of keyboard employment, including:

- data processing;
- word processing;
- typing;
- type setting;
- counter operations, for example, cash registers, travel reservations and banking;
- accounting and adding machine operations;
- telephone operations
- programming and computer aided design (CAD).

This Guidance note is concerned mainly with human factors associated with keyboard employment. For information regarding technical design standards and specifications, particularly in relation to screen characteristics, keyboards and furniture, refer in the appropriate section to standards developed by the Standards Association of Australia (SAA). For additional information on CAD applications, counter and telephone operations, refer to Appendixes A, B and C.

A glossary of terms follows the appendixes.

A bibliography, including documents referred to in the preparation of this document, is provided at the end of this Guidance Note.

DESCRIPTION OF OCCUPATIONAL OVERUSE SYNDROME

Occupational overuse syndrome, also known as repetition strain injury (RSI), is a collective term for a range of conditions, characterised by discomfort or persistent pain in muscles, tendons and other soft tissues, with or without physical manifestations.

Occupational overuse syndrome is usually caused or aggravated by work, and is associated with repetitive movement, sustained or constrained postures and/or forceful movements. Psycho-social factors, including stress in the working environment, may be important in the development of occupational overuse syndrome.

Some conditions which fall within the scope of occupational overuse syndrome are well-defined and understood medically, but many are not, and the basis for their cause and development is yet to be determined.

RESPONSIBILITIES IN IMPLEMENTATION OF PREVENTIVE STRATEGIES

The General Code of Practice states that **employers** have the responsibility to provide a safe and healthy working environment, while **employees** have a responsibility to co-operate with employers in the fulfilment of their obligations.

Organisational Policies

The first step in the prevention of overuse syndrome is the development of an organisational policy. The policy should be developed in consultation with those involved at the workplace and take into account relevant legislation.

Such policies should be circulated to all parties and should clearly state where people's responsibilities lie. All intervention, both current and future, should then be based on these policies. Health and safety policies should be integrated with other relevant organisational policies including, for example, those related to the purchase of equipment.

Consultation

For successful prevention strategies there must be effective consultation at all stages of intervention. Consultation should involve workers, supervisors and managers; and also health and safety representatives/committees and union representatives where they exist.

Planning

In the short term, it is important to take steps to adapt the existing work environment to meet the standards outlined in this document. In the longer term, steps should be taken to improve the work environment by taking a proactive approach in redesigning plant and equipment, tasks, jobs, works structures and work organisation. The effectiveness of the prevention strategy should be monitored and reviewed.

STRATEGY FOR PREVENTION

Due to the number of factors associated with overuse syndrome, a prevention strategy should encompass a range of elements and not any isolated, single factor.

The strategy for prevention outlined in the following pages consists of information about:

WORK SYSTEMS: ORGANISATION AND DESIGN

- Approaches to Job Design
- Organisational and Technological Change
- Aspects of Computer Systems Design
- Supervision
- Work Practices
- Ergonomic Factors in Work Design

WORKPLACES: ORGANISATION AND DESIGN

- Work Posture
- Workstation Arrangement
- Equipment Design and Positioning
- Environment Conditions

TRAINING AND EDUCATION

- Target Groups
- Types of Programs

STRATEGY FOR CASE MANAGEMENT

A strategy for case management is adequately provided in the General Code of Practice. The section, **STRATEGY FOR CASE MANAGEMENT**, later in this Guidance Note provides a **Keyboard Workstation Assessment Checklist**.

2. STRATEGY FOR PREVENTION

WORK SYSTEMS: ORGANISATION AND DESIGN

The aim of effective work systems design is to satisfy both technological and organisational requirements as well as the **individual's** social and personal needs.

When work systems are being designed or redesigned, consider the following factors:

- **Variety:** people should be able to vary the tasks they do, work at different speeds and move about while carrying out their jobs. Repetitive short cycle tasks should be avoided.
- **Autonomy:** people should be involved in decisions related to their work such as the method of work and the order in which tasks are carried out, particularly when changes are planned. Employees should be given responsibility for the completion of some tasks.
- **Identity:** tasks should fit together to make a complete job, as when a typist types a complete document, from first draft to final stage.
- **Feedback:** effective feedback links will allow valuable information to be passed to and from workers.
- **Social contact:** most, but not all, people desire to have contact with other people as part of their job. On the other hand, they also like to be able to choose to have some privacy.
- **Achievement:** people like to be able to go home at the end of the day feeling they have done a useful job and have achieved something.
- **Opportunities for learning and development:** although this might seem an unobtainable aim in every job, it is usually possible to provide training and development away from the worksite.
- **Job Demand:** too much work or too little work can lead to strain. In practice, it may be difficult to achieve the necessary balance, as the appropriate levels vary from person to person.

Three of these factors are particularly relevant to the design of work systems from a health and safety viewpoint: *job demand*, *autonomy* and *social contact*. Excessive job demands and lack of autonomy have been specifically linked with occupational overuse syndrome.

Approaches to Job Design

Job enrichment (increasing elements of decision making, responsibility and autonomy) and *job enlargement* (varying the job with additional, alternative tasks) are means of improving job design. In keyboard employment, where additional or alternative tasks are given to staff, care should be taken to ensure that these tasks are non-repetitive.

An example of the application of job enrichment and job enlargement in keyboard employment is the reorganisation and restructuring of keyboard jobs in a typing pool. In a conventional typing pool there is little scope for keyboard users in terms of autonomy, decision-making responsibility and planning. Typically, the jobs are repetitive and keyboard users have little or no contact with the authors of the documents they are required to key.

One option for job design would be to disband the typing pool and assign keyboard users to particular groups of authors. Jobs can then be enlarged, with additional clerical tasks such as editing, proof-reading or filing, and enriched with additional responsibilities such as liaising with authors on matters including the content of material to be keyed, deadlines and work priorities.

With this change, the workloads and work practices of individual workers will need to be carefully monitored and managed by the supervisor.

If jobs are redesigned in this way, keyboard users will then:

- have increased decision-making responsibility;
- be required to learn and apply a number of skills;
- have more scope to plan and organise their work;
- have more opportunity to develop feedback links with both their supervisors and authors;
- feel that their major task (keying) is more significant as they will be able to both appreciate and influence how that task fits into a range of other tasks in the organisation.

Redesign of work systems will also have implications for training of both managers and employees. Consideration of the work system is likely to lead to additional changes in organisations and technology which may have implications for the prevention strategy.

Organisational and Technological Change

A comprehensive and consultative approach to technological change is the best way to maximise the positive outcomes and minimise any adverse consequences. Without consultation changes could meet opposition, reducing the anticipated gains in efficiency.

Careful planning is an essential aspect of the effective management of technological change. The following stages may be followed.

Pre-implementation Stage

This stage can include a number of steps such as management discussions, equipment trials, feasibility studies and calling for tenders.

Consultation with keyboard users and their supervisors is important, to raise awareness of the proposed changes, to identify and highlight current problems and to incorporate their suggestions.

Implementation Stage

During the changeover period, managers need to ensure that:

- production targets and demands on staff are carefully balanced;
- staff are provided with training in the use of the new system and to enhance their career prospects.

Post-implementation Stage

The operation and impact of the technological change should be monitored and reviewed.

Although these stages may be distinct processes within a large organisation, they would usually proceed quickly and may not appear as distinct steps in a smaller organisation.

Aspects of Computer Systems Design

Human-computer interactions can contribute to the risk of occupational overuse syndrome. When a computerised system is used, consideration should be given to the potential effects of:

- system breakdowns;
- response times;
- software facilities;
- system messages;
- user assistance.

System Breakdowns

System breakdowns can increase operator stress and create uneven workloads. Increases in work rate, to compensate for the time lost during a breakdown, can increase the risk of occupational overuse syndrome.

Problems connected with breakdowns are probably greatest while a system is new, and it is important to be prepared for these difficulties. The consequences of stoppages can be reduced by production planning, job organisation, personnel planning and reserve capacities.

Response Times

Poor software design or a high load on the computer system can prolong response times. The 'silence' can cause uncertainty as to whether the system has broken down, interrupt work rhythm and increase operator stress.

The response time should be short and consistent, especially during peak work times. If the response time does vary significantly, the user should be informed of the reason and expected time of return to normal operations.

Software Facilities

Software should be flexible and 'user friendly'. It should specify the required skill of the user, or be adaptable to the variable capabilities of users.

System Messages

Messages should be brief and constructive, giving guidance for using the system in a courteous way. All messages should be explained in the user manuals.

The system and data should be protected from user errors. Error messages should be simple, informing the user of the nature of the error and the remedy as soon as the error occurs. They should be consistent and appear in the same position on the screen.

User Assistance

User assistance or support can be provided by:

- formal training in the operation of the system;
- software assistance, such as 'HELP' functions;
- documentation, such as easy to understand user manuals;
- secondary support from supervisory staff or management, when the system or the manual is unable to provide the assistance required.

Supervision

As supervisors provide the main link between employees and managers, one of their prime functions is to ensure that production is maintained **without** compromising the health and safety of employees.

To fulfil this role, supervisors need:

- management support;
- a clearly defined position of authority and responsibility;
- training in relevant aspects of occupational health and safety;
- training in supervisory skills. (See 'Training and Education', later in this Guidance Note)

When supervisors are aware of the work practices and the concerns of employees, they may be in a position to anticipate problems which, if corrected, will reduce the occurrence of injury. In this way, supervisors can take a preventive approach to occupational overuse syndrome.

Work Practices

Work practices which need to be considered include:

- work rates;
- work adjustment periods;
- deadlines, peak demands and overtime;
- work pauses/task variation.

General principles on these work practices are provided in this section.

Work Rates

The rate at which keyboard work can be performed will vary depending on the type of work, type of equipment, system efficiency, the capacities and experience of the individual worker and the total job demands.

The target work rates and the allocation of work should be determined in consultation, taking these factors into account.

Work Adjustment Periods

Employees newly engaged in keyboard work, or returning from an absence of two weeks or more, need a period of adjustment.

The adjustment period will depend on the individual, the equipment, the environment, and the duration of the keyboard and VDU work involved.

The adjustment may be achieved through reduced work rates, or provision of alternative duties with gradual re-introduction to keyboard work.

Deadlines, Peak Demands and Overtime

Meeting unreasonable deadlines and peak demands will increase time pressures, reduce control over workflow and may contribute to increased risk of occupational overuse syndrome.

Methods of reducing the affects of peak demands include:

- long-term planning of resources;
- organisation of tasks;
- use of extra staff;
- ensuring authors and supervisors are aware of the problem and the opportunities they have to reduce peak demands;
- giving individuals greater control over their workload and workplace.

Overtime is not recommended because extending the hours of daily keyboard operation increases the risk of occupational overuse syndrome.

Work Pauses/Task Variation

It is desirable for keyboard users to spend part of the working day on alternative duties away from the screen and keyboard. Alternative activities should not be visually exacting or of a static sitting nature. As an example, word processor operators could move away from the keyboard to collect new material, discuss details with authors and collect finished items from the printer on a regular basis.

If there are no suitable alternative work activities, work pauses must be provided.

As noted previously, both physical and psychological factors may be important in the development of occupational overuse syndrome. A number of these factors will influence the need for work pauses:

- the duration and intensity of VDU and keyboard use;
- the maintenance of constrained postures;
- the visual demands;
- psychosocial stressors, including customer liaison, and other sustained mental effort.

The length and frequency of work pauses will depend on the individual, the task and other factors. Frequent short pauses are preferable to infrequent longer pauses.

The need for work pauses, and their frequency and duration, should be determined by management in consultation⁽¹⁾.

Both management and employees need to be aware of the importance of regular work pauses. Supervisors should ensure that operators have appropriate breaks from keyboard work, and that the alternative activities are suitable.

Ergonomic Factors in Work Design

Where a user's work involves a mix of activities that form a satisfying job, the consequences of minor inadequacies in the ergonomics of the equipment or work place are minimised. On the other hand, when the pace of work is determined by the system, when use is prolonged and intense and when the individual is not motivated or involved in the work process, the ergonomics of the equipment and workplace become critical.

One way of increasing the motivation and involvement of the users is to involve them in the work design process. This ensures both a better system design, and that the users have a realistic view of the strengths and weaknesses of the system. An individual's response to the equipment and the workplace often depends as much on psychological and organisational issues as on the objective suitability of the equipment. For example, eyestrain can be as much a symptom of poorly designed work as of poorly designed equipment.

⁽¹⁾. `...a number of agreements, mainly in the keyboard area, have been negotiated between management and unions which provide for work pauses of up to 10-15 minutes in each hour.'(General Code of Practice)

WORKPLACES: ORGANISATION AND DESIGN

Introduction

The design of workplaces should be largely determined by the *task requirements* (task analysis), the *human requirements* (ergonomic analysis) and the *environmental conditions*.

A correctly designed workplace will increase user comfort, improve efficiency and minimise the risk of occupational overuse syndrome.

The Standards Association of Australia have developed and produced a variety of documents on the design of workstations, and reference will be made to specific standards where relevant.

Equipment should be maintained and serviced regularly to ensure that it operates to specifications. A system for reporting faults is also recommended.

Task Analysis

Tasks analysis **gathers** information on:

- the task and sub-tasks that are performed;
- the frequency and duration of tasks;
- the material, equipment and tools used.

A wide variety of tasks may be performed at any one workstation. For example, the tasks involved in word processing include:

- keying in information;
- formatting the text;
- proofreading and editing;
- making changes to earlier drafts;
- operating a printer.

The equipment may include:

- the VDU and its associated components;
- the keyboard;
- disc-drive;
- printer;
- telephone and a modem.

Ergonomic Analysis

Ergonomics involves the consideration of human requirements, both psychological and physical, in workplace design.

Equipment and furniture design and layout must allow for a large variation in the physical size (for example, height and reach) of users.

Environmental Conditions

Environmental conditions can have a profound effect on individual well being and posture. The best attempts to provide properly designed workstations may be ineffective if the work environment is unsuitable, as keyboard users may adopt poor working positions or rearrange their workstations in order to avoid such things as glare, reflections and draughts.

Environmental factors which require consideration include:

- atmospheric conditions;
- lighting
- noise;
- space.

For further information, refer to the bibliography, which lists relevant Australian Standards and issues from the Occupational Safety and Health Working Environment Series.

Office Space

Sufficient space should be provided to allow safe and easy access to and from workstations. The layout of furniture and equipment and allocation of space, needs to be considered carefully to optimise:

- efficiency and comfort;
- privacy and security;
- communication and workflow;
- unconstrained work posture and body movement;
- flexibility and individual control;
- social interaction.

Work Posture

A good working posture increases efficiency and reduces fatigue and the risk of injury. It comprises a natural and relaxed position, providing opportunity for movement from which the worker can assume a number of alternative postures. **It is not a single, rigidly defined position.**

Whichever option is chosen, keyboard working positions should follow these fundamental principles:

- the feet must be firmly and comfortably supported, either on the floor or on a footrest;
- there must be ample room to move the legs;
- the thighs must be adequately supported, and the underside of the thighs should not be compressed by the seat edges;
- the hips and knees should not be constrained in limited positions. Angles less than 90 degrees are generally not recommended;
- the natural curvatures of the spine should be maintained and excessive twisting and bending of the spine should be avoided;
- shoulders should be comfortable and relaxed. Elevated or slumped posture should be avoided;
- elbows should be close to the side of the body, and the elbow angle should be around 90 degrees;
- frequent or continuous bending of the wrist (upwards, downwards or sideways) should be avoided.

Three options for providing seated working positions for keyboard users are:

- *the conventional erect posture* - where ankles, knees, hips and elbows are at right angles, and thighs and forearms parallel to the floor;
- *the tilt forward seatpan position* - with the front edge of the seat tilted downwards, increasing the angle between the seatpan and backrest. The effort needed to hold the trunk erect is reduced, but, with prolonged use, the legs and/or knees become fatigued as they are preventing the body from slipping forward;
- *the leaning-back posture* - this method also increases the hip angle, with a horizontal or slightly tilted back seat, a reclined upper body and the entire back supported by a well-shaped backrest. This posture partly restricts the mobility of the head and the arms.

Workstation Arrangement

The four main factors which determine posture are:

- chair design and seat height;
- work height and desk design;
- equipment design and layout;
- reach and vision requirements.

Chair Design and Seat Height

Well designed chairs will promote good posture, allow changes in posture and minimise fatigue.

The seat height should relate to the size of the person and the height of the work surface. When this work surface is adjustable it is easy to select an appropriate height. However, when the work surface is at a fixed height then the chair must be able to be raised sufficiently to accommodate the smallest person and a variable height footrest provided.

Specifications on chair design and range of adjustment are provided in the Australian Standard AS 3590 (to be released in 1989).

Work Height and Desk Design

An adjustable height desk will promote good work postures for the majority of users and will be suitable for a variety of tasks.

The appropriate height of the desk depends on:

- the space required for thigh clearance;
- the thickness of the desk top;
- task analysis, for example, writing versus touch typing;
- the equipment used, for example, the thickness of the keyboard.

The desk must be low enough to provide for comfortable working postures of the upper limb and back, without interfering with the space required for the thighs.

If a desk of fixed-height is used, the height should relate to the taller users and the predominant task performed.

The desk top should have sufficient surface area for the work tasks and equipment, and provide space to rest the hands and forearms.

There should be sufficient space under the desk, free of storage or other obstacles, to permit movement and stretching of the legs.

The Australian Standard AS3590 (to be released in 1989) provides specifications on desk dimensions and height adjustment.

Equipment Layout

The ideal Arrangement of materials and equipment will be determined by:

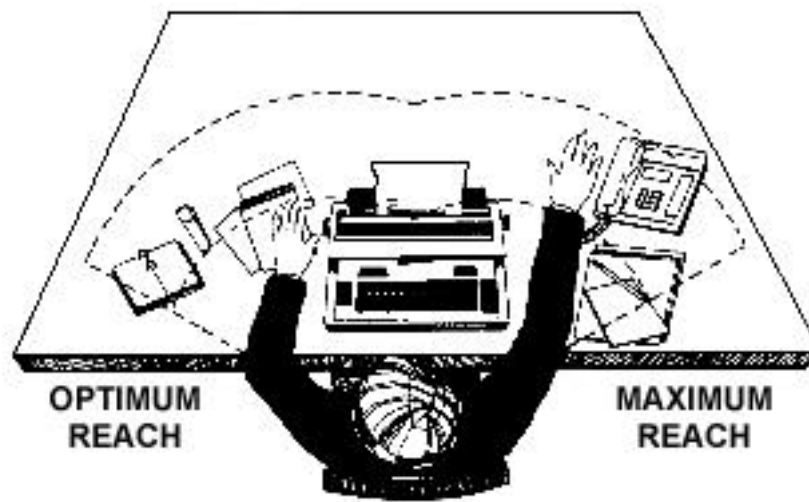
- the tasks performed, their frequency and duration, and the equipment used;
- visual requirements;
- reach distances;
- space allowances.

There is a great need for flexibility in the location and positioning of equipment.

Reach Distances

The location of equipment should be determined by task analysis. As a general rule:

- the most frequently handled objects should be within easy reach when the elbow is resting on the desk top (**optimum reach**);
- the less frequently handled objects should be placed within the distance reached by the outstretched arm (**maximum reach**).



In order to reach objects located beyond maximum reach, the worker should stand and move to a position within easy reach of the object rather than overstretch.

Visual Requirements

Head and neck postures are largely determined by the visual demands of the task. Frequently viewed material and equipment should be located so that the viewing angle and distance allows the operator to maintain an efficient posture while still being able to see the task easily.

As the main tasks in keyboard work pose high **visual demands**, it is essential that the user has adequate vision, corrected if necessary, to perform the work without undue visual fatigue.

Equipment design should aim at optimising **visual quality**; while work organisation should take into account that visual quality is often less than ideal. For example, source material, may be of varying quality and legibility (for example, handwritten text) and different types of paper (for example, carbon copies and glossy finishes) can be difficult to read.

Lighting factors are critical in optimising viewing conditions and minimising visual discomfort.

Standards on visual aspects of visual display units, keyboards and related equipment are outlined in the Australian Standard AS 3590 (to be released in 1989).

Equipment Design and Positioning

Visual Display Units

The display screen should be positioned at an appropriate height and angle for a comfortable work posture. Generally, when sitting tall and looking straight ahead, the keyboard user should be looking at the top edge of the screen. When the visual display unit is used for prolonged periods, the unit should:

- be separate from the keyboard so it can be moved around on the desk;
- be adjustable for height above desk;
- be adjustable for forward and backward tilt (in the vertical plane) and swivel (rotation in the horizontal plane)

The screen should also be maintained free from dust or finger marks.

Recommendations regarding the construction, image quality and user control of visual display units are outlined in the Australian Standard AS 3590 (to be released in (1989).

Keyboard and Other Input Devices

Keyboards which are separate from the screen are recommended, as they allow a flexible orientation on the desk top. In some instances, however, a fixed keyboard can be tolerated because it is in limited use.

The design and selection of all input devices (for example, mouse, roll-ball, joystick and light pen) should be carefully considered in relation to specific task analysis and ergonomic guidelines.

The Australian Standards on keyboard designs are Australian Standards AS 3590 (to be released in 1989) and AS 2287.

Document Holders

Document holders should be provided to prevent adoption of unfavourable postures and to minimise fatigue.

The ideal type of document holder and its positioning is determined by factors such as:

- dimensions and weight of the source material;
- the frequency of handling the documents, for example, entering receipts;
- whether writing, stamping, or stapling of the source material is required, and how frequently;
- duration of viewing source material versus viewing VDU;
- the legibility of the source material.



The following recommendations apply to document holders in general. They should:

- be appropriate to the physical size, shape and weight of the source document and the task requirement;
- be stable, and keep the source document stable;
- be able to move to different positions, heights and angles;
- provide a suitable cursor device, where appropriate.

The ideal location for source material is adjacent to the screen and at the same visual distance from the user. This optimum is not always possible to achieve. Exceptions include:

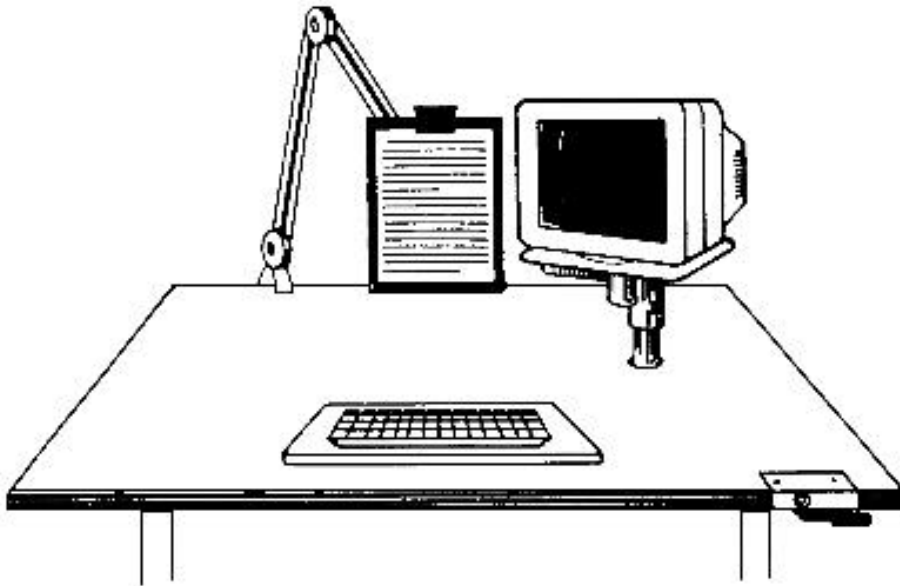
- when the draft material consists of many hundreds of separate sheets which are replaced at short intervals of time, the drafts must then be within close reach to minimise muscular fatigue of the arm and shoulder;
- when the draft material is large in size, an acceptable compromise may be to have the holder between the keyboard and the screen;
- when the draft material is to be annotated, it must be closer than the optimal viewing distance to allow for comfortable writing.

Positioning of VDU: Display, Keyboard and Document Holder

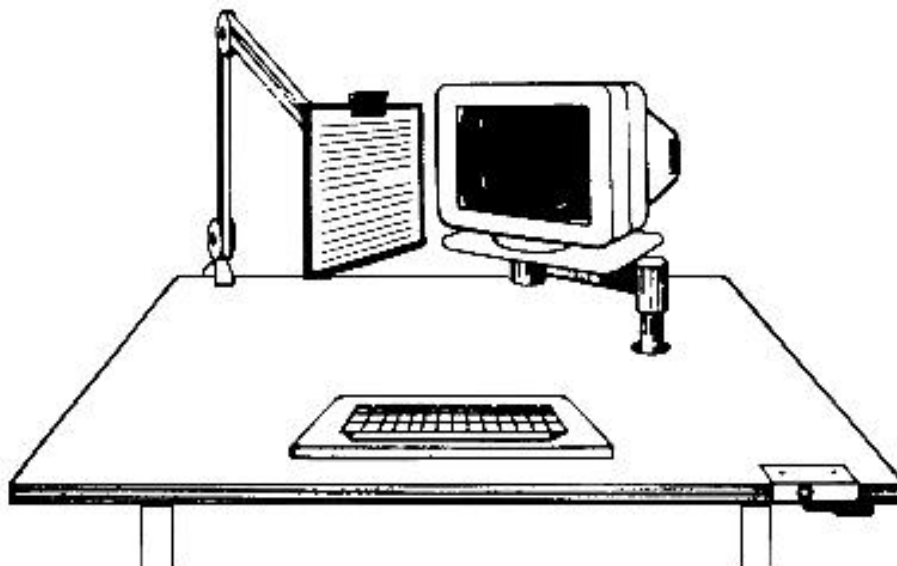
The relative position of the display, keyboard, and document holder should be determined by the task. Large work spaces and adjustable equipment allow task requirements and individual preferences and needs to be accommodated.

The workstation is often designed with the assumption that the visual display is the primary object viewed. However, the source material or, as with the 'hunt and peck' typists, the keyboard, may often be the primary focus.

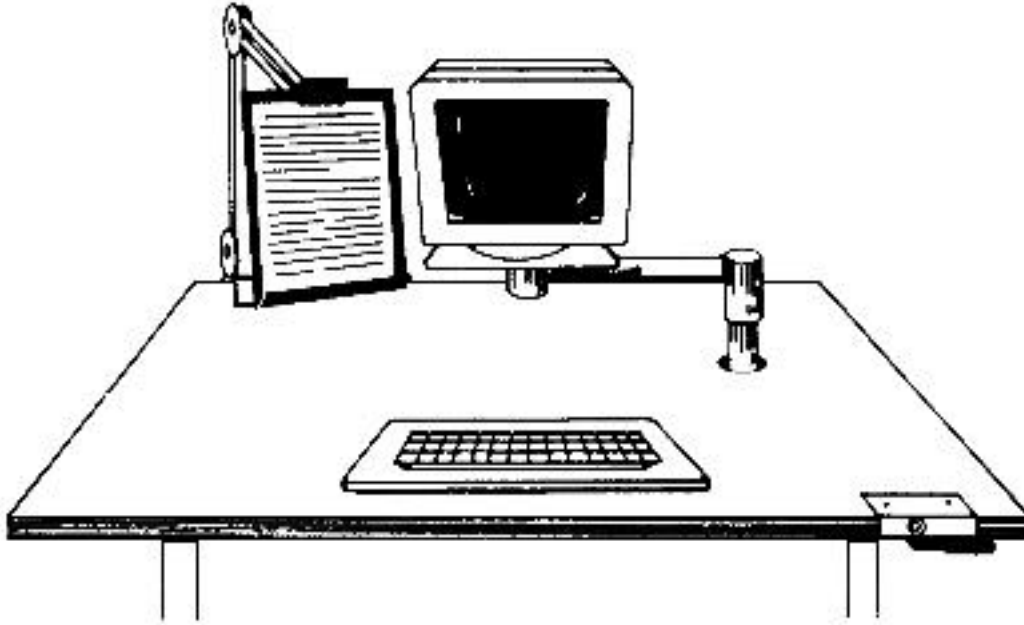
Some practical suggestions are:



If the source document is the primary object viewed then the document holder should be positioned in front of the keyboard user and the screen to one side.



If the screen and document are viewed equally, then the screen and document holder should be side by side, at the same height, in front of the user.



If the screen is viewed most of the time, then the screen should be located directly in front of the user and the document holder to one side.

Footrests

Footrests should be used where the chair or desk height compromises the correct posture of the keyboard user, for example, when smaller users are seated at fixed-height desks or where a raised height desk is used, for example, for viewing customers over a counter. As a rule:

- the footrest should be wide enough to support the feet and allow change of position;
- its upper and lower surfaces should not be slippery;
- a variety of heights should be available.

TRAINING AND EDUCATION

Effective training and education programs are essential to the success of an occupational overuse syndrome prevention strategy.

Training and education programs aim to:

- increase staff and management understanding of health and safety in the office environment;
- decrease the incidence of occupational injury and disease through hazard awareness and prevention.

Specific occupational overuse syndrome programs (based on these guidelines) can be used to supplement and enhance induction, management and supervision, training and other courses. Specific training and education programs will be more successful if they are designed in relation to the organisation's total health and safety policy.

Target Groups

The target groups for training are:

- managers;
- supervisors;
- keyboard users;
- authors;
- health and safety representatives/committees and union representatives;
- staff responsible for selecting furniture and equipment.

Type of Programs

All target groups should be provided with information on:

- the occupational health and safety policy of the organisation - its purpose, aims, content and application;
- factors which can contribute to the development of a healthy and safe work environment and the prevention of occupational overuse syndrome;
- individual responsibilities in relation to occupational health and safety.

Specific training and information regarding work duties and responsibilities will be needed by each target group.

Managers

Manager training and education should include:

- the legal responsibilities of employers in relation to occupational health and safety;
- the importance of the development and implementation of occupational health and safety policies and their inter-relationship with other organisational policies, for example, human resource planning;
- the importance of, and mechanisms for, consultation with staff.

Supervisors

Supervisors provide a link between keyboard staff, authors and managers, and hence they require training and education in the following:

- supervisory skills including communication and human relations;
- keying skills and correct work practices;
- author programs;
- workload, time and resource management;
- correct use of furniture and equipment;
- efficient and healthy work postures;
- system capabilities and limitations;
- early detection and appropriate management of signs or symptoms of occupational overuse syndrome;
- resources available for assistance, such as system back-up and support, and occupational health and safety resources.

Keyboard Users

Staff using keyboards and related equipment require training in:

- keying skills and techniques. Where appropriate, training in touch-typing should be provided;
- correct use of furniture and equipment;
- efficient work postures and the importance of movement and change of posture;
- system capabilities and limitations;
- role of the supervisor;
- resources available for assistance (as described in the paragraph on 'User Assistance' in 'Aspects of Computer Systems Design' earlier in this Guidance Note);
- correct work practices and their importance - overtime, peak demands, task variation, work pauses;
- early detection and reporting procedures for health or safety problems, such as occupational overuse syndrome.

Authors

Authors require training programs which outline their responsibilities for themselves and for keyboard staff. Hence, training and education may include:

- preparation and presentation of drafts and edits;
- reducing workload for keyboard staff;
- system capabilities and limitations;
- deadlines, peak workloads and prioritising work;
- author keying skills and/or use of dictaphones;
- the correct use of furniture, equipment and writing implements;
- correct working postures;
- task variation, work pauses and other work practices.

Health and Safety Representatives/Committees and Union Representatives

Training programs should cover the following topics:

- the ergonomic design of the task, job and work processes. This would include discussion of work rates, peak demands and work adjustment periods;
- technical information related to the equipment/technology in use;
- the health and safety hazards associated with the technology in use and the work environment in which the technology is used;
- regulations and codes of practice governing the use of the technology;
- relevant policies of management, unions and government.

Staff Responsible for Selecting Furniture and Equipment

Staff responsible for selecting/purchasing furniture and equipment should be provided with information on:

- the ergonomic aspects of equipment and the means of providing for both the human and organisational needs;
- the health and safety hazards associated with equipment of low quality and the need for a preventative approach;
- relevant Australian Standards and Codes of Practice/guidelines.

3. STRATEGY FOR CASE MANAGEMENT

Essential elements of this strategy include:

- early reporting;
- effective liaison between employees, supervisors and health professionals where relevant;
- early and appropriate rehabilitation.

KEYBOARD WORKSTATION ASSESSMENT

CHECKLIST

The checklist is provided to assist in the assessment of keyboard workstations of people reporting discomfort at work.

The checklist can be used by supervisors and occupational health and safety personnel and will assist in the identification of problems associated with individual workstations. The problems identified through the checklist should be brought to the attention of management so that appropriate action can be taken.

DATE

KEYBOARD USER

ASSESSOR

PROBLEMS IDENTIFIED

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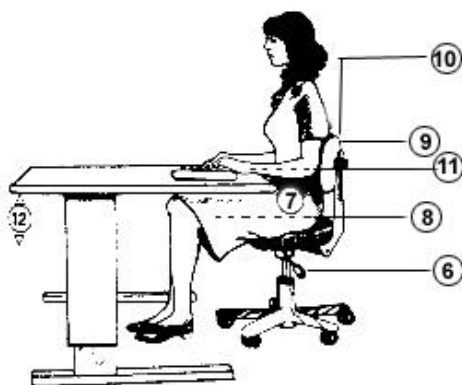
.....

WORK ORGANISATION

1. Does the user have a variety of tasks?
If YES, does the user have some control over the order in which they are done?
2. Is care taken to avoid placing the user under pressure to meet demanding work targets or deadlines?
3. Has there been a constancy in workload recently? *(This is preferable to sudden increases in workload or working overtime.)*
4. If the user is a new staff member, or has recently returned from leave, did he/she have a period to adjust to the workload?
5. Have work pauses been taken as appropriate?

YES NO

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>



WORKSTATION ADJUSTMENT

YES NO

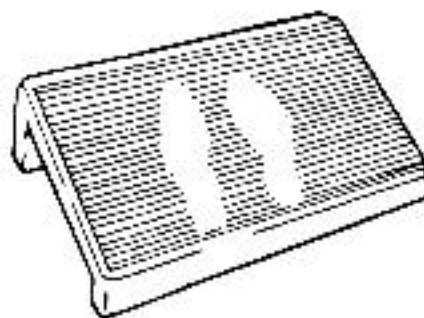
Chair

6. Is the chair easily adjusted from a seated position? ☐ YES ☐ NO
7. Can the user get close to the workstation without impediment? ☐ YES ☐ NO
(Check that the desktop is thin, chair arms are not in the way and there is clear leg room.)
8. Is the seat height adjusted so that the user's thighs are parallel to the floor with feet resting on the floor or on a footrest? ☐ YES ☐ NO
9. Is the backrest height adjusted to fit into the small of the user's back and adequately support the spine? ☐ YES ☐ NO
(To find the small of the back, have the user stand with hands on waist.)
10. Is the backrest angle adjusted so that the user is sitting upright while keying? ☐ YES ☐ NO
(User should be encouraged to change backrest position when not keying.)

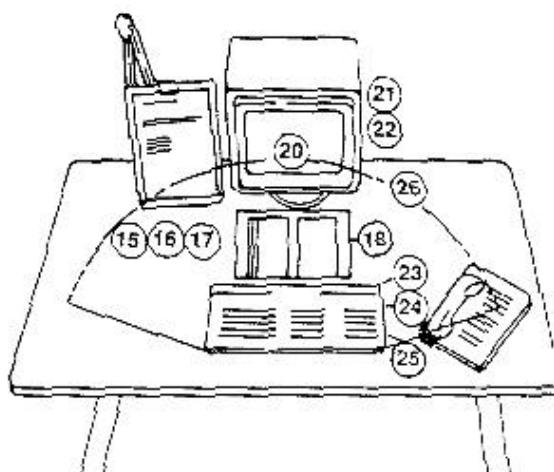
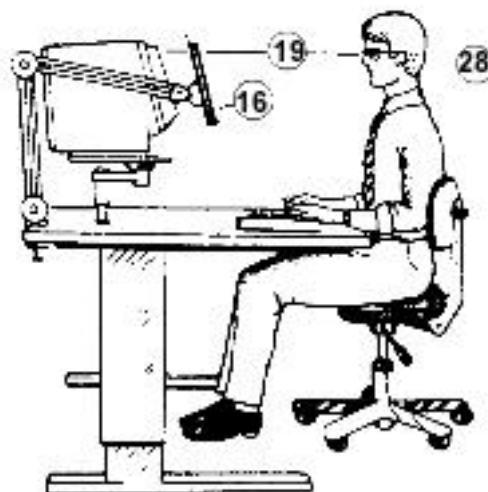
Desk

11. Are the user's forearms parallel with the floor or angled slightly downward? ☐ YES ☐ NO
(This can be achieved by lowering the desk to suit the user, or, with a fixed-height desk, raising the chair.)
12. Is the desk height adjustable? If YES, is the adjustment easily operated? If NO, has the user been provided with a footrest? ☐ YES ☐ NO
☐ YES ☐ NO

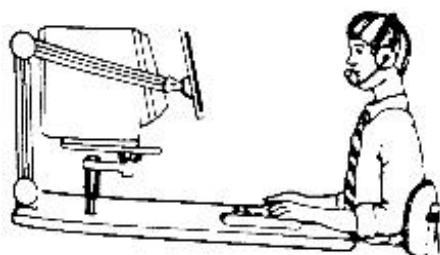
	YES	NO
Footrest		
13. Is the footrest large enough to support both feet and allow a change of position?	<input type="checkbox"/>	<input type="checkbox"/>
Counter		
14. Is there a chair of appropriate height and footrest provided at the counter where sitting/standing work is performed?	<input type="checkbox"/>	<input type="checkbox"/>



	YES	NO
Documents		
15. Are all source documents legible?	<input type="checkbox"/>	<input type="checkbox"/>
16. Is a document holder provided?	<input type="checkbox"/>	<input type="checkbox"/>
17. Does it support all source documents adequately?	<input type="checkbox"/>	<input type="checkbox"/>
18. Can documents be manipulated easily as required?	<input type="checkbox"/>	<input type="checkbox"/>
Screen (if applicable)		
19. When sitting tall and looking straight ahead, is the user looking at the top edge of the screen?	<input type="checkbox"/>	<input type="checkbox"/>
20. Is the screen at a comfortable reading distance?	<input type="checkbox"/>	<input type="checkbox"/>
21. Are all characters in the display easily legible and is the image stable?	<input type="checkbox"/>	<input type="checkbox"/>
22. Can the position and contrast of the screen be adjusted by the user?	<input type="checkbox"/>	<input type="checkbox"/>



	YES	NO
Keyboard		
23. Is the keyboard detached from the screen to ensure a comfortable working position?	<input type="checkbox"/>	<input type="checkbox"/>
24. Is the keyboard thin enough for comfortable positioning of the arms? (It should be less than 30mm thick at the home row of keys.)	<input type="checkbox"/>	<input type="checkbox"/>
25. Is the keyboard matt finished to prevent irritation from glare and reflection?	<input type="checkbox"/>	<input type="checkbox"/>
Layout		
26. Are all often-used items within easy reach? (They should be within normal arm reach with minimum trunk movement.)	<input type="checkbox"/>	<input type="checkbox"/>
27a. Is there sufficient space for large documents, completed work or writing?	<input type="checkbox"/>	<input type="checkbox"/>
27b. Is there sufficient space for CAD furniture, equipment and hardcopy materials?	<input type="checkbox"/>	<input type="checkbox"/>
28. Is the workstation designed to prevent undue twisting of the neck or trunk?	<input type="checkbox"/>	<input type="checkbox"/>
29. Are the variety of tasks performed in counter operations accommodated by the design and layout of the counter workstation?	<input type="checkbox"/>	<input type="checkbox"/>



	YES	NO
Environment		
30. Does the user find the lighting satisfactory? (Ask about glare, reflection and the ability to read documents.)	<input type="checkbox"/>	<input type="checkbox"/>
31. Does the user find the noise level conducive to concentration?	<input type="checkbox"/>	<input type="checkbox"/>
32. Does the user find the temperature and airflow in the room comfortable?	<input type="checkbox"/>	<input type="checkbox"/>
Telephone Operations and Headsets		
33. Is there a headset available for continuous telephone operations?	<input type="checkbox"/>	<input type="checkbox"/>
34. Is the headset lightweight, adjustable and comfortable?	<input type="checkbox"/>	<input type="checkbox"/>
35. Does the telephone equipment include easily adjustable volume controls?	<input type="checkbox"/>	<input type="checkbox"/>
36. For telephone operations that are traffic dependent and continuous, is a manual call control facility provided?	<input type="checkbox"/>	<input type="checkbox"/>

HUMAN FACTORS IN COMPUTER AIDED DESIGN**INTRODUCTION**

Interactive graphic computer systems, including engineering computer aided design (CAD) systems, involve the use of specially designed computer terminals and which designers can develop, modify and manipulate images which form the basis for artistic or engineering designs and drawings.

A CAD operator usually interacts with one or two cathode ray tube (CRT) displays, a keyboard and digitiser tablet, a printer/plotter, a desk and a chair.

A CAD workstation has similar equipment to an office VDU terminal. Most of the factors that effect humans in the interaction with VDU workstations apply to the CAD system. However, the CAD system has a specialised function.

WORKSTATION DESIGN

Prolonged periods spent by the operator watching the screen emphasise the need for the best possible physical relationship between the operator and the screen. The position of the screen will influence the viewing angle and distance, and the operator's posture. Muscular fatigue, and visual fatigue or discomfort, may result from incorrect positioning.

The screen and its supports should allow operators to adjust screen height, swivel and tilt easily. The dimensions of adjustment would depend on the task and workstation design.

TECHNOLOGY SELECTION, EQUIPMENT AND MACHINE DESIGN

The CAD system differs from the office VDU in that the operator is involved for long periods of time with technology that has the following characteristics:

- a high resolution graphics terminal that on most occasions involves the use of colour;
- other than the specialised screen, the system offers a library of information to the operator;
- the input devices may include items such as a mouse, joystick, light sensitive pen, thumb wheel, puck and various forms of digitiser tablets other than the keyboard.

The above factors therefore influence the selection of:

- the type of screen that is appropriate to the task;
- appropriate colour combinations which are based on the physiological and psychological principles;
- software that is easy to use and appropriate for the function of the CAD system.

SOFTWARE

Software will influence that task, intensity and duration of operator interaction with the CAD system. While choice of software is very important, prescription is very difficult due to the rapid advancement in the industry.

WORKPLACE AND ENVIRONMENT DESIGN

The constant use of graphics, colour and long periods spent by the operator viewing the screen increases the need for careful lighting consideration as in Australian Standards AS 2713 and AS 1680.

Visual relief centres such as photo murals, wall hangings and posters, may be considered. Other physical environment considerations such as noise, thermal comfort, and ventilation should conform to standards or guidelines set for the VDU office environment (*See 2. 'Workstation Arrangement' in 'Workplaces: Organisation and Design', earlier in this Guidance Note*).

TRAINING AND EDUCATION

Competent use of the CAD system involves familiarity and experience with the system and knowledge of the system's full capabilities. As well as technical training, operators should be provided with training in the safe use of the CAD system.

CONCLUSION

CAD is a specialised, complex design tool that is in a state of rapid development. While some fundamental guidelines on its effect on humans may be drawn, the present state of knowledge does not allow for prescriptive statements.

HUMAN FACTORS IN COUNTER OPERATION**INTRODUCTION**

Counters are specialised workstations which provide both a physical and a psychological barrier between client and operator. The introduction of modern technology to the office has meant that VDUs are being used increasingly in conjunction with counters. The human factors associated with this situation are complex as the operator's attention is divided between the client, the VDU and the work on the counter.

To design and construct a counter and its surroundings appropriately, consideration should be given to task analysis and work organisation. This will provide information which will make it possible to design the workplace, taking into account postural and psychosocial factors.

TASK ANALYSIS

This includes assessment of:

- services performed;
- tasks performed on the counter such as writing;
- telephoning, stamping, VDU work and other tasks;
- type, quantity and size of goods handled;
- reach requirements of both operator and client;
- communication required between operator, other staff members and clients.

WORK ORGANISATION

This includes assessment of:

- time spent at the counter;
- time spent with each client;
- whether the counter is used by one operator only or shared with other operators at different times;
- whether the counter is shared by a number of operators at one time.

POSTURE

A well designed workstation allows operators to adopt comfortable working postures. Following consideration of task analysis and work organisation decisions can be made which relate to working position.

WORKING POSITION

Sitting

A false floor behind the counter allows the operator to sit on a clerical or keyboard chair while the client stands. This is appropriate where the operator remains behind the counter for the majority of the day.

Standing

The operator stands at the counter while dealing with the client. There should be provision for the operator to sit when not working at the counter. This is appropriate where the operator is moving between this and another workstation all day.

Sitting/Standing

The operator may stand or sit while dealing with the client. The chair provided must have a longer stem than clerical or keyboard chairs. This is appropriate where the nature of the task performed allows the user to sit or stand at the counter.

SCREEN POSITION

VDU is Operated by One Person in a Single Work Period.

The screen should be able to be positioned on either the left or right of the operator and be seen easily with minimal rotation of the head. The keyboard, in most instances, should be directly in front of the operator.

VDU is Shared by More than One Operator in a Single Work Period.

The screen should be placed in the centre of the counter, that is between the users and within reasonable access to both operators. The keyboard, in most instances, should be in front of the screen.

PSYCHOSOCIAL FACTORS

Consideration should be given to the working atmosphere created for both operator and client. Factors which should be addressed include:

- security considerations;
- the nature of client/operator interaction - it is desirable that the line of sight between the operator and the client is level;
- colour of counter and surroundings.

CONCLUSION

The aim of this appendix is to convey that counter design should not be totally prescriptive, but should take into account the specific nature of the work involved, which task analysis and work organisation can describe. For further specific technical information on counters refer to Australian Standard AS 3590 (to be released in 1989).

TELEPHONE OPERATIONS AND KEYBOARD WORK

Keyboard work often includes the entry or retrieval of data advised to the operator via the telephone from customers/clients external to the organisation.

This type of operation, where customer contact is traffic dependant and of continuous use, require special considerations.

Customer contact keyboard operation is stressful in that it involves the handling of customers from a range of backgrounds from the quick-fire business executive giving rapid details, to the slow, hesitant speech of the aged or those with language difficulties.

CALL CONTROL

Operators should have control over the pace of work by the provision of manual call control facility that allows operators to physically take a call from the traffic queue, rather than calls dropping automatically into an operating position.

VOLUME LIMITERS

Telephone switching equipment should have volume limiters connected to eliminate network noises that can be annoying or harmful.

VOLUME CONTROL

Operator's equipment should include a volume control which is easily adjustable and accessible to the operator.

HEADSETS

Operators using an ordinary telephone handset for keyboard operations frequently adopt an undesirable posture which is a strain on the body.

Where continuous telephone operations are involved, headsets should be provided to enable operators to adopt a correct posture and to leave both hands free for keyboard work.

A range of headsets should be provided which are adjustable, lightweight and comfortable.

The operator should be able to plug the headset into either the left or right hand side of their workstation.

DISTRACTING NOISE LEVELS

The degree of concentration of the operator is dependent on the quality of the ambient noise, as well as the quantity.

In some circumstances, disagreeable noises such as sudden alterations in background noise level, slamming doors, unnecessarily loud conversations, and other forms of distracting noise, may cause interruption to the operator's concentration.

Depending on the task and the surroundings, these conditions are more subjective than the recognised upper noise levels.

Nevertheless, every opportunity must be taken to reduce the likelihood of distraction arising from low level sources either in the operating area or in the immediate surroundings.

**APPENDIX D IS THE PREVENTION AND MANAGEMENT OF OCCUPATIONAL
OVERUSE SYDNROME GENERAL CODE OF PRACTICE DECEMBER 1986**

**THIS IS SUPERCEDED BY
NATIONAL CODE OF PRACTICE
FOR THE PREVENTION OF
OCCUPATIONAL OVERUSE SYNDROME
[NOHSC:2013(1994)]**

GLOSSARY OF TERMS

Consultation

Means the sharing of information and exchange of views between employers, employees and employee representatives. It includes the opportunity to contribute to decision making in resolving occupational overuse syndrome risks.

Dynamic muscle effort (work)

Characterised by a rhythmic alternation of contraction and extension, or tension and relaxation of muscles, for example, cranking a wheel. Movement occurs.

Employee

Means an individual who works under a contract of employment, apprenticeship or traineeship.

Employee representative

Includes an employee member of a health and safety committee where established in the workplace, or a person elected to represent a group of employees on health and safety matters.

Employer

Means a corporation or an individual who employs persons under a contract of employment, apprenticeship or traineeship.

Note: The definition of employer includes the *self-employed* which means a person who works for gain, other than under a contract of employment, apprenticeship or traineeship, whether or not that person employs others.

Ergonomics

The scientific study of the capabilities and limitations of workers in relation to a work system, machine, or set task, and in relation to the physical, psychological and social environment in which they work, with the aim of promoting the well-being, safety and productivity of those workers.

Extreme (awkward) postures

Body postures where the mechanical and physiological mechanisms of joints, muscles and soft tissues are jeopardised.

Force

Means any action that tends to maintain the position of an animate or inanimate object, to alter the position of the object, or to distort it.

Grip types (see Figure 25 below)

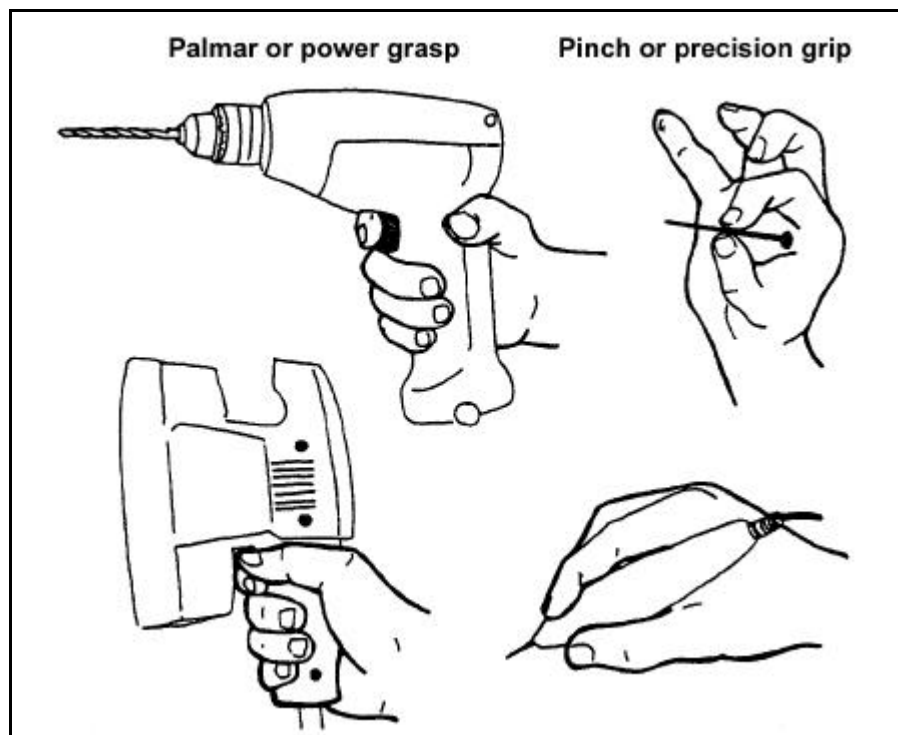


Figure 25 Grip types.

Hand and arm movements (see Figure 26)

Hazard

Means the potential to cause harm or injury.

Human factors

The capabilities and limitations of workers in relation to a work system, machine, or set task, and in relation to the physical, psychological and social environment in which they work.

Musculoskeletal system

The musculoskeletal system is comprised of bones, joints, muscles, connective tissue and the interaction of these. It provides the body with structure, support, strength, movement and protection.

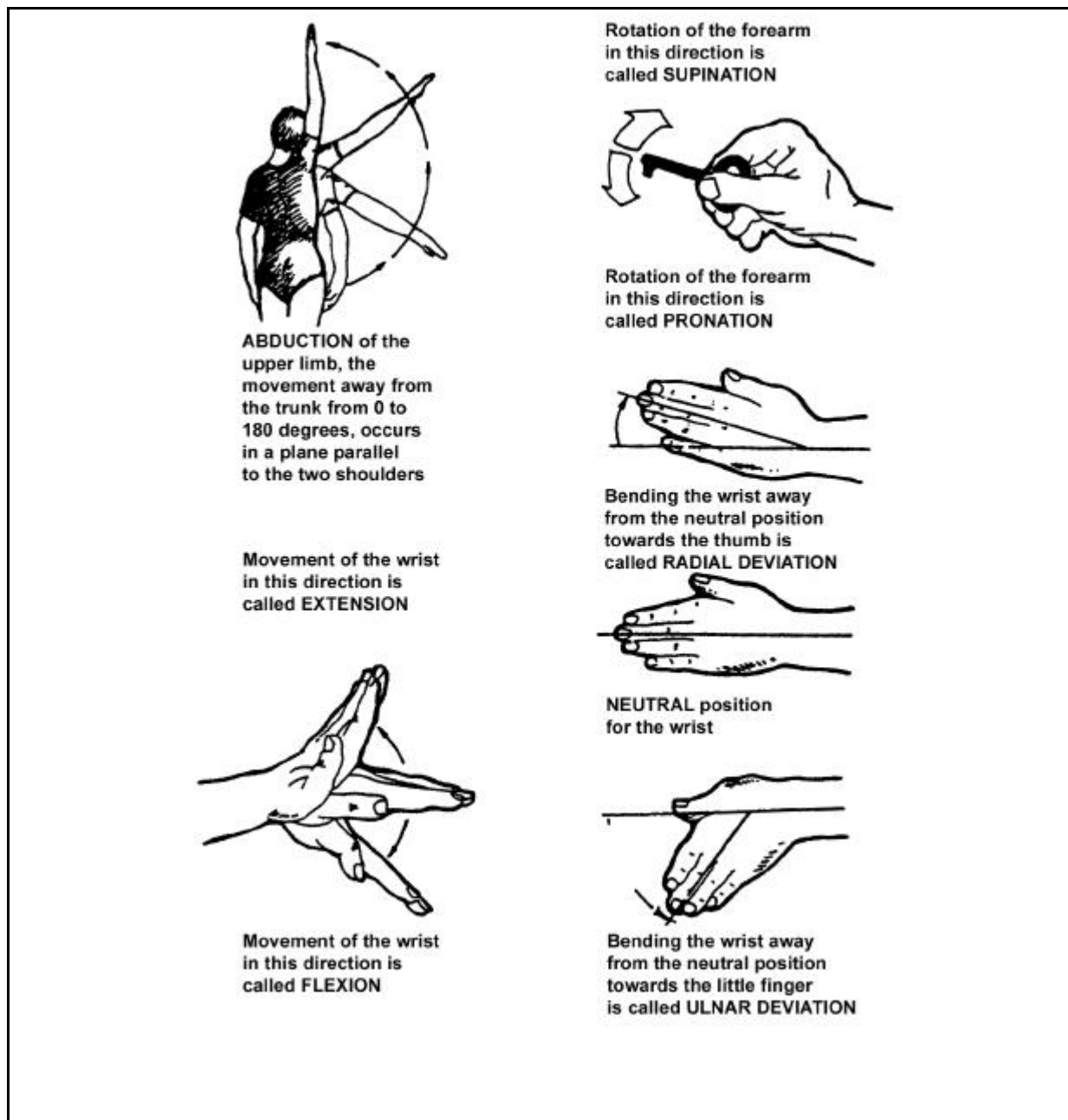


Figure 26 Terminology for hand and arm movements. (Source: Occupational Overuse Syndrome – Preventative Guidelines SAA HB10-1987, Standards Australia, Sydney)

Risk

Means the likelihood of harm or injury actually occurring.

Static muscle effort (work)

Characterised by a prolonged state of contraction of the muscles, which usually implies a postural stance, for example, supporting a weight at arm's length. Little or no movement occurs.

Weight

Means the mass of an object (expressed in kilograms).

Work cycle

The length of time provided to complete one task or subtask.

Work level

The level where the task is performed, above the work surface height, defined by the thickness or height of the equipment or the machinery used.

Work rate

The number of work cycles in a given time period. The work rate may be self-paced or machine paced.

Work surface height

The distance measured from the floor surface to the work surface such as a bench, table or conveyor surface.

Workplace

Means any place, including any aircraft, ship or vehicle, where a person works, or is likely to work, and includes any place where a person goes while at work.

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